VOLUME 1 ISSUE 1
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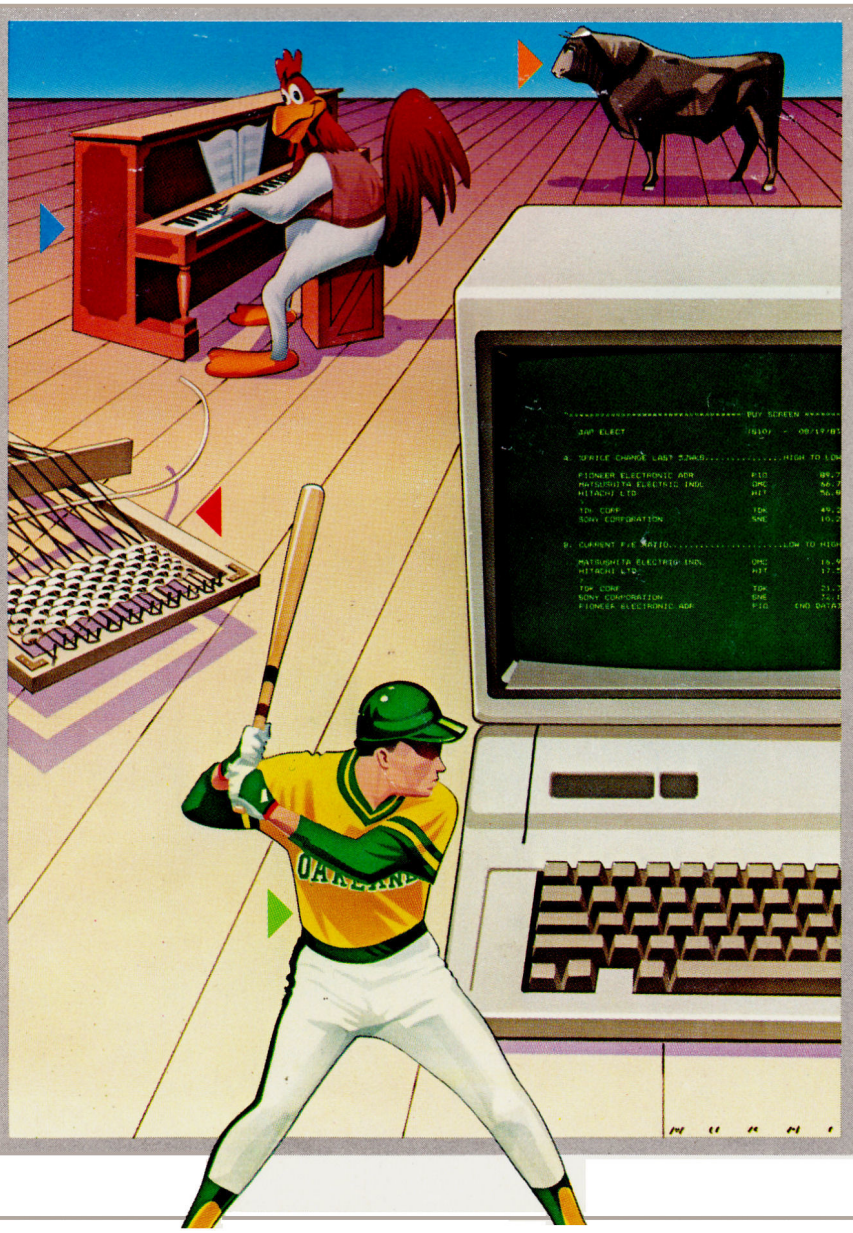

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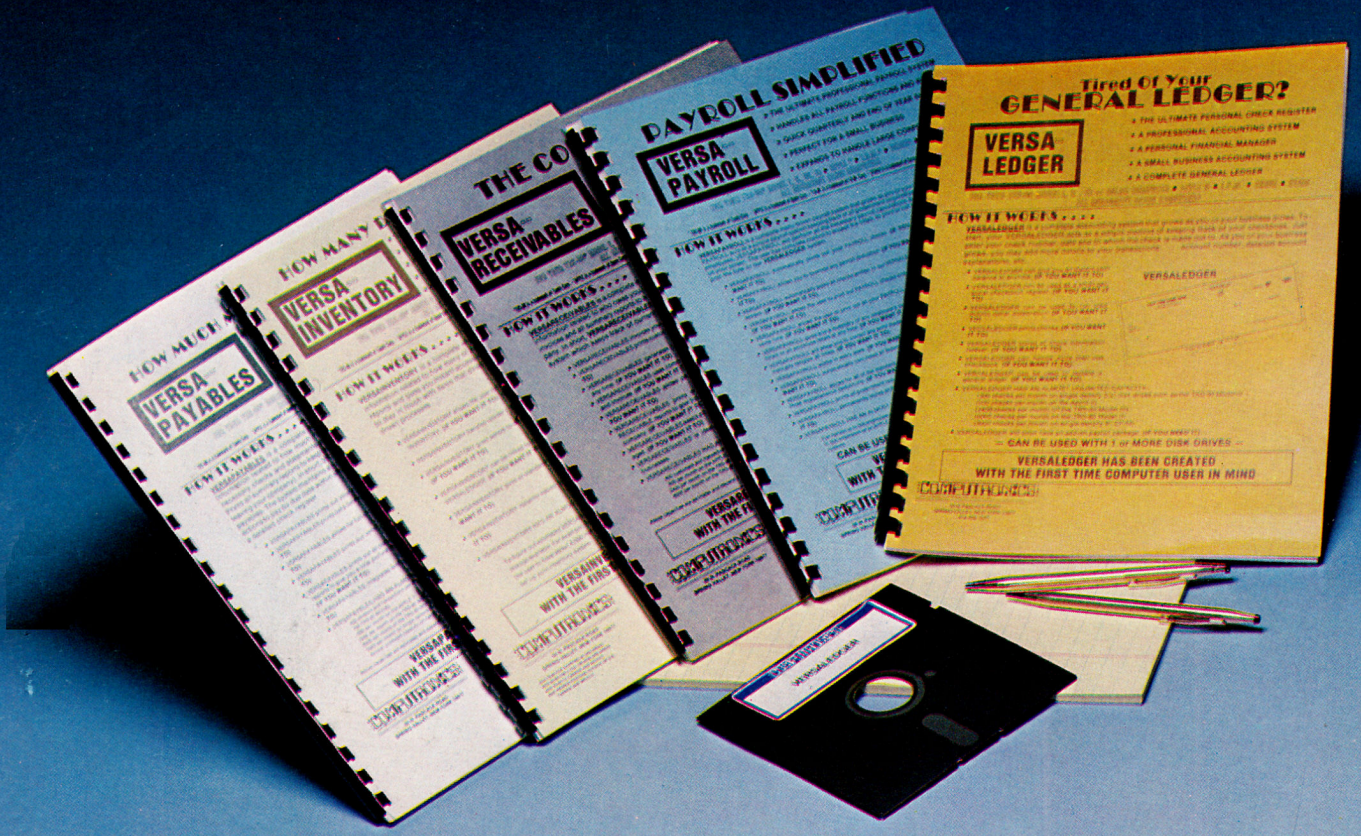

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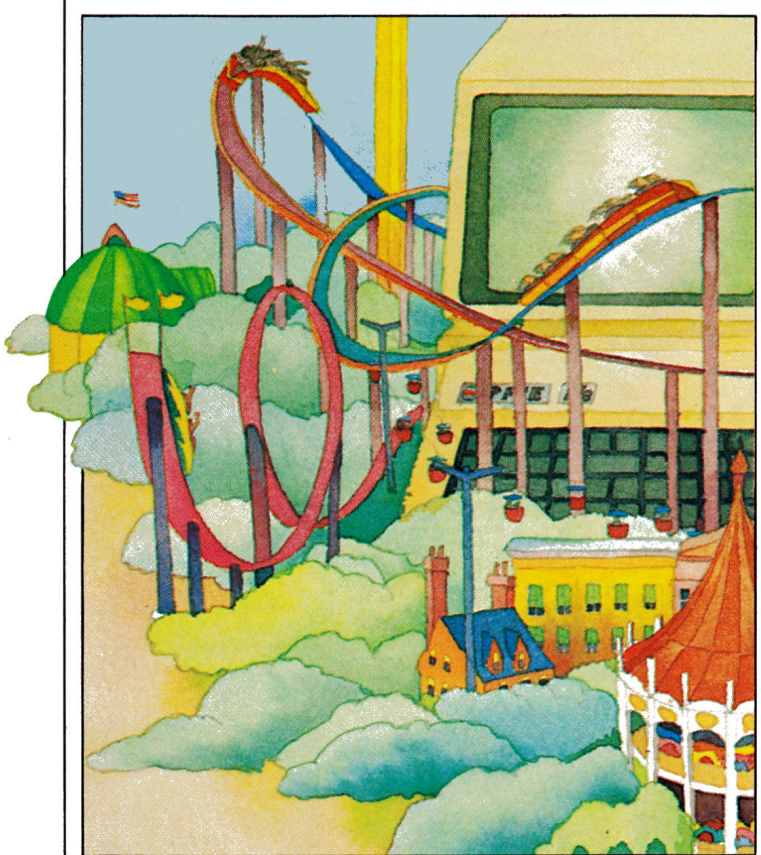

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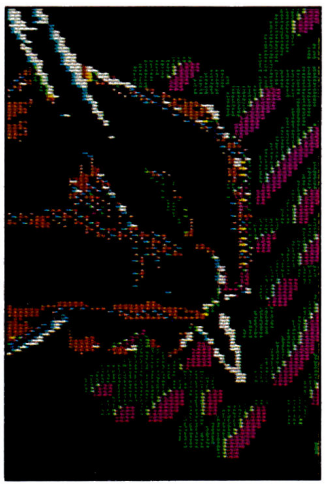

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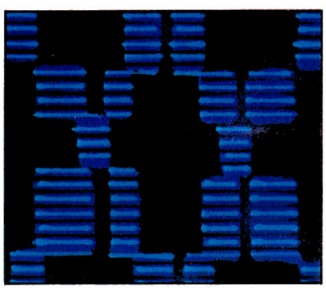

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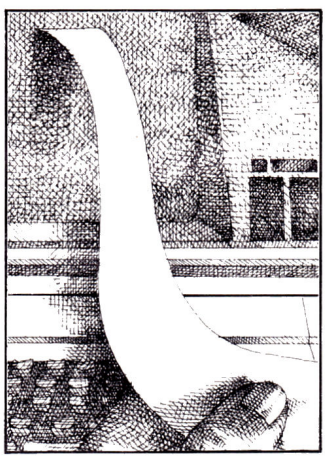

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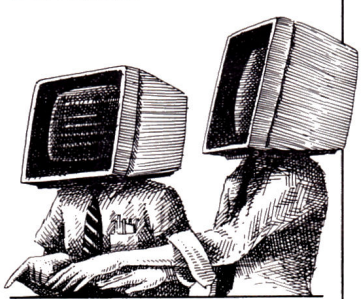

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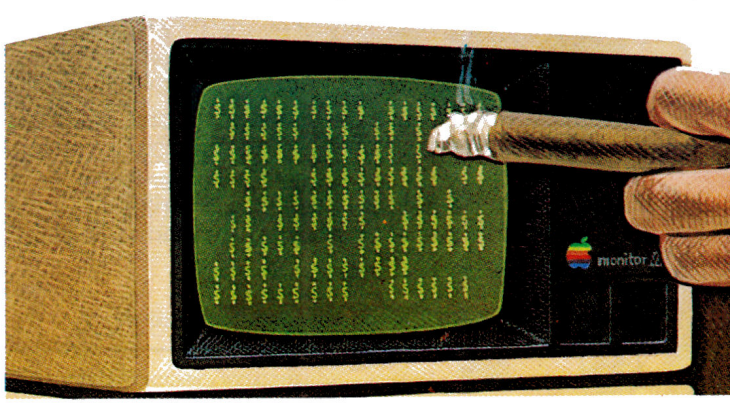

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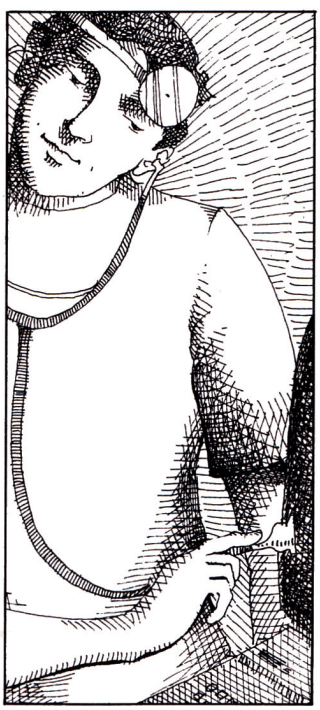

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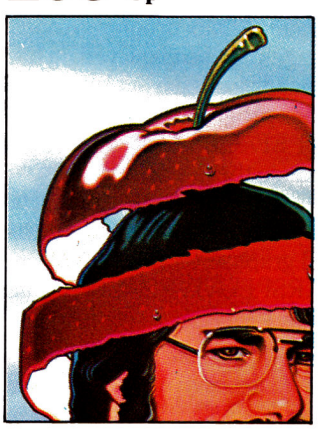



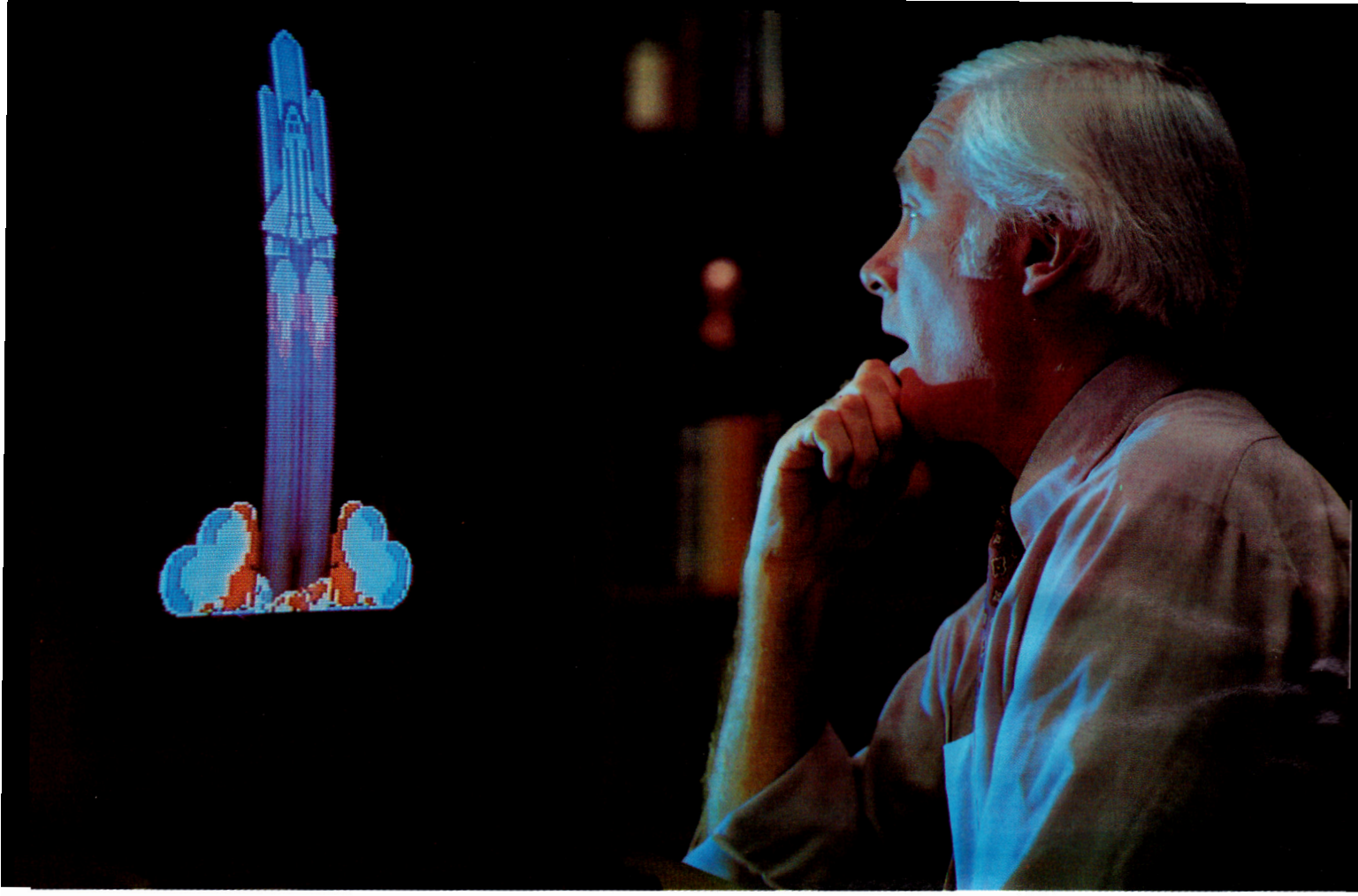

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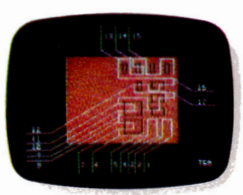

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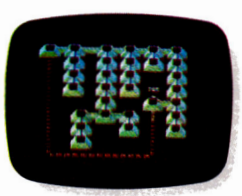

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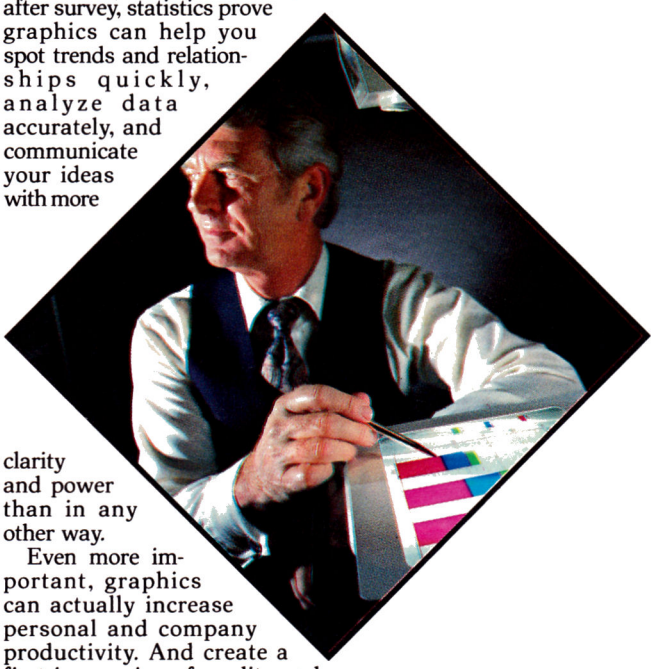

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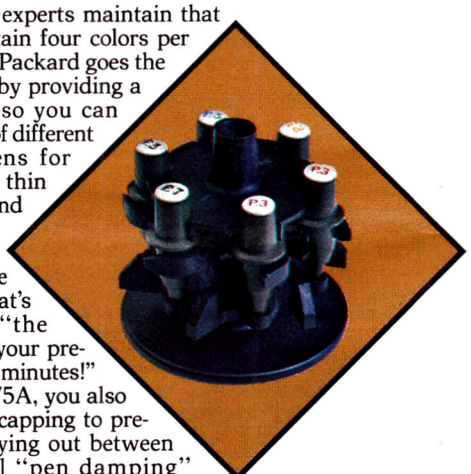

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A MESSAGE FROM MAGGIE

WELCOME TO A+



In the beginning Man created the computer. The computer was without proportion and filled with vacuum tubes; and the spirit of Man was moving towards making a smaller computer.
First day: Transistors.
And Man said, "Let there be transistors." And Man saw that the transistors were good; and Man separated the vacuum tubes from the transistors.
Second day: Microprocessors.
And Man said, "Let there be a microprocessor in the midst of computers, and let it separate the big computers from the small computers."
Third day: Kits.
And Man said, "Let the computer components be gathered together into one place, and let the personal computer appear in kits."

We have come an incredibly long way since those early days of personal computing in the mid-seventies.

Fourth day: Mass production.
And Man said, "Let there be pre-assembled personal computers to separate the hackers from the hobbyists."
Fifth day: Software.
And Man said, "Let the personal computers bring forth swarms of software packages, and let the software fly across to the world of business applications."
Sixth day: Competitors.
And Man said, "Let the personal computer revolution bring forth living competitors according to their kinds: Apple

and Commodore and IBM and Radio Shack and more.''
Seventh day: Magazines.
Thus the personal computers were finished. And on the seventh day Man finished his work and told publishers to create magazines in his image.

That is not exactly how the personal computer was created, but close enough for you to get the point. We have come an incredibly long way since those early days of personal computing in the mid-seventies, when only engineers and programmers could master the power behind the first personal computers. With the advent of mass-marketed hardware and software, personal computers are now used in all walks of life, by all kinds of people—people like you, who are using your personal computers for such diverse purposes as running your businesses, monitoring your investments, and educating your children. And as you know, because you had to make a choice among equipment, the personal computer market is intensely competitive. Industry analysts all concur that a ''shake out'' in the personal computer arena is imminent. With nearly a million units being used actively and new products in the offing, there is no doubt that Apple Computer will continue to be a leader in the personal computer field.

It is with this knowledge—that Apple Computer is a remarkably successful company that produces innovative products, attracts top-quality people, and has a vision for the future—that Ziff-Davis Publishing decided it was time to create a definitive magazine to serve the needs of

I am looking forward to the challenge of providing interesting and useful information on a monthly basis.

the ever-growing Apple computer community. Thus, I welcome you to A^+, the magazine for Apple computer users.

Some of you may know of me through my previous incarnation as the editor-in-chief of *Infoworld*, the newsweekly for microcomputer users. During my years there, I chronicled the growth of Apple Computer from a two-man, garage-based operation into a 4,000-strong Fortune 500 company. I met many of the main players at Apple, from Steve Jobs and Steve Wozniak to Mike Markula and John Scully. I was fortunate to get to know the people who designed, built, promoted, and delivered the products you use today. My overall impression was and still is of respect and admiration. That is not to say that Apple Computer has not had its share of flops and problems, but it is to say that Apple Computer is a company that embodies the American dream—an entrepeneurial dream come true. But equally important to financial success has been the vision that motivates the people who work for Apple. The energetic and youthful staff at Apple Computer fervently believes that the products it produces and sells are not only innovative, but that these products actually improve the world we live and work in, and enhance the meaning of the commonplace. Some might argue the merits of this mentality, however, I personally believe that this attitude will help Apple compete successfully against IBM. So, having covered Apple for years from the news point of view, I am pleased to join Ziff-Davis Publishing to create a new family of magazines for the Apple Computer user community.

As the editor of A^+, I am looking forward to the challenge of providing interesting and useful information on a monthly basis. I am targeting the editorial at the typical Apple user, whom marketing types like to refer to as an ''achiever.'' An ''achiever'' can be described as a man or woman in the age group of 18-45, who is using an Apple computer for professional purposes. (Marketing types also like to include the go-getter, risk taker, and sports enthusiast in this definition, but not many of us Apple users are all those things, so I prefer to leave that to the marketeers.) Professional uses span the entire spectrum of the working world, from writing a manuscript to keeping the books to forecasting markets, from working at home to working in a large corporation. We will concentrate on the Apple II and Apple IIe for the obvious reason that they are the most prevalent products. However, we will include regular articles on the Apple III and the Lisa, as well as new products, such as the Mackintosh, when they are introduced.

The emphasis of the articles will be on practical applications, from word processing to database management to telecommunications and so forth. Although we are not aiming at the neophyte computer user, we do aim to educate. The goal of each issue will be to provide you with information on new ways to use your Apple and teach you how to use the available software and hardware to its fullest extent. Product reviews will be an integral part of A^+. As the creator of the Report Card review section of *InfoWorld*, I am keenly aware of the importance of critically evaluating the myriad products you must try to choose from.

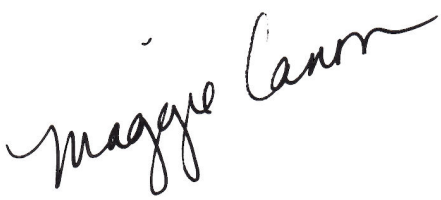
The emphasis of the articles will be on practical applications.

Although we will be emphasizing off-the-shelf software, we will also be running regular features on programming tips, what's new in languages, information on utilities, and such. Fun is not to be neglected either, and each issue will have numerous game reviews in our That's Entertainment section.

Besides monthly articles on how to use your Apple most effectively and hardware and software reviews, there will be regular departments on users' groups, new products, questions and answers (Rescue Squad), interesting tidbits (Dispatches), and education, as well as tutorials and columnists. This first issue will give you a taste of what is to come as we forge ahead with A^+.

Always, when you start a new project, you want to thank all the folks who helped you pull together what you thought was the impossible dream, but to thank all the individuals for their contributions in this project would take up half the magazine. However, I will take a little space to say thanks to the people in Ziff-Davis who worked so hard to produce the first issue of A^+. And I would also like to thank Kathleen Dixon, John Fenwick, and Rene Olson of Apple Computer and Steve Rosenthal for their invaluable assistance in this first effort.

Finally, I have a request for our new readers. This magazine is in existence to serve you, so let me know what you think by writing me letters with criticisms and, if you will, suggestions for articles that you would like to see in A^+. I am looking forward to hearing from you and making A^+ the best editorial product possible!!



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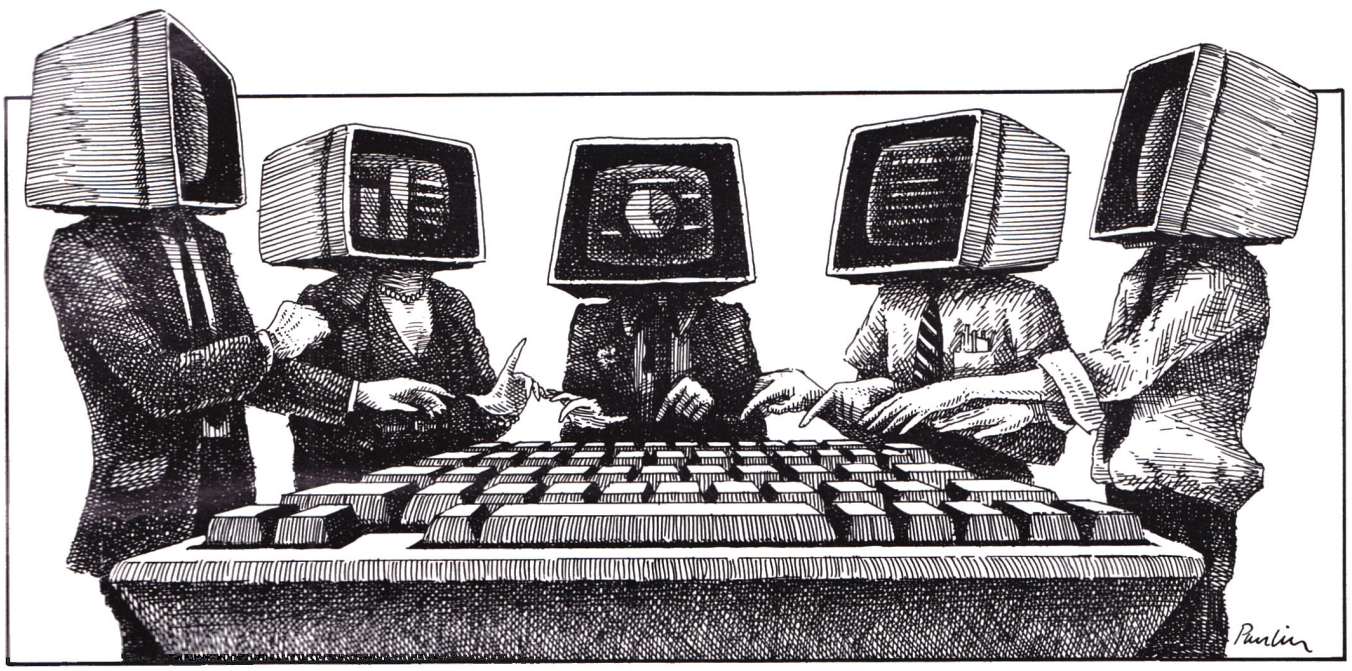
CIRCLE 109 ON READER SERVICE CARD

THOUGHTWARE/BY STEVE ROSENTHAL

How integrated are the software packages available on the Apple today? Though complete integration is still in the future, some current software is headed in that direction.



ON THE ROAD TO INTEGRATED SOFTWARE

The ideal computer software package would be like one of those private secretaries in English romance novels: efficient, cheery, helpful, understanding, and able to handle any task without so much as a murmur of complaint.

Developers of integrated software are striving for that goal, and though they aren't there yet, at least they're on the way. Aside from being just "user friendly," integrated software represents an attempt to make computers more "user helpful."

Because spreadsheets (the so-called "calcs" or "what-if" financial models) and word processing are the most common tasks done on personal computers, these functions form the core of most integrated software systems. The majority of systems also include some kind of graphics output, plus a database or mail-list mode.

However, when people talk about how "integrated" their package is, what they mean varies quite a lot from package to package. Before taking a look at some current products and what they can do, let's first explore the various aspects of integration and see what they can do for you.

When people talk about how "integrated" their package is, what they mean varies quite a lot.

Types of Integration

For some people, any set of programs designed so that one program can read the output of another is integrated. People at the other extreme say that in true integrated software, users cannot even tell where one program ends and the next begins.

A close look reveals that most claims revolve around two distinct facets: software can be integrated by passing data back and forth, or it can be integrated by sharing a common interface between users and programs. Furthermore, each of these facets can be implemented over a range of levels. Integration is a question of degree, not a yes or no issue.

Of the two types of integration, data integration is the easiest to implement and can be done even for programs that are written independently. Programs that are integrated by data exchange can be different in philosophy, style, and user interface. In some respects, you can consider even a package of programs designed for different machines to be an integrated series, if they all deliberately share data paths.

The lowest level of data integration is simply file or communications compatibility. If you are working one task, can

the data you enter or create be used by another task? For example, if you are working on a spreadsheet, is there a way to save your data in a disk file and then read the file with a word processor?

Three factors that might interfere with this level of integration are control character usage, number representation, and operating system file typing. Key differences in any of these areas can prevent one program from reading files produced by another.

In some programs, any bit pattern is legal output, including all 256-byte patterns. Byte values of 0 through 31 (0 to 20 in hexadecimal) may be used, for example, to indicate character string lengths and not to mean the ASCII control characters. Many text-handling programs, however, take byte patterns 0 through 31 to be control characters and react to them accordingly.

For numbers, most arithmetic programs store numbers as binary or binary-coded decimal values, both of which are ways of representing values by bits and not by printable digits. A program that produces binary values may also produce data files with bit patterns that a program that reads text refuses to accept.

Because bit patterns may not always be valid characters, some word processing programs refuse to accept input files that are marked as binary. Therefore, even if the actual bit patterns turn out to be printable, these editors will not read a file the operating system has noted as binary.

Consequently, you'll find that most integrated software packages that were written for an existing operating system exchange all their data as text files. Control characters are filtered out, and data is formatted in lines of reasonable length. Numbers generally are given as character strings rather than in binary or binary-coded decimal values.

Just because a file can be read, however, doesn't mean that it makes any sense. The next level of data integration addresses this key question: Can the receiving task make any sense of the data generated by the first task? To accomplish this level of integration, the graphics package, for example, must be able not only to read a spreadsheet file, but also to recognize the values to be plotted and separate them from formulas and headings. Similarly, a word processor must know which fields to read from a database file.

This level of data exchange requires that each program understand the output format of the others. With the knowledge of how the sending application structures a file, the receiving application can be programmed to recognize patterns such as the sender's data fields, number formats, and text separators.

On the Apple III, the furthest that integration has gone is the Catalyst program from Quark Incorporated.

Several programs can standardize on a single format for data exchange, making it easier for a wide range of applications to share data. Many of the plotting and graphing programs, for example, accept the DIF (data interchange format) used by *VisiCalc* and some similar programs.

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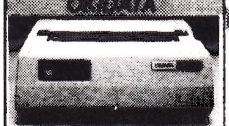

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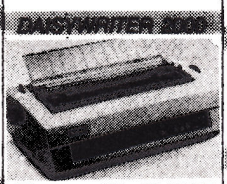

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CIRCLE 110 ON READER SERVICE CARD

Data sharing is often a one-way street. In many current systems, most tasks can generate text output for inclusion in word processing documents. Few systems, however, allow text from a word processor to be used for any other task, because parsing (extracting information from a text string) is much more difficult to program than formatting (creating text output from data).

To reach the next level of data sharing, an integrated system first has to provide for data transparency: Any task in the integrated software package must be able to use data generated through any other task, and be able to make any required translation without explicit instruction from the user. For example, on the ideal system, you could make a list of cost data with the word processor and have it added to the database by the database portion of the package. You could also draw a chart with a graphing package, and the software would compute the values upon command and enter them into your spreadsheet.

Once equipped with data transparency, the system would then be able to go the final step to a single common database for the integrated package. A common data system keeps only one set of records for each set of files, allowing updates to be made from any authorized program. For example, if you create a database using a list program, then make a change in a name using the word processor, the next time you go back to the list mode you will see the new name instead of the old one. Similarly, if you use the graphics package and decide to change a value based on what a chart shows, that changed value will be used the next time you run the spreadsheet.

Although the goal of data sharing is clear, there is little agreement about how much integration of tasks and procedures is desirable.

Modes and Procedures

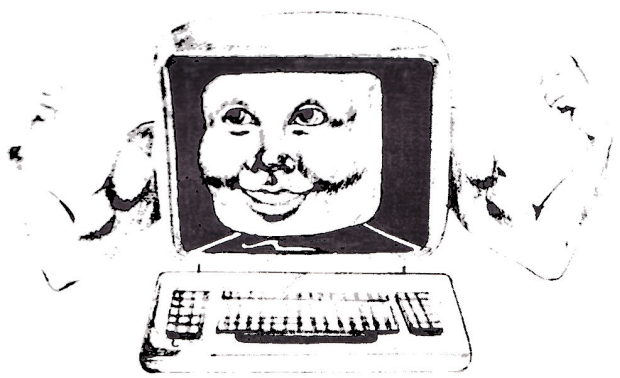
Although the goal of data sharing is clear, there is little agreement about how much integration of tasks and procedures is desirable. Two possible goals are modeless operation and parallel operations.

In modeless operation, the software would appear as a seamless web. Rather than look at where you are, you would have to know only where you wanted to end up. If you wanted to insert more text, it should be of no importance whether your previous act was defining a column of a spreadsheet, drawing a line on a chart, or typing in 20 straight pages. If you wanted to create a graph, you should have only to request one, and not first ask for the graphics package.

AI (artificial intelligence) fans say that modeless operation is what an intelligent system should provide. Just like the private secretary, a modeless system would be able to switch smoothly from one set of operations to another based on the combination of instruction and context.

Another view is that even if the software can understand what you want, a modeless system does not provide the essential contextual information to allow you to easily remember and understand your options. It would be like arriving halfway through a movie, with no sense of who the characters are, what they are doing, and how they got there.

According to this view, an essential



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CIRCLE 192 ON READER SERVICE CARD

BUT IS IT MULTITASKING?

A number of strategies besides integration can make a computer system easier to use and more productive.

With a multitasking system, the computer seemingly works on more than one job at once. Especially when waiting for disk operations and input or output from the terminal, the CPU may not have anything else to do. In operations requiring mostly input and output and only short periods of actual computation, therefore, the computer can be given multiple tasks to do, and each one will run almost as fast as if it were running alone.

Each task in a multitasking system can be a part of one program, or it can be a different program. Some of the more sophisticated systems even automatically break long programs up into separate tasks, if it will speed execution.

Concurrent systems are multitasking computers that run more than one separate program at a time. They generally are designed for a single user with only one terminal. The operating system must therefore allocate one task access to the screen at a time, or divide the screen into windows. Programs can be run concurrently even if written for independent operation, but some require so much screen input and output that it is not worth trying to keep up with two at once.

Multiuser systems are set up for more than one person. Along with running several jobs concurrently, a multiuser system also keeps track of passwords and private file spaces, and routes the output of each running program to the appropriate terminal. Some systems even allow each user to run more than one task at a time.

A last concept that often is confused with integrated software is interactive software. While integrated means that two or more programs or applications share information and methods of operation, interactive simply means that the software solicits information from the user and responds to it. —*S.R.*

element of modes is their hierarchy of cues. In each mode, you have only to remember or choose from commands that are related to a particular task. You are not at every moment faced with the full range of every possible command or choice in the complete integrated package.

For example, if you want to draw a dotted line at an angle, you select the drawing mode, then select from a reasonable number of choices for how to draw a line. You don't have to remember every menu choice or command that might be useful for spreadsheets. There is no reason to add angled lines to spreadsheets, and the capability would just make operation more confusing.

Furthermore, the modes also provide the system with essential clues for interpreting ambiguous user commands. If you are in a word processing mode, for instance, and ask for a paragraph to be inserted at a point down the page, the system can reasonably expect that you want it lined up with the left margin of the existing text, unless you say otherwise. In this mode and operation, the exact horizontal position of the cursor can normally be ignored.

On the other hand, with a graphics package the system might reasonably conclude that if your cursor is a few spaces to the left or right of the margin, that's exactly where you want the text block to be positioned. Unless you ask for a textual or graphic element to be aligned on some edge or grid line, a move operation in a graphics package should pay attention to both horizontal and vertical positions.

Whether you prefer a modeless system or one with landmarks, one goal in software integration should always be to make instruction operation as consistent as possible. The instruction format for similar operations should be parallel across the full breadth of the integrated package.

The lowest level of procedural integration is simply to provide a master menu from which you can select various programs.

If there is a command in the spreadsheet to delete a row, it should be similar or identical to the word processing command to delete a line. If there is a database command to create a new file, it should closely model the graphics package command to create a new drawing.

Furthermore, if function or control keys are used, these should also perform similar operations. The key to move the cursor down in a text editor should do the same in a drawing package. A key to turn on the printer echo in a database program should do the same in a spreadsheet.

Parallel operations are important for integrated software packages, but they do not address the question of fluid movement from one application to another. In addition to similar commands, therefore, a desirable feature in an integrated package is procedural integration.

The lowest level of procedural integration is simply to provide a master menu from which you can select various programs. Like a command shell, this level substitutes for the usual method of telling of a particular program.

In an integrated system, only programs within the integrated family are listed in the main menu, and you can pick among them by code number, letter, or position, rather than having to name them completely. On systems with a mouse or light pen, you can simply point to your choice.

The next level of procedural integration lets you go from one application to another without returning to the main menu. You could, say, go directly into a data communications package from a word processing program without going back to the main menu. Or while running *WordStar* with a CP/M card, you can tell the system to run another program and return to where you are without leaving *WordStar*.

The highest level of procedural integration exists in systems that let you shift modes without worrying about which mode goes with which program. If you complete a spreadsheet, this type of system will let you go from that point to the plotting routines in the graphics package without explicitly leaving the spreadsheet and entering the graphics package. When you are done with the graphs, you can go back and make more corrections on the spreadsheet.

Integrated Software for the Apple II

There are two widely distributed software families for the Apple II that provide significant levels of integration. The first is the *pfs* series from Software Publishing Corporation, and the second is the VisiSeries from VisiCorp.

The *pfs* series started as a one-program product, now called *pfs:file*. But now there is a whole family of programs, with defined data paths between many and some similarity in operation (see Figure 1). So far, there is no spreadsheet

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CIRCLE 112 ON READER SERVICE CARD



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product in the series; instead, the system is able to make use of files generated by VisiCorp's *VisiCalc* program.

Although the packages do not have any common procedural shell, any package can supply data to be read by the *pfs:write* word processor. The *pfs:graph* package can read *VisiCalc* files as well as files for *pfs:file*. The *pfs:report* program also reads *pfs:file* data.

One goal in software integration should always be to make instruction operation as consistent as possible.

Thus, data entered into the database can be shown as graphs, as formatted reports, and as merged data in letters or other text files.

VisiCalc files also can be transformed to graphs or text files (and the graphs can then be included in the text files as well). The word processing program, *pfs:write*, reads files from any member of the series, as well as *VisiCalc* files and external ASCII text files.

So far, at least, there are no reverse data paths. Data from the database cannot be routed to *VisiCalc*, nor can text files from *pfs:write* be added to *pfs:file*.

On the command level, there is some similarity between the four *pfs* programs. In general, function key usage is the same or parallel, as are many of the operational commands. But since the package uses a "foreign" spreadsheet, there is no special operational similarity there.

VisiCorp has also parlayed a single successful product into a complete line. From the highly successful *VisiCalc*, the company has added *VisiTrend, VisiTrend/Plot, Desktop/Plan, VisiLink, VisiWord,* and *VisiFile*.

Again, data from the file program can be read by the word processing and graphics packages, and the *VisiCalc* data can supply information to most of the others.

A significant number of the data exchange paths in the VisiSeries go both ways. For example, not only can the *VisiCalc* program supply information for *VisiFile*, but data from *VisiFile* data can be used in spreadsheets as well.

VisiCorp also has made an effort to keep program operation parallel. Although there are some differences, all of the programs have similar command interfaces and use mostly the same control characters.

VisiCorp is now hard at work on their *VisiOn* environment, which should provide a much higher level of procedural integration as well.

Integrated Software for the Apple III

On the Apple III, the furthest that integration has gone is the *Catalyst* program from Quark Incorporated. Like a supermenu, this program lets you display all the available programs on the hard disk and invoke any one without reloading from the floppy disk.

The *Catalyst* program originally was advertised as a mere "hard disk boot" program for keeping all your software on the Apple Profile hard disk. Among its virtues is that it allows you to move copy-protected software to the hard disk, but retains that level of protection against further duplication.

Now that users want integrated software, Apple is touting *Catalyst* as an integrated environment. But in the terms discussed above, *Catalyst* provided only file exchange and a master menu. Since the individual programs are unaltered, there is no guarantee that one program



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The special Scorpion language with 30 instructions is explained in detail in the 130 page manual (8½ × 11) accompanying the kit.

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can make sense of files provided by another, nor that the procedures used in one program will produce parallel results in another.

Apple is also trying to make its supported software for the Apple III data compatible. But thus far that effort extends only to the BPI accounting package and *AppleFile*, both of which share the RPS (record processing service) data format.

The Integrated Lisa

The Apple Lisa represents the most ambitious computer thus far by any personal computer maker to produce a truly integrated package. As released, the procedural and task integration set impressive standards, but data interchange is only slightly more advanced than several Apple II products (see Figure 2).

The striking feature of the Lisa is the icon and mouse system, and its image of the work space as an office desktop. With the icon and mouse system, most functions are represented by on-screen pictures, and a mouse is used to point to the desired choice. The mouse also is used to point to choices on menus, where selections are primarily identified by text instead of by picture.

The Lisa environment is strongly mode-oriented. Initially, the six modes provided are a word processor *(LisaText)*, a spreadsheet *(LisaCalc)*, a graphics package *(LisaGraph)*, a drawing package *(LisaDraw)*, a very limited database *(LisaList)*, and a project schedule program *(LisaProject)*. So far only a communications program *(LisaTerminal)* has been added, but more are in the works.

The Apple Lisa represents the most ambitious attempt thus far by any personal computer maker to produce a truly integrated package.

Although there are some functions that can be done in more than one program, you can operate in only one mode at a time, and only commands from that application are valid. For example, if you are working with the *LisaCalc* spreadsheet program, you can't draw pictures in the margins with *LisaDraw*.

If you want to go back and forth between applications, you can open a window on the screen and start a new task. But at any time, you can only stack tasks and work on the top one, rather than place them side by side and do both.

Some tasks can continue to operate even if they are not on the top of the pile. At present, this feature seems to be used mostly for demonstrations with moving images; it should turn out to be quite useful as more software is developed.

Among the nicest features is that the procedural parallelism on the Lisa is almost complete, a feature that greatly eases training and operation. Cursor movement works the same way in all modes many menus are the same, and the techniques of selection and activation are identical.

However, it is still early to tell what the possibilities are for the Lisa system. Apple has only recently released their Lisa Toolkit to outside program developers, and the results should start coming in fairly soon. If software developers use what Apple has provided in the desktop metaphor, the icon system, and all the operating parallels, the integrated domain of the Lisa could extend out in many additional directions. ✚

A REPORTING SYSTEM FOR A SPREADSHEET DATABASE
(for any VisiCalc© or Lotus 1-2-3™ User)

Most database systems consider rows of data fields as records. The 3-D concept promoted by Abacus says to consider an entire report as a record. Therefore, visualize "pages" of reports stacked-on or scattered-around your desk; these would constitute your database.

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Each Product has a simple Question & Answer procedure to assist you in organizing your report processes. You can create a complete reporting network from a spreadsheet database. They have the ability to "remember" the steps they went through to create the final reports. You can use your spreadsheet program to recalculate new data, then use our products to regenerate all new reports in one single step. Also, you can set-up special formulas to calculate additional data fields within the new reports. You can customize titles, row and column headings, footnotes, etc. for each report.

Both products include sample sessions which are easy to understand, allowing the average person to learn them in only 15 minutes. They are both compatible with dBase II™ (IBM), PFS Graph® and a host of popular products.

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TOTE THAT PRINTER, MOVE THAT DISK DRIVE!

Boxes of books litter the floor. "Helpful" friends lounge around with glasses of wine, saying, "I'll be with you just as soon as I finish this." You can't remember where you left the tape, the scissors, or the cat.

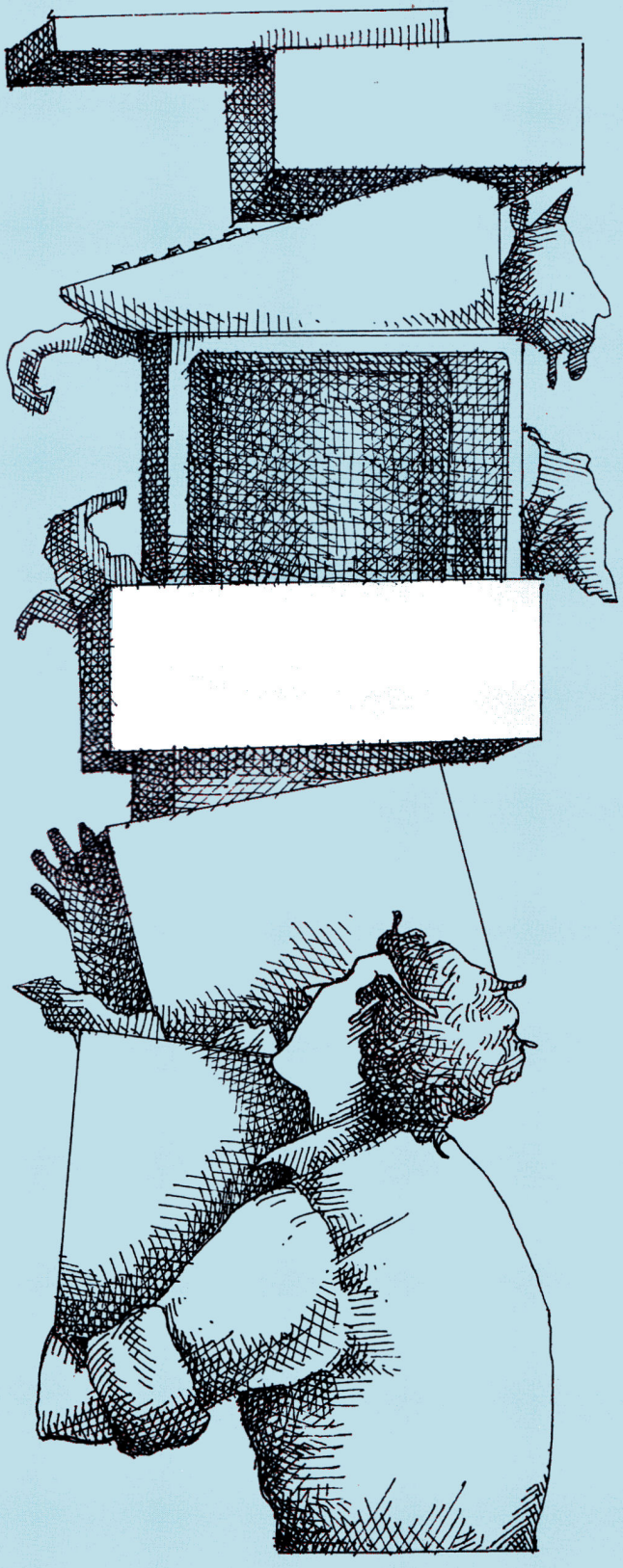
Yes, it's moving time. But this go-around you have a new worry: how to move this delicate piece of machinery that is your Apple without crushing or static-frying its innards.

The key is to immobilize your computer, says Bob Mullin of Office Movers, Inc. Damage comes with movement.

Ideally, of course, you saved the original packing cases your computer came in. Those specially-designed styrofoam molds really do an excellent job of shielding the crucial pieces. What, you threw them away or let the children turn them into forts? Okay, the next step is to buy styrofoam popcorn or bubble wrap, which are acceptable substitutes. Or you could wrap the computer in layers of cloth—if that's your choice, though, be sure the cloth won't attract dust. Avoid rugs.

If you have a professional mover lugging your stuff, check into extra insurance. Most firms insure on a per-pound rate, which isn't helpful with a 20 lb computer worth $3,000. Some more costly insurance plans include full replacement value.

And as for your floppy disks, those precious squares of priceless information: move them in your car yourself, says Mullin. Just keep them away from heat and metal, to avoid static discharges.



HARD TALK ON SOFTWARE COPYRIGHTS

Everyone talks about the widespread and sometimes flagrant violations of software copyrights in education, but nobody does anything about it.

Now, however, trying to stem the rush of unauthorized copies of educational software and documentation, the International Council for Computers in Education has stepped in.

The ICCE recently adopted a "Policy Statement on Network and Multiple Machine Software" to help educational organizations conform to software agreements and copyright laws. Written by a committee of educators, publishers, and vendors, the policy statement is aimed primarily at educators, but it also urges vendors to provide network-compatible versions of software and multiple-copy discounts at reasonable costs.

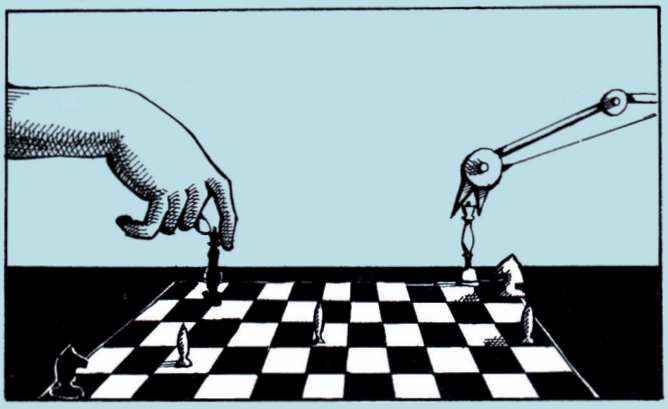
The statement suggests a district policy on software copyright, a software policy for a community college with a large microcomputer lab, and a format

for software licenses. It also offers some technical notes on software encryption for software/hardware vendors.

Copies of the statement are available from ICCE at the University of Oregon, 1787 Agate St., Eugene, OR 94703, (503) 686-4414.

ROBOTICS: FROM BLACK AND WHITE TO BLACK AND DECKER

The same machine that can pick up a knight and move it three spaces ahead, two to the right, can also check drill bits on an assembly line. That's what Microbot, developers of a robotic arm called the MiniMover-5, have found as academia and industry test the latest techniques in computer-controlled manufacturing.



Dr. K. K. Wang, professor of mechanical and aerospace engineering at Cornell University, paired an Apple II computer with the table-top arm of the MiniMover-5 to teach his students. The unit comes with a firmware card that slips into one of the Apple II's extension slots—this card lets users program the robotic arm using Microbot ARMBASIC.

One of Wang's students developed a chess program as a course project, "teaching" the arm to move chess pieces via the Apple keyboard. Simple enough. However, a more sophisticated application of the MiniMover-5 came from Black and Decker Manufacturing Company. Controlled by a multiple-loop ARMBASIC program more than 400 steps long, the robotic arm picks up partly-finished router bits, tests their diameters, and places them in the tooling chuck to complete the tooling process.

The Black and Decker project was planned from the outset as an example of what an inexpensive robot and an inexpensive computer can accomplish together, said a manager at Black and Decker. He said, "We chose an Apple because it's something everyone understands."

BUT WILL IT PLAY IN CUPERTINO?

The authors of "WarGames," the box-office smash film that may yet make data encryption a household word, visited Apple Computer to explain how it just couldn't happen that way. Really. They think.

Larry Lasker and Walter Parkes, who wrote the movie's screenplay, wowed the latest Apple Independent Developers Conference with film clips and funny stories about the flick. Lasker and Parkes said that although each security breakthrough depicted in the movie actually occurred as an isolated incident, that constellation of events has never happened together, and probably never could. They noted that the moral issues bandied about in "WarGames" didn't come up until after they'd started writing.

Strangely enough, neither Lasker nor Parkes had ever owned computers. After their boffo debut at the conference, Apple decided to remedy that by "Apple-izing" them with T-shirts, pens, paper . . . oh, and an Apple IIe for each. Now, if the password "Joshua" pops up on your screen. . . .

UNIVERSAL BAR CODE

Forget the Columbia School of Bartending. Become your own computer bartender with a home bar guide called "Drinks on a Disk."

This "computerbook" by Homemaker Software of Palo Alto, California is no dry tome—discriminating tipplers can drink in 110 plain or fancy recipes from 32 categories, from Old Favorites to Trendy Drinks to Calorie Conscious, even Non-Alcoholic.

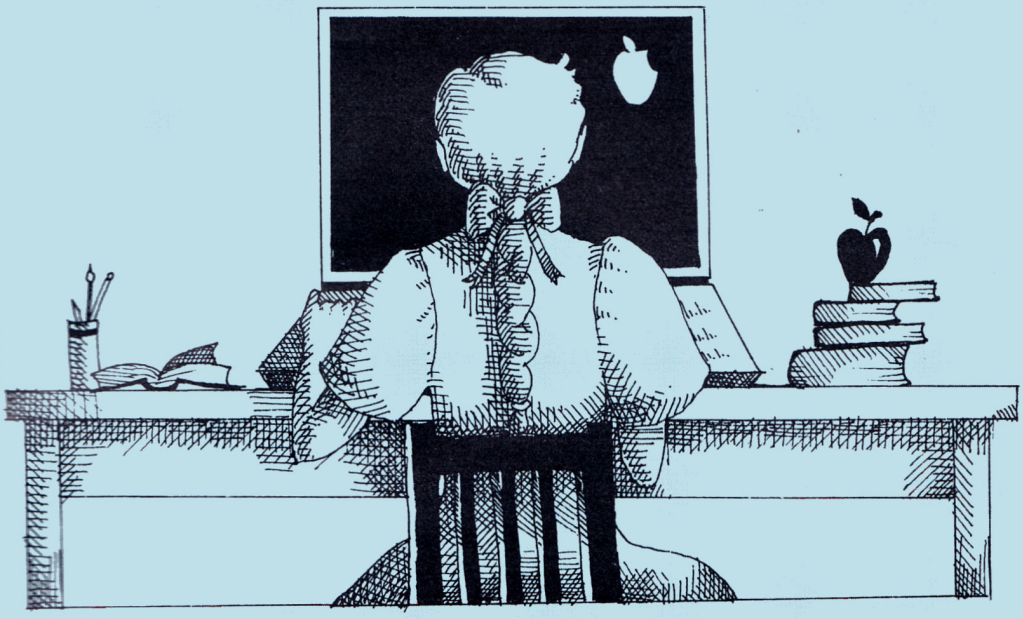
You can even punch up your bartending expertise with a quick review of liquor measurements, proper glassware, and bar equipment. No data input or technical knowledge is required, just enough sober reflection to push a button. Bottoms up!

A MATTER OF POLICY

Keep your computer in good hands—check to see whether your insurance policy protects your precious Apple IIe from theft, flooding, or electrical damage.

More than 1.4 million people have a personal business computer in their home, but few have taken advantage of some insurance companies newest gimmick: "scheduled personal electronic equipment endorsement." With the flick of a pen you can tack on coverage for your personal computer to your existing homeowner's or renter's policy to the tune of $2 per $1,000 in value.

The endorsement effectively circumvents the normal $1,000 limitation in value on business equipment in the home and raises that limit to



$20,000. That limit doesn't affect anyone who uses their computer only for personal matters, according to Donald L. Brown, agent for the Kemper insurance group. Unfortunately, no insurance firm appears to be offering a stand-alone personal computer insurance policy yet, but with the burgeoning number of requests for endorsements, individual coverage could be available soon. Take a gander at your own policy's fine print.

SHAKING THE LEARNING TREE

If you want your kids to really *learn* rather than merely parrot the teacher or play computer games, get them an Apple.

That's because the Apple is currently the only machine to run what some experts consider the best educational software, such as Logo and Bank Street Writer.

Marc Tucker of Annapolis, Maryland, who is currently studying the use of personal computers in education on a grant from the Carnegie Corporation, shies away from recommending a particular brand of computer (though he himself is an Apple owner).

He does recommend, however, that parents steer their children away from just drilling and practicing rote work with computers. You'll help your children most if you let them "study" with packaged programs like Logo on their own, he believes—that way they'll figure out how to record, to analyze, and to express themselves most comfortably.

And that, Tucker thinks, is the key to real learning.

YOUNG MR. LINKIN'

Ed Svoboda, Jr., may be one of the nation's youngest postmasters. At the age of 14, he already runs his own software network and electronic post office on an Apple II in his bedroom at home.

Svoboda's non-profit business, the Silicon Valley Interchange Remote CP/M Public Domain File Transfer and Electronic Mail Facility, has logged more than 3,000 calls from all over the United States. His system links CP/M users and users of specific languages and hardware systems, and allows immediate and wide use of public domain software.

Though he's only been studying computers for five years, Svoboda is already honing the tone of an expert. The one problem he cites with his Sunnyvale-based business is that his Apple overheats. Says Svoboda, "I believe the Apple is too small and needs a minimum of seven interface cards to implement a large full-fledged Remote CP/M System." Look out, Steve Jobs—the kids can't wait!

BYTE BAT BATTERS BETTER

Had one too many system crashes? Would you rather "Control-Y" *all* your software? Well, don't take it out on your family or your furniture—strike back at your recalcitrant computer with the new Byte Bat.

This "universally compatible foamware" is a 17-inch-long foam-rubber bat, similar to the "Bataca" bats used in encounter groups for humans. The Byte Bat looks tough and makes a satisfying but harmless thud against the surface of an errant Apple.



A+ DISPATCHES

It comes with a special user badge, a two-color poster demonstrating proper use of the bat, and a warning decal that proclaims "this computer-friendly liveware is protected by Byte Bat."

The Byte Bat, manufactured by MicroTie Systems Corporation of Albuquerque, New Mexico, has already sold out its test run of 10,000 bats. MicroTie plans to saturate the market with silicon swatters for the Christmas rush.

Can homes for battered computers be far behind?

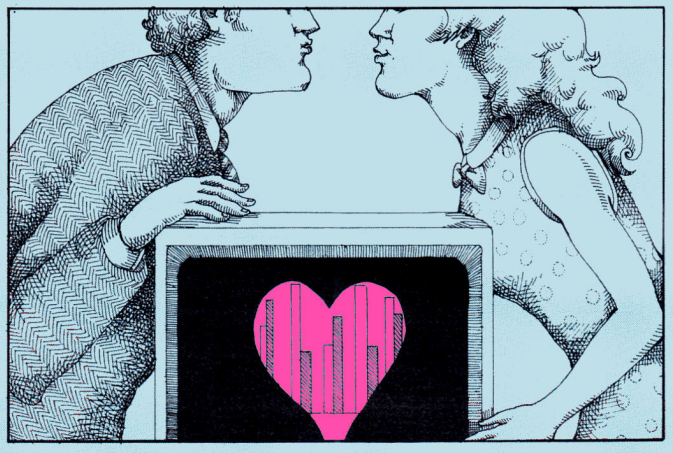
SQUEEZING BLOOD OUT OF AN APPLE

If you thought your doctor would never know you've stopped eating your health-giving bran muffin every morning, be warned that those days of ignorance are nearly over.

Dr. Ronald S. Lankford, M.D., of the Wilshire Medical Group in Des Moines, Iowa, reports that he's employed his Apple computers to check back on patients' appointments to make sure they're following instructions.

Lankford ordered his Apple II Plus to search his database of clinical records and locate patients diagnosed as having high blood pressure. Then he examined their appointment records to see who had missed appointments. The result: in 20 minutes he'd combed through 6 months of data to unearth 7 people who probably weren't taking their anti-hypertension medication. He followed up with a discreet phone call.





CHARTING TRUE LOVE'S COURSE

Today's egalitarian relationships require more fine tuning than in earlier, less divorce-prone times. It's hard to remember all the niggling entries in that giant double-entry book of relationship accounting. Is it your turn to indulge your domestic associate's quirky cravings, or should your mate give this time while you take?

Elizabeth Weal, who works in Apple Computer's publications department, proposes a modest solution to the endless trend analysis of today's twosomes—drag in the computer as scorekeeper.

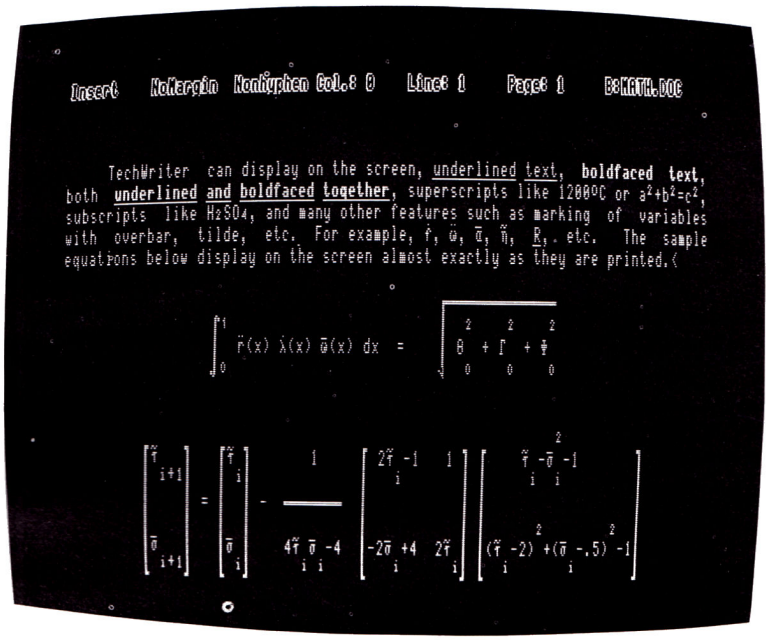
"A relationship is an objective entity," capable of being quantified and tallied like any business transaction, claims Weal. Just develop a database for your relationship to record information about each daily compromise, and consult the computer whenever conflict crops up. Did you pick the restaurant for three weeks in a row? Does your mate hold back on giving any gift more extravagant than a can of tennis balls? Your computer can log in all the data and present it in pretty (or damning) pie charts.

Weal recommends, by the way, that you purchase a portable computer for your recordkeeping. It's a real drag to schlep home to check out your stats.

A+ WANTS YOU

Do you have news, gossip, or unusual computer stories for the Dispatches section? We will pay up to $50 for each submission used. You must include your name, address, and telephone number with the item. We will preserve your anonymity if you wish. All submissions for Dispatches become the property of *A+* and are subject to editing. Please send submissions to the Dispatches department, at *A+*, 654 Bair Island Rd., Suite 212, Redwood City, CA 94063.

CAN YOUR WORD PROCESSOR DO THIS?



ACTUAL TECHWRITER™ SCREEN DISPLAY

TechWriter can display on the screen, underlined text, **boldfaced text**, both **underlined and boldfaced together**, superscripts like 1200°C or $a^2+b^2=c^2$, subscripts like H_2SO_4, and many other features such as marking of variables with overbar, tilde, etc. For example, $\dot{f}$, $\ddot{\omega}$, $\bar{\alpha}$, $\tilde{\eta}$, $\underline{R}$, etc. The sample equations below display on the screen almost exactly as they are printed.

$$\int_0^1 \ddot{r}(x)\ \dot{\lambda}(x)\ \bar{\omega}(x)\ dx = \sqrt{\theta_0^2 + \Gamma_0^2 + \Psi_0^2}$$

$$\begin{bmatrix} \tilde{\tau}_{i+1} \\ \bar{\sigma}_{i+1} \end{bmatrix} = \begin{bmatrix} \tilde{\tau}_i \\ \bar{\sigma}_i \end{bmatrix} - \frac{1}{4\tilde{\tau}_i\bar{\sigma}_i - 4} \begin{bmatrix} 2\tilde{\tau}_i - 1 & 1 \\ -2\bar{\sigma}_i + 4 & 2\tilde{\tau}_i \end{bmatrix} \begin{bmatrix} \tilde{\tau}_i - \bar{\sigma}_i^2 - 1 \\ (\tilde{\tau}_i - 2)^2 + (\bar{\sigma}_i - .5)^2 - 1 \end{bmatrix}$$

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Inside Apple

Vol. 1, No. 3

Apple's new Monitor II. A sight for sore eyes.

If you've been using a TV as a monitor, perhaps you can get a friend to read this for you:

Apple's brand new Monitor II will improve your vision.

It features all the latest ergonomic improvements in monitor technology.

For example:

Studies have shown that the leading cause of eye fatigue for computer users is lack of contrast between the displayed characters and their background.

So we designed the Monitor II around a high contrast green phosphor CRT that provides an extremely dark background. That means you can read text at a lower brightness. And that means you can be more productive — working longer and more comfortably.

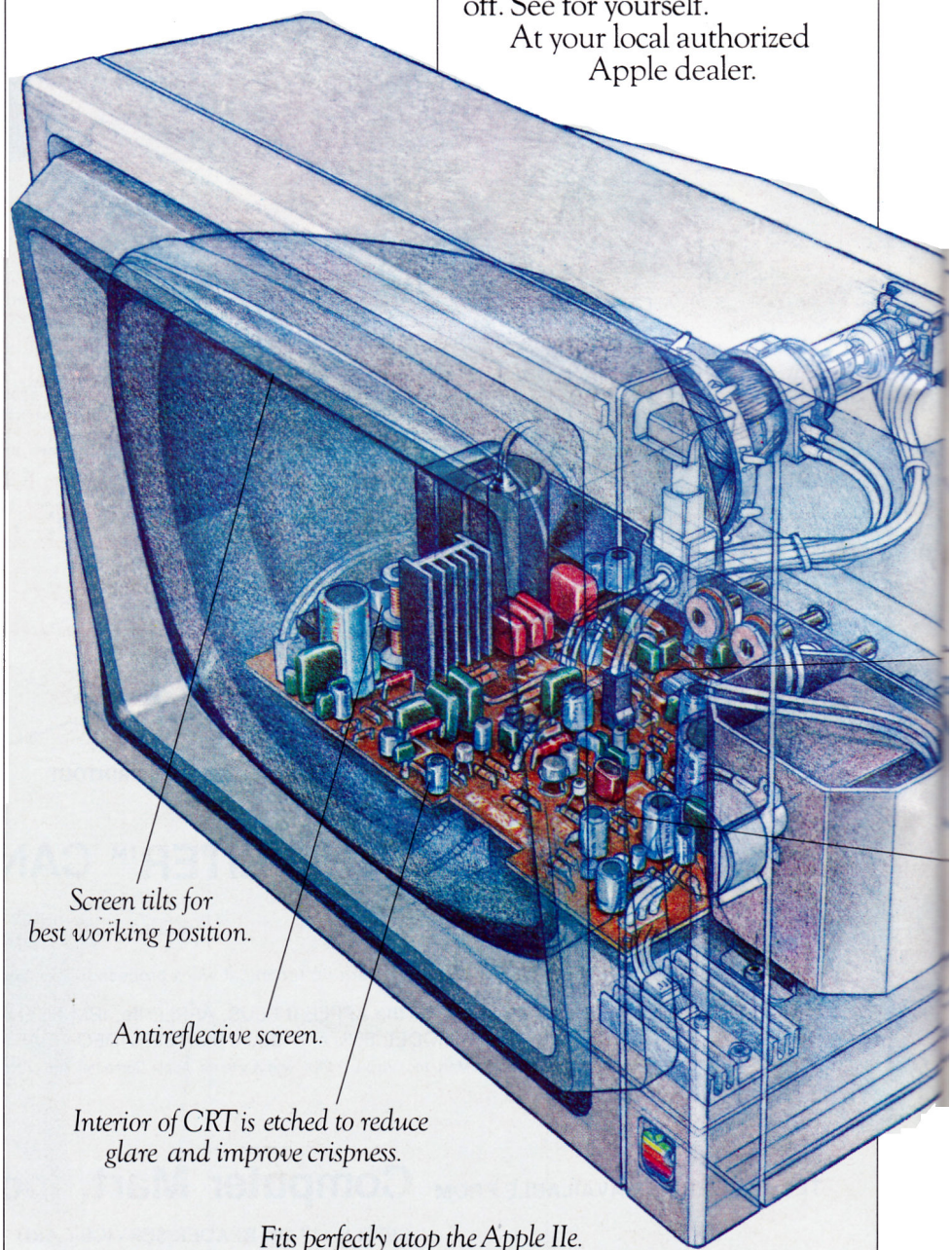
Toward that same end, we also gave Monitor II a tilt screen. So you can angle it perfectly for your working position, without scooting your chair around or sitting on phone books.

And we made that screen antireflective to reduce glare from ambient light.

Monitor II also features a high bandwidth video amplifier and a high tolerance linearity circuit. The former keeps characters from smearing on the screen and eliminates the annoying "ghosts" left by a fast moving cursor. The latter keeps characters crisp, legible and prevents "keystoning" right up to the edges of the display. Both add up to superior display of 80-column text and extremely accurate graphics.

Designed as the perfect system partner for the Apple® IIe Personal Computer, Monitor II requires no monitor stand. It's a perfect fit, aesthetically as well as technically. So it's pleasing to the eye even when it's turned off. See for yourself.

At your local authorized Apple dealer.



Now Apple plots color.

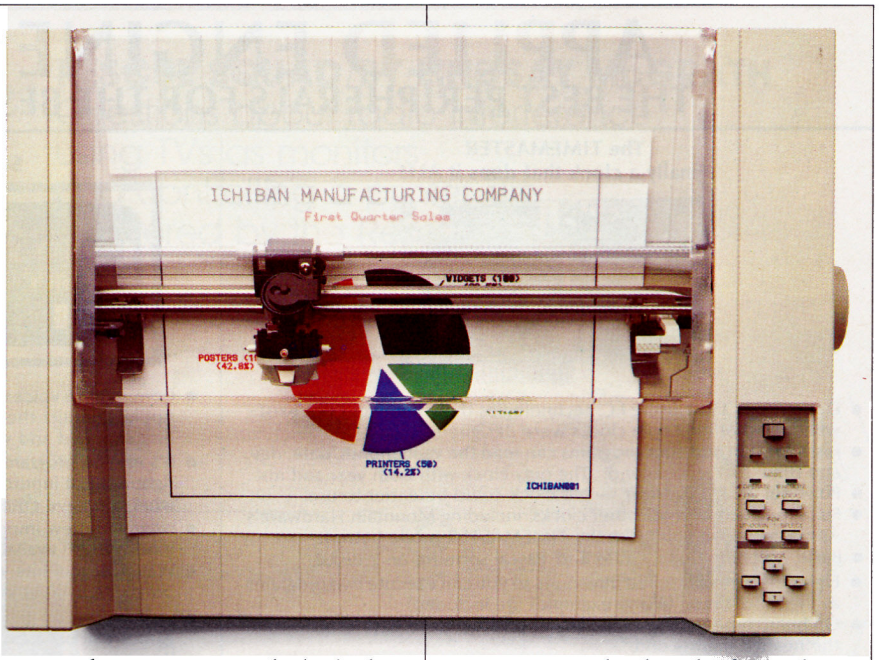
Since color graphics are becoming ever more important in business, we've been hearing more and more calls for a color plotter as reliable as an Apple.

Here it is:

Apple's new Color Plotter can generate all kinds of presentation graphics, engineering drawings or anything else you have to illustrate in up to eight brilliant colors.

And it can perform its art on any size paper up to 11" x 17". Or, with optional transparency pens, it can draw right on transparent film for overhead projection.

Measuring just 4.8"H x 16"W x 12"D, it's the smallest four-color, wide bed color plotter you can buy — about half the size of conventional flatbed plotters. So it takes up less space on your desk and can easily be moved to someone else's desk.

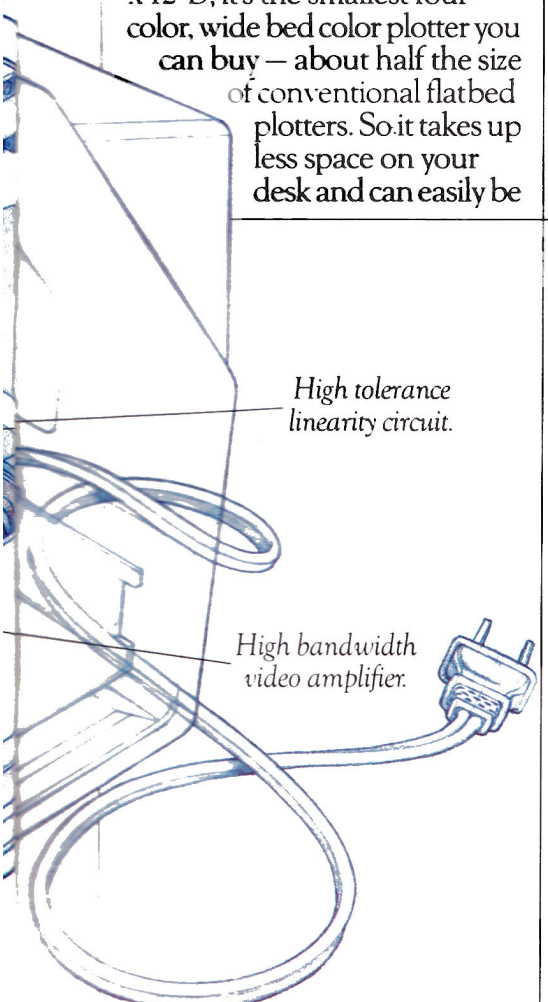


There are two color plotter accessory kits to choose from to assure a perfect marriage with your Apple II or IIe, or Apple III.

Each kit comes with eight color pens — red, blue, green, black, burnt orange, gold, violet and brown. Plus a starter package of plotter paper. Plus all the manuals, documentation and cables appropriate to your particular kind of Apple. So you can get up and coloring right away.

Apple also offers a complete selection of 24 different pen packages — so you can choose whatever colors you need in a variety of widths for a variety of applications and media types.

As you might expect, all of the above is available at many of our authorized Apple dealers.



Carry on with AppleCare℠ Carry-In Service.

No matter how long you've owned your Apple system, you can now get a long term service contract at a very reasonable cost.

AppleCare Carry-In Service is a service plan that will cover most Apple-branded components in your system for one full year.

It covers an unlimited number of repairs and is honored by over 1500 authorized Apple dealers nationwide.

Apple-trained technicians assure you of the highest quality service, fast — in most cases less than 24 hours.

AppleCare Carry-In Service is ideal for anyone who needs to know ahead of time the cost of maintenance for their system.

So check out the details — you'll find it's the lowest cost health plan an Apple can have.

Apple Computer Inc., 20525 Mariani Ave., Cupertino, Calif. 95014. For the authorized dealer nearest you, call (800) 538-9696. *©1983 Apple Computer Inc.*

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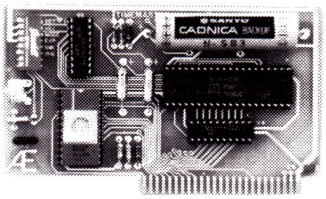
CIRCLE 118 ON READER SERVICE CARD

APPLIED ENGINEERING
THE BEST PERIPHERALS FOR THE BEST COMPUTER

The TIMEMASTER
Finally a clock that does it ALL!



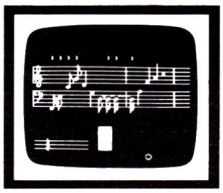
- Designed in 1983 using I.C. technologies that simply did not exist when most other Apple clocks were designed.
- Just plug it in and your programs can read the year, month, date, day, and time to 1 millisecond! The only clock with both year and ms.
- Powerful 2K ROM driver — No clock could be easier to use.
- Full emulation of most other clocks, including Mountain Hardware's Appleclock (but you'll like the TIMEMASTER mode better).
- Basic, Machine Code, CP/M and Pascal software on 2 disks!
- Eight software controlled interrupts so you can execute two programs at the same time. (Many examples are included)
- On board timer lets you time any interval up to 48 days long down to the nearest millisecond.

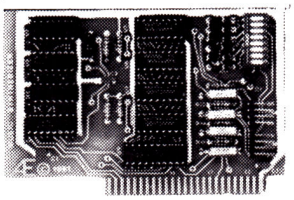
The TIMEMASTER includes 2 disks with some really fantastic time oriented programs (over 25) plus a DOS dater so it will automatically add the date when disk files are created or modified. This disk is over a $200.00 value alone — we give the software others sell. All software packages for business, data base management and communications are made to read the TIMEMASTER.

If you want the most powerful and the easiest to use clock for your Apple, you want a TIMEMASTER.

PRICE $129.00

Super Music Synthesizer

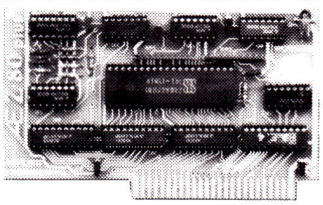




- Complete 16 voice music synthesizer on one card. Just plug it into your Apple, connect the audio cable (supplied) to your stereo, boot the disk supplied and you are ready to input and play songs.
- It's easy to program music with our compose software. You will start right away at inputting your favorite songs. The Hi-Res screen shows what you have entered in standard sheet music format.
- Now with new improved software for the easiest and fastest music input system available anywhere.
- We give you lots of software. In addition to Compose and Play programs, 2 disks are filled with over 30 songs ready to play.
- Easy to program in Basic to generate complex sound effects. Now your games can have explosions, phaser zaps, train whistles, death cries. You name it, this card can do it.
- Four white noise generators which are great for sound effects.
- Plays music in true stereo as well as true discrete quadraphonic.
- Full control of attack, volume, decay, sustain and release.
- Will play songs written for ALF synthesizer (ALF software will not take advantage of all the features of this board. Their software sounds the same in our synthesizer.)
- Automatic shutoff on power-up or if reset is pushed.
- Many many more features.

PRICE $159.00

Z-80 PLUS!



- TOTALLY compatible with ALL CP/M software.
- The only Z-80 card with a special 2K "CP/M detector" chip.
- Fully compatible with microsoft disks (no pre-boot required).
- All new 1983 design incorporates the latest in I.C. technologies.
- Red "CP/M WORKING" LED indicator, the Z-80 Plus does not interfere with non-CP/M programs.
- An on-card PROM eliminates many I.C.'s for a cooler, less power consuming board. (We use the Z-80A at a fast 4MHZ)
- Does EVERYTHING the other Z-80 boards do, plus Z-80 interrupts.

Don't confuse the Z-80 Plus with crude copies of the microsoft card. The Z-80 Plus employs a much more sophisticated and reliable design. With the Z-80 Plus you can access the largest body of software in existence. Two computers in one and the advantages of both, all at an unbelievably low price.

PRICE $139.00

Viewmaster 80

There used to be about a dozen 80 column cards for the Apple, now there's only ONE.

- TOTALLY Videx Compatible
- 80 characters by 24 lines, with a sharp 7x9 dot matrix
- On-board 40/80 soft video switch with manual 40 column override
- Fully compatible with ALL Apple languages and software — there are NO exceptions
- Low power consumption through the use of CMOS devices
- All connections on the card are made with standard video connectors, no cables are soldered to the board
- All new 1983 design (using a new Microprocessor based C.R.T. controller)

JUST COMPARE!

	PRICE	BUILT-IN SOFTSWITCH	SHIFT KEY SUPPORT	PASCAL COMPATIBLE	7X9 DOT MATRIX	LIGHT PEN INPUTS	40 COLUMN OVERRIDE	INVERSE CHARACTERS
VIEWMASTER	**169**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
SUP'RTERM	375	NO	YES	NO	NO	NO	YES	YES
WIZARD80	245	NO	NO	YES	YES	NO	YES	YES
VISION80	375	YES	YES	YES	YES	NO	NO	NO
OMNIVISION	295	NO	YES	NO	NO	NO	YES	YES
VIEWMAX80	219	YES	YES	YES	YES	NO	NO	YES
SMARTERM	360	YES	YES	YES	NO	NO	YES	NO
VIDEOTERM	345	NO	NO	NO	YES	YES	NO	YES

The VIEWMASTER 80 works with all 80 column applications including CP/M, Pascal, WordStar, Format II, Easywriter, Apple Writer II, Viscalc, and many others. The VIEWMASTER 80 is THE MOST compatible 80 column card you can buy at ANY price!

PRICE $169.00

MemoryMaster IIe 128K RAM Card

- Expands your Apple IIe to 192K memory
- Provides an 80 column text display
- Compatible with all Apple IIe 80 column and extended 80 column card software (Same physical size as Apple's 64K card)
- Available in 64K and 128K configurations
- Bank select LED's for each 64K bank
- Permits your IIe to use the new double high resolution graphics
- Automatically expands Visicalc to 95K storage in 80 columns! The 64K configuration is all that's needed, 128K can take you even higher.
- Complete documentation included, we show you how to use all 128K.

If you already have Apple's 64K card, just order the MEMORYMASTER with 64K and use the 64K from your old board to give you a full 128K. (The board is fully socketed so you simply plug in more chips.)

MemoryMaster with 128K	**$249**
Upgradeable MemoryMaster with 64K	**$169**
Non-Upgradeable MemoryMaster with 64K	**$149**

Our boards are far superior to most of the consumer electronics made today. All I.C.'s are in high quality sockets with mil-spec. components used throughout. P.C. boards are glass-epoxy with gold contacts. Made in America to be the best in the world. All products work in APPLE IIe, II, II+ and Franklin (except MemoryMaster). Applied Engineering also manufactures a full line of data acquisition and control products for the Apple; A/D converters and digital I/O cards, etc. Please call for more information. All our products are fully tested with complete documentation and available for immediate delivery. All products are guaranteed with a no hassle **THREE YEAR WARRANTY.**

All Orders Shipped Same Day. Texas Residents Add 5% Sales Tax. Add $10.00 If Outside U.S.A. Dealer Inquiries Welcome.

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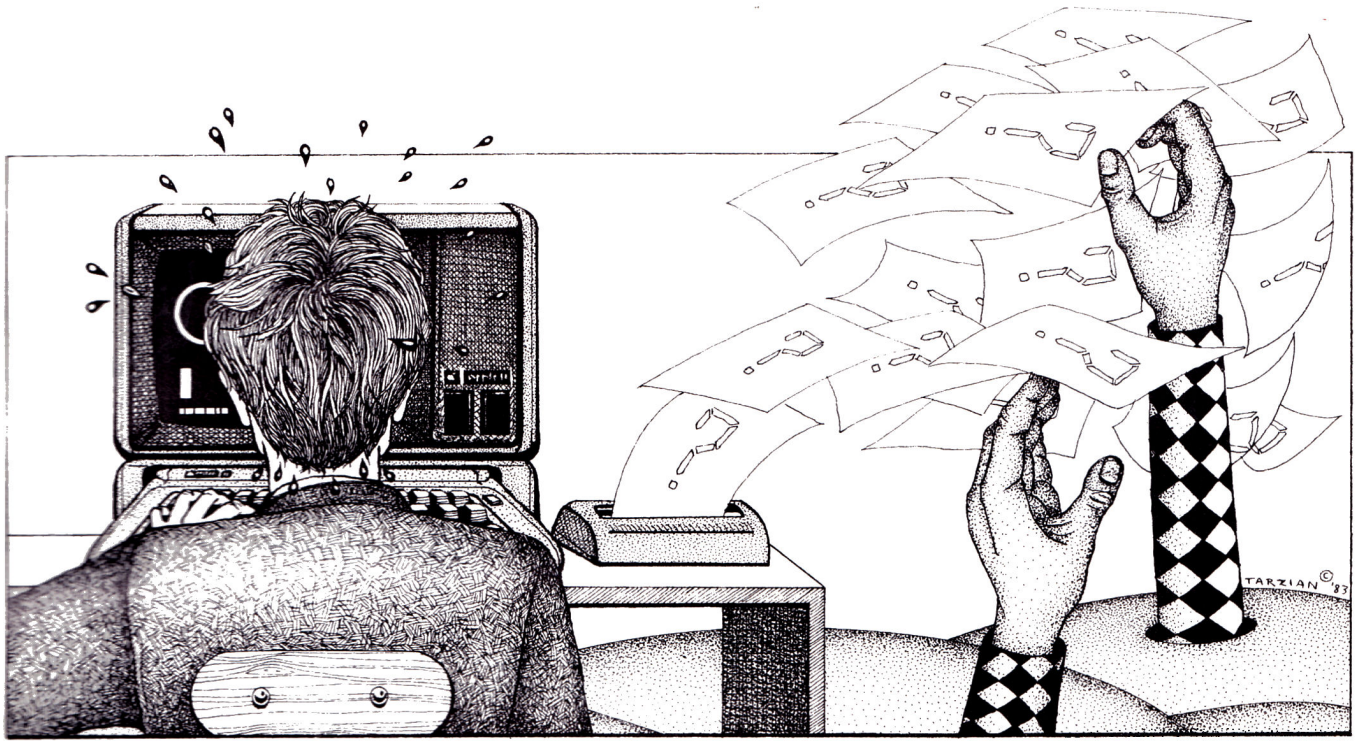
CIRCLE 175 ON READER SERVICE CARD

RESCUE SQUAD/BY LINDSAY McGRATH

Questions about radio interference, using TVs as monitors, and controlling a printer are answered by the Rescue Squad.



Finding the Facts

Q: I have just purchased an Apple II+ computer. Who can I go to with my many hardware and software questions? Apple's manuals are very good, but don't contain all the information I need.

A: *Your Apple dealer can help with any questions you might have. There is also a user support line you can call for an answer directly from Apple. The telephone number is (408) 745-6731. Chances are your call will be recorded by an answering machine. Apple should provide you with an answer within 2 working days.*

Ruining Interference

Q: I have owned an Apple II since 1978. Recently, I tried to use it with a shortwave radio receiver to decode radio-teletype transmissions. However, the computer created so much interference that I couldn't pick up any stations.

My system has 64K RAM, two disk drives, two monitors, and I don't use a video RF monitor. Can you tell me how to reduce the level of RF radiation from my Apple?

A: *An Electromagnetic Interference (EMI) Suppression kit may be just the thing to reduce interference from your older Apple. The kit consists of a shielded housing and lid, a shielded disk interface cable with the necessary installation hardware, and instructions. The kit may be obtained from your Apple dealer for a suggested retail price of $100 without installation. You'll need an additional shielded cable for your other drive.*

Can you tell me how to reduce the level of RF radiation from my Apple?

Printing Problems

Q: I need some advice on how to implement all the wonderful features of the *Applewriter III* software I just received as a gift. My problem is, how can I get my NEC PC-8023A-C dot matrix printer to change font, type size, etc. through the *Applewriter III*?

A: *Sending instructions to your printer with* Applewriter III *is done through the Control-V command. To use this command, you need to know the instruction the printer is expecting. Let's say that an Escape-U made the printer print in bold face and Escape-D makes the printer print normally.*

If you were typing the words "little red hen" and wanted to have the word "red" in boldface, you would type the following: little [Control-V, the Escape Key, the U key, then Control-V] red [Control-V, the Escape key, the D key, then Control-V] hen.

Monitoring Your Apple

Q: Why can't I use a television as a monitor for my Apple II+? I've tried several different brands, and none performed well—text drifted or was completely unreadable! I finally broke down and bought a color monitor.

I have not found much information

PROFESSIONAL, MOLDED

PROTECTIVE CASE

- Dual Wall Construction. 1" Protective Spacing Between Inner and Outer Wall.
- Molded Cavity on Left for Apple II Plus or E and Two Cavities on Right for Apple Drives. Prevents Component Shifting.
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FREE
With Each Case Ordered:
A-41 Dust Cover



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Protect Yourself From Lost Time, Data, and Money Associated With Accidents and Contaminants.

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Antistatic, High Quality, Heavy Gauge Clear Vinyl

(A-41) Covers Apple II with Apple Monitor and One Disk Drive (Set of 2 Covers) **$19.90**

(A-42) Two Disk Drives, Stacked (1 Cover) **$10.90**

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Printers: Advise type and/or dimensions **$10.90**

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CIRCLE 120 ON READER SERVICE CARD

available regarding the compatibility of Apples and TVs. Can you tell me what went wrong?

A: *The problem you encountered is that some TVs with digital tuning will not work with Apple computers. Unfortunately, there is not a list of specific brands that are incompatible.*

Apple doesn't have any control over how companies manufacture the television sets, so it markets its own monitor to ensure compatibility and performance.

Junk Letters

Q: I am having trouble using my Apple II for word processing. Whenever I print out a file, the printer begins by typing several unwanted "junk" letters that are not in my text file.

My system is comprised of an Apple II with an Apple parallel card, a NEC 3530 Spinwriter, and the *Screenwriter II* word processing program. I've tried all the printer parameters and driver routines in the *Screenwriter II* program. I checked the parallel card and my printer tests out perfectly.

A: *Flush out the print buffer before starting any printout. The printer manual should have information on the procedure. If that doesn't solve the problem, write to the printer manufacturer, and ask for additional information on the printer's operation.*

Hot RAMS

Q: Recently, I added an Apple language card, a disk drive without controller, and DOS 3.3 upgrade kit to a system that already includes an Apple II, a disk drive with DOS 3.2 controller, and a C. Itoh Starwriter daisywheel printer with Centronics parallel interface. Adding the new equipment created a problem.

The 16-sector *Applewriter* printer program doesn't work consistently on hot days. After storing print constants, the system crashes and will only respond to a reset command. Other programs, including my 13-sector *Applewriter* program, drive the printer with no problem.

Maybe the installation of the hardware was faulty. Or would a fan help?

A: *It sounds like you might have an unreliable RAM chip. A fan might help cool things off, but it would be best to locate the bad chip, if there is one. A continuous RAM test by your dealer should pinpoint the problem.*

Differences in I/Os

Q: I've created a light pen for the Apple II and am seriously thinking of buying an Apple III. Can you tell me the difference between the game I/Os on the two machines? Also, is there any difference between the Apple II and the Apple III in its emulator modes?

A: *There are some differences between an Apple II and Apple II Emulation on the Apple III. The major difference is that you can't use Pascal or any Pascal-based language (Fortran, Pilot) or program while in Emulation. Apple Logo will not run in Emulation. The reason is that you have only 48K of user RAM in Emulation mode.*

Another difference is that Game I/O does not act the same. The Apple III has two paddle ports, A and B. Port A has paddles 0 and 2, while port B has paddles 1 and 3. This can make it tough to play some games written for the Apple II.

Listing Binary Files

Q: How can I list a binary file on the Apple II+? Should I BLOAD the file at a certain memory location and list it? Or do I need to know the memory location where the program starts? I do not know the starting memory address.

A: *It is necessary to know the starting address in order to list a binary file from the memory of an Apple II+. The information for a binary file on disk is saved with two items of information: first the starting address of the file in hex and then the length of the file in hex. This is how the system knows where to put the information when the file is loaded.*

If the binary file is for a high resolution picture, there are only two possible memory locations it can be loaded in. The first is the location of high resolution page 1 or (HGR), with starting hex location A$2000 and a length of hex L$2000. The second is high resolution page 2 or (HGR2), with starting hex location A$4000.

If the file is an assembly language program, there is no set place where it is loaded. The program is placed into memory from where it was saved. And, unless the starting address and length were saved as part of the name of the file, there is no way to find this out from the disk catalog. There are, however, some aftermarket disks that will list disk files and their locations. One of these is Recover 4.0, published by Computer House Division, 1407 Clinton Rd., Jackson, MI 44202, (517) 782-2132.

We would like to thank the technical support people at Apple Computer for their assistance in answering these questions. We are establishing this monthly column to help you solve problems you may have in using any Apple computer and related products. Please send your questions to Rescue Squad, A+, 654 Bair Island Rd., Redwood City, CA 94063.

Do You Run Your Business or Does It Run You?

The biggest headache you may be facing these days is getting better control of your business. Tracking unpaid bills, sending out second billings, monitoring which salesman sold how much and to whom, keeping track of inventories, and on and on.

There's a remedy. It's called VersaForm... the business database.

VersaForm is a powerful database designed specifically for business, but based on the simplicity and convenience of your familiar business forms.

If you can fill out a business form, you can create a database.

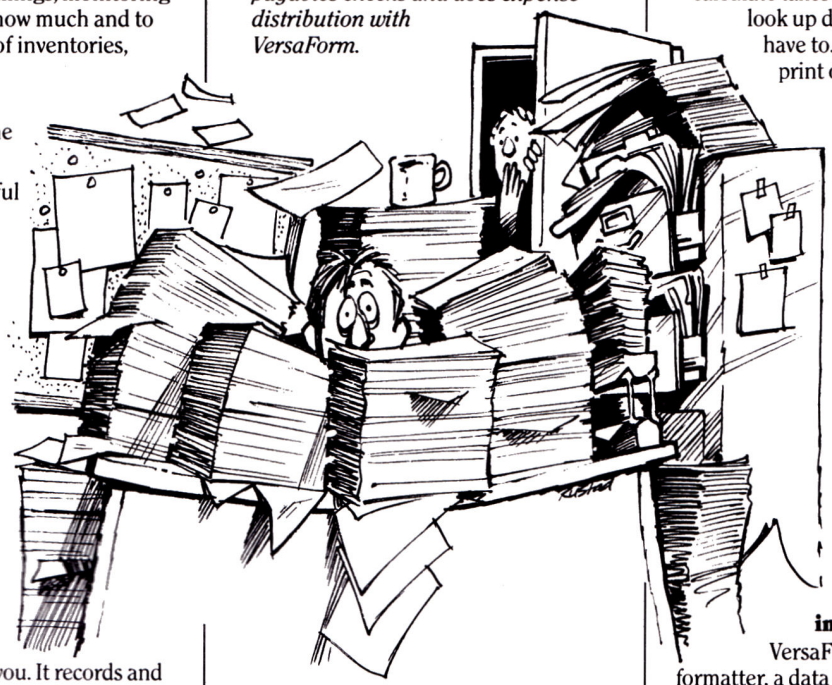
VersaForm starts with your existing forms and procedures. As you copy your forms onto the screen, VersaForm automatically creates a database for you. It records and saves information from Purchase Orders, Invoices, Job Estimates, Disbursement Ledgers... maybe even a few things you're not recording that you should be.

VersaForm is an electronic file cabinet that will store all this information, yet have it at your fingertips when you need it! It's designed with a non-technical user in mind, so you can concentrate on streamlining your business with none of the usual database headaches.

Adapts to your business... your way.

With VersaForm you don't have to completely re-orient your staff. It fits right into the way you're doing business now. Only now your operations will be completed more efficiently and with electronic speed.

- *A doctor in Moulton, Texas, posts his patient billing and completes his medical insurance forms with VersaForm.*
- *A small college in Wheaton, Maryland, uses VersaForm to create tuition invoices, class lists, accounts receivable, and accounts payable.*
- *A computer supplies company in Mountain View, California, writes payables checks and does expense distribution with VersaForm.*



- *A roofing company in Green Bay, Wisconsin, computes job estimates, contracts, invoicing, and tracks actual costs with VersaForm.*
- *A manufacturer in Beaver Falls, Pennsylvania, uses VersaForm to build his company's parts records, and generates "where-used" lists.*

VersaForm has the power to do these jobs and more because it's designed especially for business. It can also calculate taxes and prices, and can look up discounts, so you don't have to. VersaForm will even print on your own pre-printed forms.

Pull information together fast.

Pulling information together from paper files can be time-consuming and frustrating. Why make it tough? VersaForm puts vital reports like sales analyses, overdue payables, open purchase orders, and alphabetical employee lists at your fingertips. Minimum effort, maximum results.

All in one easy-to-use, integrated package.

VersaForm provides a screen formatter, a data entry program, a database, a report generator and a forms printer. And you can purchase predesigned Templates for standard jobs like Purchasing, Invoicing, and Expense Journals. VersaForm is the all-in-one business productivity tool. Ask for a demonstration at your computer dealer. Or contact us directly.



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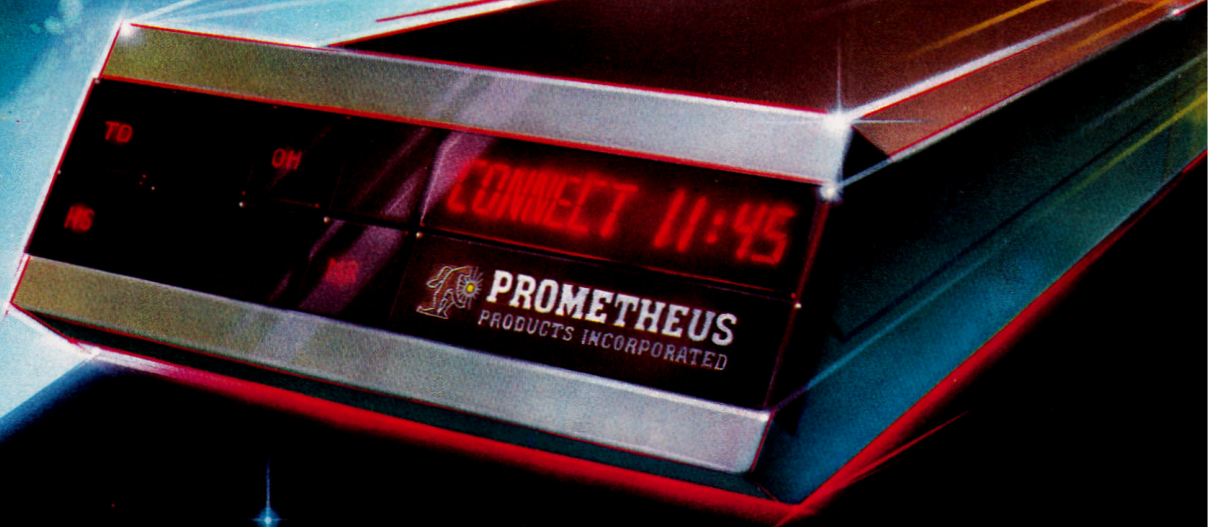
133-D

For use with the Apple II, IIe and III, and the IBM PC and compatibles.

CIRCLE 121 ON READER SERVICE CARD

PRO-MODEM 1200



It's about time.

Time for your computer to make the telephone connection – with an intelligent, full 212A 300/1200 baud modem – with a real time clock/calendar – and with the capability to expand into a complete telecommunications system. It's time for PRO-MODEM 1200. Much more than just a phone modem.

When you're on-line, time is money. PRO-MODEM telecommunication systems help you save. By monitoring the duration and cost of your phone calls. And by sending and receiving messages, unattended, at preset times when the rates are lower. . . with or without your computer.

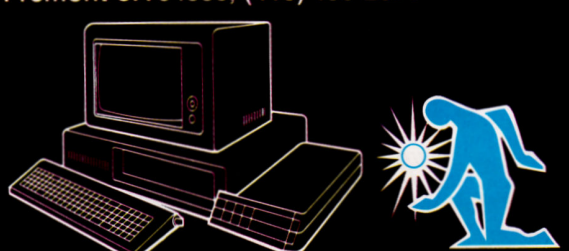
Compare the $495 PRO-MODEM 1200 with any other modem on the market. For example, you'd have to buy both the Hayes Smartmodem 1200 plus their Chronograph for about $950 to get a modem with time base.

PRO-MODEM 1200 is easy to use. A convenient "Help" command displays the Menu of operating command choices for quick reference whenever there's a question about what to do next. Extensive internal and remote self-diagnostics assure that the system is operating properly. Some of the other standard features include Auto Answer, Touch Tone and Pulse Dialing, and Programmable Intelligent Dialing.

PRO-MODEM does more. It lets you build a full telecommunications system with features like Auto Dialer, Incoming and Outgoing Message Buffering, Business/Personal Phone Directory, Programmable Operating Instructions, a 12-Character Alpha-Numeric Time and Message Display, and versatile PRO-COM Software. PRO-MODEM commands are Hayes compatible so you can use most existing telecommunications software without modification.

There's much more to the PRO-MODEM story. See your local dealer for complete details. He'll show you how to save time. And money.

Prometheus Products, Inc., 45277 Fremont Blvd., Fremont CA 94538, (415) 490-2370



PROMETHEUS

PRINTER COMPARISONS

GETTING IT ON PAPER WITH AN APPLE

Getting your hands on hard data is a lot easier when a printer has done its job. Hundreds of models will plug directly into the Apple. Here's how they work and how their mechanical processes differ.

By itself, the Apple is an actor without an audience. Although it can tell tales of dismay and delight about the future using mathematics and modeling, it keeps them a secret, privy to the select few who can see its monitor screen. Only by gathering a committee and having it huddle around the computer, like a powwow around a campfire, can the Apple share its electronic insights with a group.

A printer can change all that. A contrivance that's half electronic brain, half mechanical beast, the printer converts the computer's electrical impulses to the inky marks on paper that human beings obstinately prefer to read. The printer frees your computer's hidden secrets and makes them available to the rest of the world.

Printers are not a single kind of machine; as of yet none comes in a big white box labeled, "Generic hardcopy output device." Rather, they come in more flavors than ice cream—hundreds, possibly thousands of different models—and they are as different from one another as plain vanilla is from double-chocolate-mint chip.

Classifying printers takes more imagination and perseverance than naming a new flavor; some printer differences are slight and some of the classifications merge together. It's like trying to find exactly where the chocolate ends and the fudge begins. But printers can be divided into several stereotypical, overlapping categories based on the mechanical process used to get ink on paper (impact versus nonimpact printers, with various subclasses) and the volume of type (character, line, page) printed at a time (serial, line, or page printers, respectively). Other distinctions tend to be more fanciful or conjectural, such as the attempts to give objective classifications and names to the subjective appearance of the final characters on paper (letter quality, correspondence quality, draft quality, and data processing quality).

The printer frees your computer's hidden secrets and makes them available to the rest of the world.

The best way to find your favorite among printers is to try out each and every one. However, if your budget does not allow that luxury, the next best way is by making an informed choice, based on an understanding of how all printers work and which ones suit a particular application best.

Hitting the Paper

Probably the most popular type of printer is use today is the impact printer. Until recently nearly the only kind connected to personal computers, impact printers are direct descendents of office typewriters and work on exactly the same principle. A hammer of some kind strikes a ribbon (cotton or nylon) soaked in ink and a ribbon (film or Mylar) coated with ink then strikes the paper. The impact of the hammer against the ribbon forces ink onto the paper.

Like any mechanical impact, the hammer hitting the ribbon and paper makes noise; a sharp staccato rattle that's usually louder than normal conversation and obnoxious, at least when compared to the hushed whir of nonimpact printers.

Impact printers are popular because they're relatively cheap to make, straightforward to understand, and reassuringly familiar. They can print on anything a typewriter can, from plain paper to thin cardstock, and the impact is sufficient to make multiple copies at a time using carbon paper or carbonless multiple copy forms.

A list of nonimpact printers, which brings to mind the special effects used in a George Lucas movie, includes laser, electrosensitive, ion deposition, magnetic imaging, thermal, ink-jet, and photographic-based printers. The only generalization that can be made about them is that they don't strike the paper with a hammer to make images. The more accessible—that is, more affordable—nonimpact printers do, however, share some common characteristics: relatively quiet operation and inability to make carbon copies.

The more common nonimpact printers generate text by altering the surface characteristics of a specially treated paper either by heat (thermal printers), by electricity (electrosensitive), or by light (photographic). The more exotic nonimpact machines are designed for specialized applications: extremely high output or extremely high quality, for instance. They might be used in the data processing department of a major corporation or a phototypesetting plant. Generally speaking these printers are expensive.

Making the Most of the Matrix

Matrix, or, more commonly, dot-matrix, printers type the on-paper equivalent of a newspaper halftone photograph. They form printed characters out of dots. Each character is broken into a collection of dots, each one of which is positioned at a specific location in a grid array, or matrix, for each character. Like the newspaper halftone photographs, the printed characters are a little rough at the edges, and the on-paper printed quality varies with size and number of dots in a given area. More dots closer together yield a character with more detail and greater legibility. Unambiguous upper and lowercase characters can be printed in arrays as small as five horizontal dots by seven vertical dots, but seven dots is not enough to make the tails of the descending characters (lowercase *g, j, p, q,* and *y*) dip properly below the character line. Most popular inexpensive matrix printers use a 9-by-9 matrix today, although larger matrixes are not that unusual.

Though the rough character approximations of matrix printers are not as aesthetically pleasing as normally typed or printed characters, the dot-matrix printers have an advantage over other typing technologies. Because the dot patterns are computer controlled, the typeface or type font (what each individual character looks like) can be altered by changing the software. Characters can be made wider or narrower, italicized or boldface, just by changing the pattern coded into the printer's memory. Many newer matrix printers even allow the user to develop his own character fonts or other symbols and load them from his computer into the printer's memory. The matrix printer can type such downloaded characters as easily as any other lettering.

The most common matrix printers use an impact print mechanism, in which each dot is formed by a single tiny hammer, actually a wire, striking a ribbon to transfer ink onto the paper. Typically, a seemingly complex, but efficient mechanism controls the wire. While a spring constantly pushes the print wire toward the paper, most of the time the wire is held back by a strong permanent magnet. When a command from the host computer indicates that the wire should make a dot on the paper, an electromagnet is energized to generate a field that neutralizes the permanent magnetic restraining effect on the print wire. Released from magnetic restraint, the print wire is pulled by the spring's force to strike the paper.

A printhead consists of a number of these wires and their associated mechanisms. In a typical low-speed or serial matrix printer (speeds measured in up to hundreds of characters per second), seven or nine wires (or more, depending on the vertical height of the matrix) are arranged in a vertical column in the printhead. The printhead moves horizontally across the paper, and each wire fires as necessary to form the individual characters one nine-dot column at a time. For better image quality and more dots per inch, some machines send their printheads past the same typed line more than once, filling in the tiny blanks between dots and making the printed characters look closer to letter-perfect.

Impact printers are popular because they're relatively cheap to make, straightforward to understand, and reassuringly familiar.

One of the primary factors that determines how fast any impact matrix printer can create characters on paper is the time between successive strikes of the print wire. Physical laws of motion limit the acceleration of the wire and hence the speed at which it can move. Therefore, barring the repeal of the laws of Nature, a great speed increase is impossible. One way around this speed limit is by combining more print wires and by shortening the sweep of the printhead for each line. More wires firing within the same period means more characters can be formed.

High speed matrix line printers (with speeds of hundreds of lines per minute) typically use a horizontal row of 132 print wires that stretches across the entire width of a sheet of paper. For each full line of characters, the printhead moves only five or so dots (or increments) over, then the paper is advanced one full line, and the printhead starts typing the next line of text.

Matrix characters can also be formed without impact using ink-jet, thermal, laser, and related principles.

Although the first ink-jet printers were expensive, high-speed line printers that sprayed tiny drops of ink onto paper from a long horizontal row of nozzles, the latest serial ink-jet printers use a small, moving printhead and rival the serial impact matrix printers in both speed and cost. The individual jets of ink can be carefully controlled for high-quality printouts; however, the simpler mechanisms used in low-priced ink-jet printers create text that can only be classed as data processing quality.

Electrosensitive and thermal printers create matrix images by using special printheads with multiple styli arranged like the printwires of impact matrix printers. The styli physically contact a special paper treated to change color (usually darken) in response to the electrical or heat changes in the styli. Although inherently quiet, reasonably fast, and relatively inexpensive, these printers have not yet won wide favor because they require special, hard-to-obtain paper. In business applications the need for treated paper is a particular handicap because it precludes the use of preprinted forms and letterheads.

Pages per Minute

Luke Skywalker's laser technology has been adapted to high-speed printers. A laser beam is used in such machines to trace characters on a drum coated with light-sensitive selenium. The exposed areas of the drum can be electrostatically charged to attract pigment. When paper is wrapped around the drum, the pigment can be thermally bonded to it. The operating principle is exactly the same as a Xerox photocopying machine—and, as you might expect, the resulting hard copy looks just like it came from a Xerox machine.

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Laser printers resemble Xerox copiers, too, in size and cost—table-sized rather than table-top, with prices in the tens of thousands of dollars range. But just as photocopiers have been shrinking both in size and price, so have the latest laser printers. (One was announced last year with a $4,500 tag.)

Laser printers' photostatic process permits the use of nearly any paper (besides wax paper), including stationery and preprinted business forms. Legibility and print quality is high (although the characters are not fully formed, the matrix density is very high), and throughput is astounding—measured in *pages* per minute, rather than character per second or line per minute. Current machines average from 20 through 43 pages per minute. Laser printers cannot make carbons, but they're so fast it may not matter!

Ion-deposition printers work on a similar principle but substitute a stream of ions (electrically charged atoms or molecules) for laser beams. Though a fledgling technology, ions have a substantial advantage over lasers. They can be directed and modulated into the proper on-paper patterns using magnetic or electrostatic fields. Shifting a laser beam requires optics. Potentially, ion-deposition printers can be simpler (hence, less expensive) than laser machines.

The Electronic Linotype

Fully formed character printers make letters the old-fashioned way. Like old newspaper linotypes that cast the finest detail of every character by pouring lead into a negative mold, fully formed characters use a form of mold to create images with the finest detail. Each character is formed in one step from a negative single image, which can serve as a model for a nearly unlimited number of exact copies of the character.

Impact fully formed characters carry on the proud heritage of their typewriter forefathers. A raised, fully formed negative image of the final character is struck against a ribbon, which then transfers that exact image to the paper. Each character to be printed must be moved in sequence in front of a hammer, which will strike it against the ribbon.

Various schemes have been devised to move the characters into position. Ball mechanism printers are just refugee ball-mechanism typewriters. The character molds are arranged on the surface of a sphere or ball, which is shifted into the proper orientation so that a specific spot on its surface can strike the ribbon. Because the ball of type makes more gyrations than a disco dancer, most ball printers are relatively slow, below about 12 characters per second.

So-called "daisy-wheel" printers arrange their negative character images on the tips of petallike hubs of a wheel and rotate the appropriate character in front of the print hammer. Bend the petals of the daisy upward, and the result is a "thimble." This arrangement greatly simplifies the positioning process. And because the spinning wheels never need to change direction, they can be sped up.

To avoid smearing the images they make, however, every part of the printing mechanism must come to a halt before the hammer strikes—this means the daisy wheel must stop spinning, and the carriage mechanism must settle down before anything gets on the paper; then it must speed up again to get to the next character. Although fully formed character printers need make only one stroke to equal the dozen or so wire dots of matrix printers, their ultimate speed capabilities are lower, ranging from 12 to 55 characters per second.

For higher print speeds combined with high print quality, fully formed characters can be rearranged in another manner, embossed onto a continuous band that's driven between pulleys at very rapid rate, to create a "band printer." Another variation on the theme is the "chain printer," which has imprinting characters embossed on slugs linked together into a continuous chain.

SEVEN BASIC APPLE-COMPATIBLE PRINTERS

Seven contenders slug it out for the title, "Best Of The Budget Matrix Printers." We'll let you be the referee.

Unless your eyes are sensitive only to the color green (or whatever the hue of your monitor) the question of adding a printer to your Apple system is usually foregone. Today a printer is not so much an accessory as a necessity—for listing programs, unfurling spreadsheets, and materializing both memos and manuscripts.

The big question that arises after deciding to buy a printer—Which printer is best for you?—is not so easily answered. The variety of available Apple-compatible printers is, at best, bewildering and, more likely, mind boggling. Permutations of makers' names and model numbers mixed with the best of the buzz words—ink-jets, daisy-wheels, dot-matrixes, laser, and thermal are just the beginning—bring the total number up to the multiple hundreds.

The first step in narrowing your search is to decide exactly what your primary purpose is and match prospective machines to that purpose. For instance,

Unless you're allergic to ink, the style of ribbon should not be a major factor in choosing a printer.

if you want your printer to impress your neolithic friends, you can probably find a printer that's gold plated or blows smoke rings. If you want absolutely the most versatile machine available, don't be satisfied with anything less than one with a built-in bowling ball polisher and compost compiler. However, if by some chance, your goal—getting words and data down on paper as simply and cheaply as possible—coincides with that of most personal computerists, you'll find a number of candidates worthy of your choice. Among the possibilities you'll discover the seven matrix printers discussed here: the Apple Dot Matrix printer, Epson RX-80, Gorilla Banana, C. Itoh ProWriter II, Mannesmann-Tally Spirit-80, Star-Micronics Gemini-10X, and the STX-80.

These seven samurai (all hail from the Land of the Rising Sun) fit into the couple-of-hundred-dollar price range, typically near the bottom of their makers' printer price lists. All have one primary purpose: to get you printing for the lowest price and the minimum fuss and bother. All are matrix machines and handle normal 9½-inch wide continuous-form computer paper and plug directly into the Apple's accessory parallel interface. But as much as they are alike, they are also different; each is built with a varying degree of quality, range of speed, and array of special features.

Perhaps the only way to know which of them best matches your needs is to try

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out all of them. But that kind of selection process is expensive if you can't beg, borrow, or abscond with the whole array. So, here is an alternative: We've done the trying for you (including poking a hole in some ballooning print speed figures), and we'll share our thoughts and the features of each machine so you can match our findings to your needs.

This report is not without its limitations. To be honest, the number of matrix printers vying to be the best for your minimal budget is a bit larger than seven. In fact, over 100 printer models are available for less than $1000! Nevertheless, our selection of machines is representative of features you might expect from low-priced printers. We had to limit the number of printers in this review for practical reasons.

We used the same strangely skewed selection criteria that the typical first-time printer buyer might rely on.

We used a highly scientific method to narrow the field: arbitrary choice. Our selection is a mixture of things we've heard a lot about, the cheapest printers we could find, new machines that intrigued us, and the official minimal model from our favorite computer manufacturer. In short, we used the same strangely skewed selection criteria that the typical first-time printer buyer might rely on.

Examining our Examination

Reading our reports you may believe that our procedure was simple: We put all the printers in a room and let loose a trained chimpanzee to see if he could get them running, or as an alternative, see if he could destroy them. Close. We set our hardware reviewer free in a room containing all the printers and would not let him out until he had them all running. To simulate a typical office environment, we used a typical office. To simulate the normal response of other people sharing a room filled with chattering printers, we loaded the room with editors.

Not content with manufacturer's print speed ratings, we tested "throughput," or how fast the characters were actually formed on paper. We connected an Apple IIe individually to each printer in turn and tested speed with a simple loop in Applesoft BASIC (with the newsman's favorite teletype phrase, "The quick brown fox jumped over the lazy dog's back. 0123456789," which contains every letter of the alphabet). The throughput rating given on the accompanying chart is for the highest print speed we measured for each printer. In every case this was the standard 10-pitch typeface with no enhancements or special features. Note that although condensed or italic type doesn't slow down the speed by much, emphasized or double-width characters can cut speed in half. Note, too, that even these inexpensive machines have advanced speed-enhancing features like logic-seeking bi-directional printing (except the Banana, with which printing is a one-way job).

We tested sound level on two axis, about one meter away from the printer and averaged the readings, using slow meter response and "A" weighting. Taken individually these readings are meaningless, because there is no absolute standard of noisiness—such measurements can vary widely with technique and test conditions. Taken together, however, the figures allow you to compare how noisy each printer was in relation to the others we tested under identical conditions.

Printer manufacturers use an amazing variety of names for the characters their printers make: boldface, emphasized, double-width, expanded, headline type, to name a few. We've tried to sort through and use common names. Expanded and double-width characters are given in the chart by their equivalent character pitch (that is, how many of each will fit on a linear inch of paper). We've listed other added printing effects. If names alone don't suffice, we've included examples of the print quality (see print samples) for various typefaces and graphics from a selection of these printers.

Apple Dot Matrix Printer

If you don't want to look at what seems like a thousand printers and test each one for compatibility, the obvious choice is the official Apple Dot Matrix Printer.

Although you might choose it by default, it's a good choice. You get a top-quality printer with more features than most people will ever use, reasonably high print speed, and a cabinet with a color and name tag that match your computer. All you need do is plug it in and you'll be printing without having to tangle with DIP switches and make sense of escape sequences.

Of all the printers in this test, the Apple offers the widest variety of type sizes and styles, seven widths (condensed, ultracondensed, pica, elite, extended (9-pitch), and two that are proportionally spaced). Any of these can be underlined, bold-faced, or made into headline (double-width) type through the appropriate software command. Furthermore, it allows downloadable (design-your-own) character sets and provides a whopping big 16-by-8 dot matrix to hold each of the characters derived from the flights of your imagination. Normal character sets are formed by the Apple's nine-wire printhead in a 7-by-9 dot matrix. The printer can also handle dot-addressable graphics with nominal 72-by-72 dot-per-inch resolution. (Horizontal dot density can be increased, but little detail is gained by doing so.)

The controls, located in a recessed area on the front of the machine, allow normal paper handling (pushbuttons marked T.O.F. for Top-of-Form and L.F. for Line Feed) and selecting the machine on-line or off-line (SEL pushbutton). LEDs indicate that the power is turned on (green LED labeled POWER), that the printer is on-line (green LED labeled SEL) and if a fault should occur (red LED labeled P.E., possibly meaning Paper Error or Problem Erupting). The line feeds are rather slow but become faster and smoothly continuous if the L.F. button is held down for more than a second.

The Apple Dot Matrix Printer uses a small ribbon cartridge containing a fabric ribbon. It is not a continuous loop; it automatically reverses direction when it reaches its end—more like a typewriter's ribbon than a printer's. Installing and changing the ribbon is a snap. (Although the manual indicates only Apple ribbons will fit, C. Itoh ProWriter II ribbons proved to be interchangeable.)

Printer manufacturers use an amazing variety of names for the characters their printers make.

The paper handling abilities of the Apple allow use of either continuous-form paper from 4 to 10 inches wide or friction-fed single sheets. Continuous form paper is first fed from the rear of the printer through the tractor mechanism, then around a rubber platen, and past the printhead. The platen knob on the right side of the machine permits precision paper positioning and even allows you to roll the paper backwards. A red plastic lever on the right side of the printer

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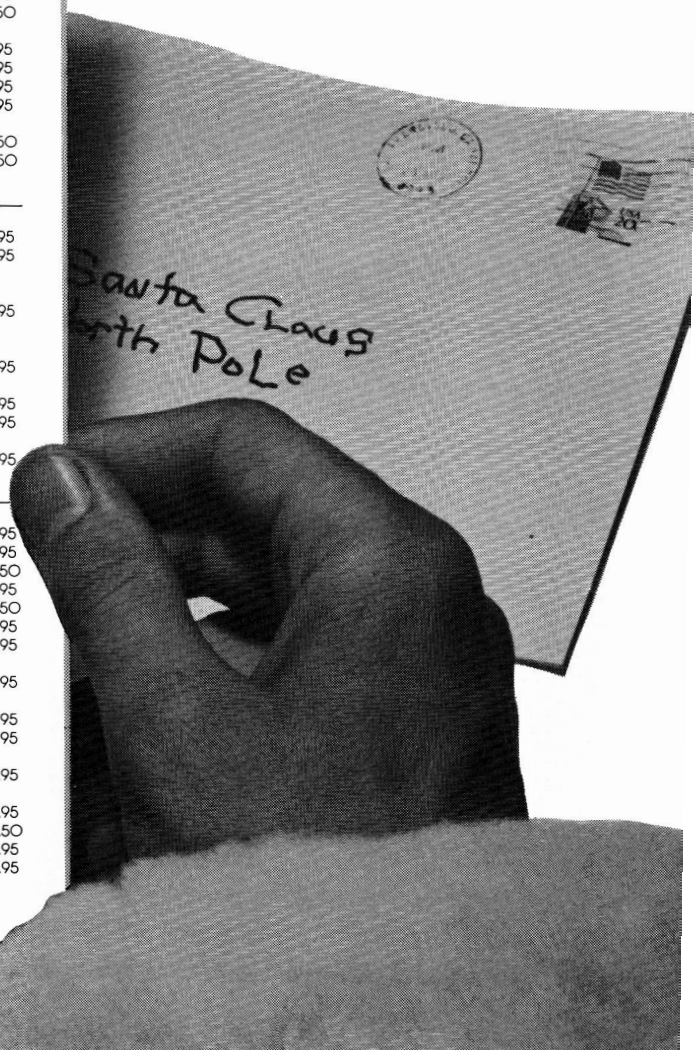

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adjusts the head gap for optimum print intensity or for multiple copies (original and up to three carbons totalling 0.011 inch).

The Apple printer we used in our tests was borrowed from a Lisa system, so its documentation came in a binder to match the rest of the Lisa manuals. The setup instructions are among the clearest and

A-PLUS BASIC MATRIX PRINTER COMPARISON CHART

	APPLE Dot-Matrix Printer	**EPSON** RX-80	**GORILLA** Banana	**C. ITOH** ProWriter II	**MANNESMANN-TALLY** Spirit-80	**STAR-MICRONICS** Gemini-10X	**STAR-MICRONICS** STX-80
Claimed Top Speed*	120	100	50	120	80	120	60
Tested Throughput**	63	59	21	74	59	72	27
Tested Sound Level***	72.5	78.5	77	74.5	75	78.5	<60
Printer Type	Impact	Impact	Impact	Impact	Impact	Impact	Thermal
Character Pitches	4.5,5,6,7.5,8.5,9, 10,12,15,17 & 2P.S.	5,6,8.5, 10,12,17	5,10	5,6,8.5,10,12, 17 & P.S.	5,9,10,17	5,6,8.5, 10,12,17	5.5,11
Line Spacing****	6,8 or n/144", 1<n<99	6,8, or 7/72" n/72", n/216"	6	6,8 or n/144" 1<n<99	6 or n/72" or n/216"	6,8 or n/72" or n/144"	6,11 or 7/66" or 4/33"
# of Copies (incl. orig.)	4	3	2	4	4	Not Specified	1
Printhead Wires	9	9	1	9	9	9	[9 styli]
Italics?	No	No	No	No	Yes	Yes	No
Emphasized/Bold?	Yes	Yes	No	Yes	Yes	Yes	No
Superscript/Subscript?	No	Yes	No	No	Yes	Yes	No
True Descenders?	Yes	Yes	No	Yes	Yes	Yes	Yes
Downloadable Characters?	Yes	No	No	No	No	Yes	No
Block Graphics?	No	Yes	No	Yes	Yes	Yes	Yes
Dot-Addressable Graphics?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maximum Paper Width (in.)	10	10	10	10	10	NS (9.5" fits)	(uses special paper)
Minimum Paper Width (in.) (that fits tractors)	4.5	4	4.5	NS (4.5 okay)	4	NS (4.5 okay)	(uses special paper)
Friction Feed? (Single Shts.)	Yes	No	No	Yes	Yes	Yes	Yes
Tractor Feed?	Yes	Yes	Yes	Yes	Yes	Yes	No—use roll paper
Weight (pounds)	18.75	11.3	9.9	18.7	11	15.4	7.7
Size (W x D x H) (inches)	15.7x11.3x5.3	14.7x11.9x4.1	16.5x9.2x5.3	15.4x11.3x5.1	14.8x11.6x4.9	15.2x12.4x5.8	13.9x7.5x3.9

*(characters/second) **(characters/second at highest speed) ***(SPL in dB at 1 meter, A-weighted) ****(lines/inch or programmable interval)

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CIRCLE 126 ON READER SERVICE CARD

easiest to follow of any we have seen. Although the manual warns that the nonprogrammer may not want to get involved with them, a full list and description of all available command codes is given (including software-variable line spacing and vertical tabs). Most references in the manual, expectably, are to the Lisa system.

While we were testing the Apple Dot Matrix Printer and the C. Itoh ProWriter II, we were struck by the similarity between the two machines. Except for color, top plate, and label, they looked identical. In fact, we discovered the front and back covers were interchangeable between the two machines. It should be no surprise, then, that both printers began life in the same factory.

Appearances can be deceiving. Although two machines may look very similar, they can be very different inside, particularly because the "identity" of most printers (that is, how they work and how they react to the outside world) is determined by software programs contained in ROM chips. A printer can be changed into an entirely different machine merely by changing one integrated circuit.

Our tests demonstrated the subtlety of the differences. The mechanisms of the two machines look identical (at least to our eyes), but they don't work in the same way. The ProWriter actually dashed ahead of the Apple, with a speed about 15 percent higher. (We didn't believe it, either, and checked several times—the results were the same.)

When it comes to sound level, the Apple is noticeably quieter than the ProWriter. In fact, it was the quietest impact printer in this test. Note, too, that right from the box the Apple printer worked perfectly with our IIe. The ProWriter gave us double line feeds, which required DIP switch resetting (easy, once you know what you're doing), and the examples in its manual are written in Microsoft BASIC and require translation to Applesoft. The Apple also has a wider variety of character widths available on command, but the ProWriter allows block graphics.

Epson RX-80

The Epson RX-80 is an almost unremarkable printer that offers both a good selection of features and speed in a compact package. A few years ago, it would have been an amazing machine, but these days and in this review it's just another face in the crowd. Far from a condemnation, this assessment illustrates the high standard that can be expected from today's inexpensive matrix printers. The RX-80 is workmanlike rather than wonderful, but it's both competent and competitive.

It differs from the others in the group tested (except for the Banana) in that it has no typewriterlike rubber platen for friction feeding paper. Instead, a tractor pulls sprocket-fed paper past a fixed metal platen, an arrangement used on many very-high-speed, expensive matrix machines. Loading paper in can be tricky until you get the hang of it; you must slide the paper in from the rear of the printer until it magically appears in front of the printhead, and then pull it up and latch it into the tractor mechanism. A knob on the right side of the RX-80 (can we call it a platen knob even though it doesn't roll the platen?) helps in precision paper positioning, but beware. If you fail to line up the perforations in the paper perfectly with the top of the printhead, it is difficult to move the paper backward. (And doing so is not recommended by Epson.)

Of all the printers in this test, the Apple offers the widest variety of type sizes and styles.

Abandon all hopes of stuffing your impressive 100-percent rag copperplate-engraved personal stationery through the RX-80. It is incapable of friction feeding either individual sheets or roll paper. Nevertheless, if you need to impress, preprinted microperforated fanfold stationery will fill the bill. Or consider the RX-80's brother, the RX-80 F/T, which does offer friction feed.

The fabric ribbon used by the RX-80 is a continuous loop contained in a large cartridge that's wider than the 10-inch paper carriage. A length of ribbon nearly the full width of the cartridge is left exposed. Using a pencil to push the inked fabric past the printhead, the ribbon can be properly threaded in seconds, without discoloring your fingers. Then again, if like me, you try to put the ribbon in unaided by such a simple tool, you may end up signing your work with purple fingerprints as I did.

There must be some Japanese standard for the required minimum of matrix printer controls. Every machine in this sample (except the Banana and STX-80, which differ from the norm in other significant ways) has the same set of controls and indicators: line feed, form feed, and on-line/off-line pushbuttons; and LED indicator for power, on-line, ready, and fault (all green except for the last, which is red). The RX-80 conforms to that hypothetical standard perfectly.

The RX-80 will print in nine different type sizes or style combinations, including standard Pica characters (10 pitch), emphasized Pica (bold), condensed Pica (17-pitch characters), enlarged Pica (double-width or 5 pitch), emphasized enlarged Pica, condensed enlarged Pica (8.5 pitch), Elite (12 pitch), enlarged Elite (6 pitch), and superscript/subscript (roughly half height). Sorry, printing condensed or emphasized Elite characters is impossible, as are emphasized condensed enlarged Pica Elite subscripts. Besides the standard 96 printable ASCII graphic characters, 32 block graphic symbols; 11 international character sets; and 96 alternate characters are safely locked in the RX-80's memory chips. The printer will also handle dot-addressable graphics eight wires at a time.

The manual we received with the RX-80 left a lot to be desired: Thirty pages were omitted, including the specifications and interfacing information. The first call to Epson America brought a response that might be described as, "Go away and bother your distributor instead." When we finally were able to talk to a human being at Epson rather than an indoctrinated automaton, we got our missing pages. (We bothered so many people at Epson that we eventually got two copies!) Word is that a new version of the manual will soon be available. Actually the RX-80 manual we did receive was not nearly as awful as the company implied (it was characterized by Epson as "a Japanese manual," with derogatory connotations emphasized). It was complete and detailed, perhaps overly so. The bulk of it was a description of control codes in alphabetical rather than functional order—basically a programmer's reference guide.

Getting the RX-80 to work with our Apple IIe was simply a matter of plugging in a standard Centronics cable. It came to life and worked flawlessly without adjustment of the setup and default DIP switches. That's good, because accessing the switches requires digging into the machine.

The heading, "Number of Copies," on the comparison chart may be a bit misleading. We quoted the number straight from the manufacturers' specifications. Although most said four, Epson said three. However, in giving the maximum thickness of paper that the printers

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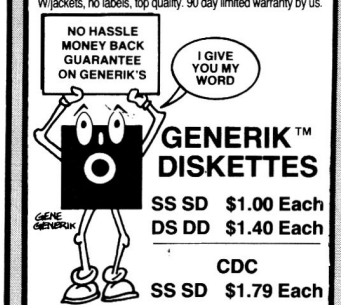

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can handle, the four-rate printers spec sheets uniformly said 0.011 inch. The three-rated Epson's specs said 0.012 inch.

Also note that although the RX-80 was among the noisiest printers in this review, Epson allows a software command to slow the machine down to half speed, which also cuts the noise by 3 decibels.

Gorilla Banana

Maybe it's not the cheapest printer in the whole wide world, but at about $250, the Gorilla Banana is undoubtedly the cheapest one most people will try to plug into their Apples. You could buy two of them for the price of other so-called budget printers.

By strange coincidence, we ended up receiving two of them. One had a charcoal gray plastic case with a glued-on label that proudly announced "Gorilla/Banana," and the other was decorated in off-white and labeled "Leading Edge GX-100." In fact, except for color scheme the two machines are very much the same (GX-100 is the Banana's official model number.) Earlier machines were in fact labeled GX-100.

The biggest lesson the Banana taught us was not to make up our minds too soon. Certainly we could ignore the ridiculous name, but we could not ignore the fact that our first Banana came without screws holding the case together. We opened the box and got handfuls of pieces rather than a printer. Our reaction was the same one you'd have if you grabbed a banana without its skin—Yuk!

The kit-form printer gave us our first view of its mechanism; many of the parts looked familiar, as if rescued from a child's toy or radio controlled model.

In fairness to Leading Edge, its manufacturer, our operating timetable evidently caused it to steal the printer away from either trolls who were teasing it or another magazine that had been testing it with a hacksaw rather than software, then to rush it to us. Obviously an abused rather than used machine, it seemed to have lost touch with the world. The control codes listed in the manual baffled it entirely. After an instruction to print expanded characters, it suddenly became capable only of line feeds. Upon being told to return to normalcy, it would wind itself up and whir ominously, cough, and totally lose consciousness. The only way to revive it was by switching off and back on.

Banana #2/GX-100 arrived the next day, completely equipped with screws, which made it feel quite solid and filled us with a little more confidence. It was completely operational, except that its ribbon was dry and printed very faintly.

The ribbon on the Gorilla Banana is a good example of how cutting all the little extras keeps printer costs down. Most inexpensive printers have large ribbon cartridges that stretch the full width of carriage travel. The Banana uses a quasicartridge, two half cartridges that mount on either side of the full carriage width with nothing but a length of ribbon in between them. The quasicartridge is easier to load than a noncartridge ribbon and won't turn your fingers purple, but it's not as easy to use as a cartridge. Nevertheless, it works. Though, unlike noncartridge ribbons, it cannot be turned over to increase its life.

Another thing you won't get with the Banana is controls. It has only one—an on/off switch. There are two indicators: a pilot light LED that indicates that the solitary switch is turned on and power is indeed seeping into the machine, and an error LED that lights up when something has gone wrong. The Banana is always on-line when properly plugged into your Apple, so no "select" or "on-line" switches or LEDs are used.

The Banana is painfully slow; it ran through our test at 20 characters per second.

In lieu of line-feed and form-feed switches, and even the platen knobs, the Banana has a thin, knurled wheel called a "paper feed dial," the upper edge of which protrudes slightly from the top of the case. To advance paper, spin the dial with your finger or thumb. It clicks in increments of 1/18th of an inch, locating the printed line on paper reasonably precisely. Trying to form feed paper with the dial, however, is apt to wear a hole through your thumb. Because the dial turns only in one direction, there is no way to move paper backward.

A unidirectional tractor handles fanfold continuous form paper, adjustable for any width between 4.5 and 10 inches. Do not even think of using individual sheets of paper without feed sprockets. The feed mechanism is not very strong. In fact, the manual recommends that paper be fed from a stack level with the printer—lifting paper from the floor might be too much for the miniscule mechanism. The warning was well-founded.

Another limitation of the Banana is that it doesn't print descenders. Letters that normally droop below the general line of text won't when printed with the Banana. Instead, lowercase *g*'s, *j*'s, *p*'s and *q*'s all protrude higher than they ordinarily should, and lowercase *y*'s are just plain squashed. The reason is that the Banana prints a 5-by-7 matrix—seven dots vertically, probably the minimal size required to make upper and lowercase letters decipherable. Normally, true descenders require 8 or 9 vertical dots.

The limitations of the 5-by-7 matrix are readily apparent when you want the printer to underline. The Banana does not even recognize a standard escape code instruction to underline. If you want to underline, you must instruct it to backspace and print an underscore character (_). But when you see how it looks, you may not want to do that: The underscoring prints right over the bottom dot of each letter and makes lowercase *b*'s and *h*'s indistinguishable.

Actually printing with a 5-by-7 matrix is a genuine technical achievement because it has a one-wire printhead. Rather than having to race past a character seven times to form those seven vertical dots, however, it uses a clever mechanism. The platen, normally the round rubber roller that the print wires strike against, is a spinning cylinder with raised ridges. The relative position of each ridge when the printhead fires determines the vertical location of the dot on the paper. The position of the printhead itself determines the horizontal location of the dot. The mechanism saves many moving parts—about six finicky print wires—and replaces them with one reliable rotating platen.

The penalty, however, is speed. The printhead must fire up to seven times for each horizontal position it advances. Further, the printhead is unidirectional—it only moves from left to right. Net result: the Banana is painfully slow; it ran through our test at 20 characters per second. Nor is it a very mighty print mechanism—two-part forms are the thickest it can handle.

Banana's manufacturer also cut corners in the special printing features department. The Banana prints with only one character height and style and two character widths: 10 pitch and double-width 5 pitch. It has only one other print mode—dot-addressable graphics.

When we attached it to our Apple IIe, the Banana gave us double-line feeds; no

Continued on page 174

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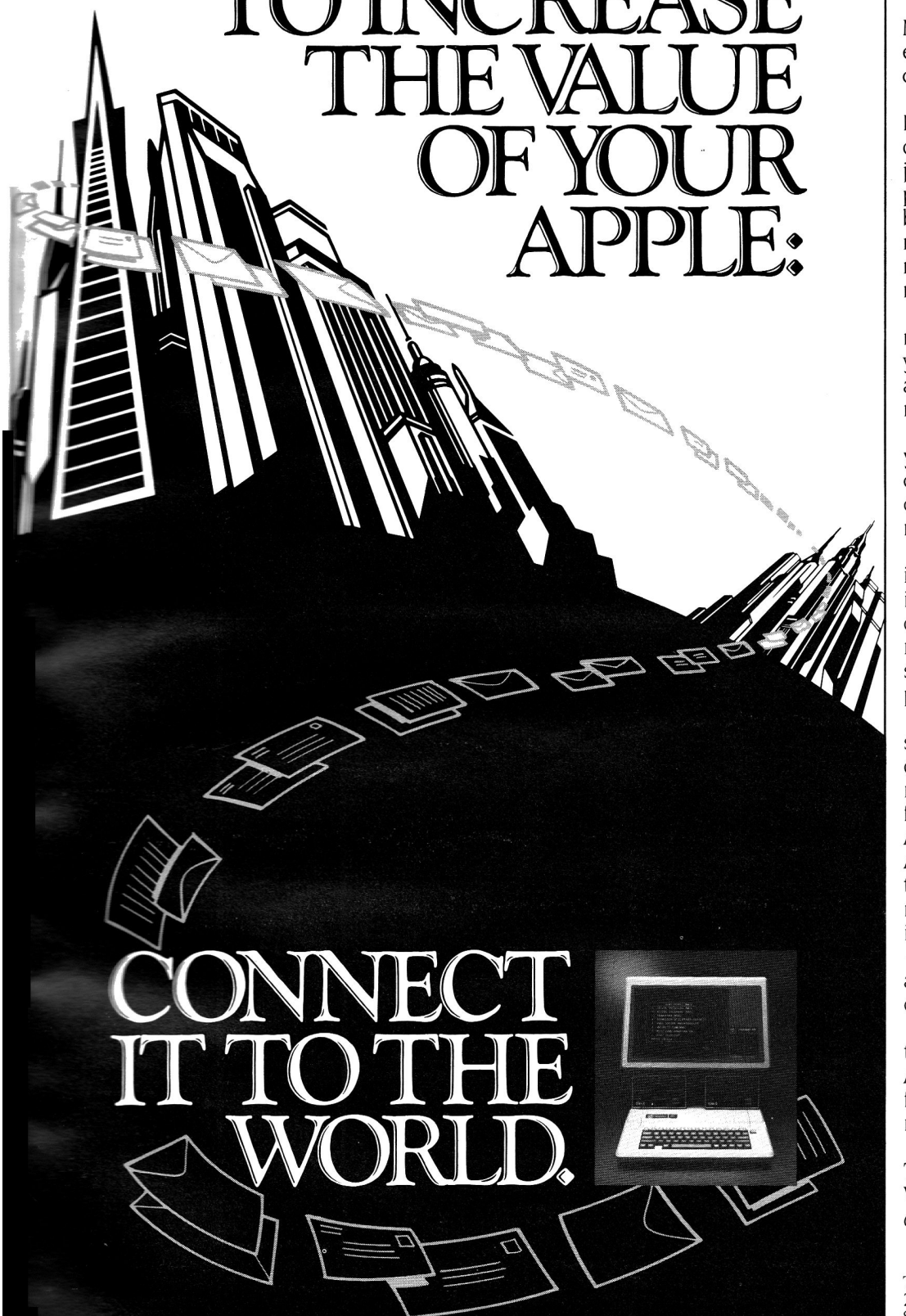

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CIRCLE 129 ON READER SERVICE CARD



THE GREAT AMERICAN APPLE

From cinematic animation to recordkeeping in the personnel department, Apple computers lend a hand at Marriott's Great America amusement park.



His name is Foghorn Leghorn, and he's a seven-foot-tall chicken who hangs out in front of the Snowshoe Saloon.

Foghorn, who has a five-foot-long tail, a two-foot beak and feet like something out of a movie called "Chickens Take Over the World," is run by an Apple computer.

An attendant opens the doors to his ramshackle saloon. Foghorn sits at an old upright piano that is wrapped in chicken wire. Straw hangs from the room's exposed rafters and a mock wood stove is off in a corner. The chicken dominates the small room. With the help of the Apple, Foghorn starts his show. He bellows comic patter and sings old barroom songs appropriately tailored to the tots who stare up at him. They think he's real, and most of his monologue is aimed at them. His head moves up and down and from side to side as one eye rolls down to look at the children while his over-stuffed fingers plink out tunes on the piano.

Foghorn seems to be a hit.

Overwhelming Numbers

He is part of a multi-million dollar business called Marriott's Great America, a theme park in Santa Clara, California. Foghorn is a small part of the amusement available to the approximately 30,000 people who wander through the 65-acre park on a good day. Marriott's business is to give its customers a good time with little inconve-

nience. Marriott's employees must keep the customers satisfied.

The job of hiring an efficient staff starts in the personnel office, a small, temporary-looking building located near the park. Inside, thirty chairs are arranged in neat rows facing the windows. On a recent day about half were occupied by teenagers filling out applications or waiting to be interviewed.

The slow season has set in; twenty-five to thirty applications come in each day. Starting in January the office will be inundated by about 300 applications daily, a pace that will continue through the end of March before the park opens. In one year the personnel office here processes about 10,000 applications.

It's a large task that was once done manually. It took a lot of time, a lot of people, and was cumbersome.

Then, 4 years ago, Tony Scott, Marriott's manager of employment and manpower utilization, bought two Apple IIs for the office. Those two, the 9 Apples subsequently purchased, and the 7 or 8 Apples employees brought from home have changed the way business is done at Marriott's in marketing, rides and admissions, cash control and especially in personnel. Computers keep track of applicants and the 2,500 employees in what is essentially a small city between Memorial Day and Labor Day and a ghost town the rest of the year.

During Marriott's small city phase, some employees work 18 major rides, 23 shops, 26 restaurants, 15 food kiosks, 26 game centers and 15 arcades. Others help major song-and-dance reviews, minor shows, roving bands and magicians, minstrels, and strolling cartoon characters. Additionally, there are maintenance people, programmers, accountants, secretaries, carpenters, medical people, clerks and all the other people necessary to Marriott's business.

Tracking Details

Scott is in his office next to the personnel waiting room. He talks about the Apple that sits on a desk in the waiting area.

"We do all the personnel stuff, manpower utilization, park productivity, labor-hour control, and a lot of reports that use the database to track developments on that Apple. It has been a phenomenal tool," he says.

Scott supplements the usual general information kept in the Apple about employees with data on special skills, foreign languages, and training in running rides or other park-related jobs.

"We have people visiting the park who speak only Japanese or Swahili," Scott says, leaning back in his chair and lighting a cigarette. "With an Apple, you just punch in the language and up come the people who speak it.

"We're working on a financial project. It involves every area of the park and ranks sales, labor hours, and labor costs. We threw it on the Apple and, presto, whamo, we had the information. We couldn't do that before. We had the information but it wasn't formulated to be useful," he says.

The second Apple II in personnel is tucked into a four-by-six foot cubbyhole. Scott takes a seat and then looks embarrassed. Loose papers, pencils, and odds and ends festoon the tiny place. An ashtray, half-filled, identifies this Apple as the one where Scott does most of his work. He hastily sweeps aside the litter.

Less Paperwork

Scott is at the Apple to demonstrate how he and others schedule fluctuating shifts for the 240 workplaces in the park, which he describes as a monumental task. He punches up the program and gives an example. According to Scott, many of the restaurant managers are college students who may have little or no experience beyond the general knowledge that more people are needed at dinner and lunch than at other times.

"So we wrote out a program to help them out," Scott says.

A manager keys in the number of people he or she thinks will be needed at various times, say, five at dinners and lunches and two in other periods. It's broken into 15-minute segments. The program allows for lunches and breaks and the 15-minute walk to get to some of the restaurants. In the final schedule, when five people are needed, five people are there—not at lunch, not on a break, not getting there—but at their jobs, according to Scott.

The program also aims for long shifts. It takes about ten minutes from the time a manager walks into the cubbyhole, sits down, gets comfortable, calls up the program, punches in what he or she needs, says good morning to passersby, and checks the final results to when the manager leaves the cubbyhole with a schedule for each employee.

"The problem before the Apple was the paperwork. It was a disincentive," Scott says. It was easier for managers not to keep fiddling with the shifts trying to optimize efficiency, while wearing holes in the schedule with their erasers. "This program and the Apple maximize a person's shift and minimize the number of people needed. If some kid for some reason has to work 10:00 a.m. to 4:00 p.m. on Fridays, we can put that in and the computer works around it. It's an interesting, unique program that we have here. I don't know anyone else who does this."

Beyond Scheduling

The Apples in personnel also print employee identification cards, track equal opportunity employment data for government reports, do some word processing, and run financial modeling for special events to help determine profitability.

Scott says the Apple is particularly good for details. For example, if the drink stand near the dolphin show temporarily loses one employee to the flu, that's half the workforce at that station. The computer flags it. "The small ones are where the worries are. It's critical to keep tabs on those. Keeping track of openings could be monumental if it weren't on a computer."

Someone pokes his head around the corner of the cubbyhole, sees that the Apple is in use, then disappears. Scott grins and explains that while all departments have access to mainframe computers, not all have the small Apples. He finds people regularly wandering in to use his, especially finance people, who have taken to running weekly capital expenditures on the Apple in the cubbyhole.

Scott gets up, checks his cigarette supply, and strides through the waiting area and down a side hall to the marketing and sales department, where another Apple is in use. He points to a dark-haired young woman, who keeps track of the "tens of thousands" of clients contacted yearly by Marriott's account executives, who sell various group ticket

The Santa Clara Park led all Marriott divisions in the use of microcomputers.

People tend at first to stare strangely at the newly-installed computers.

plans to corporations and other organizations.

Before Apple, when a group ticket plan was sold to, say, Intel, she logged in manually, in three different places, the name of the group, when they would visit, the name of the salesperson, and which group ticket plan was sold.

"Now, she types it into the computer once, and when we want to know something we just punch it up," Scott says.

The group sales data are used in projecting attendance at the park. "The individual days are fairly predictable based on past stuff, but if Intel has 5,000 coming over, then you have to staff up." The Apple in marketing and sales was introduced last year. The company is still experimenting with it.

Fears Evaporate

Scott is the in-house programmer, and he says that once an Apple is installed, he doesn't have the time to do all the things people want done when they realize the computer's potential.

"It's getting better though. We have to bring people up to speed on how to use them. You have to hold their hands at first," he says.

People tend at first to stare strangely at the newly-installed computers.

"Now, people are running their own stuff. Their curiosity is so great, they overcome any uncertainty quickly. Once they're exposed to it, they want to do twenty things with the information, they want me to develop the report for them, and they want me to do it tomorrow."

Scott takes people through the programming and reporting step-by-step so they learn to do it themselves. Most are proficient, or nearly so, now.

Cash Flow

He leaves the small marketing, personnel and costume-changing building to head toward the cashier's office inside the park. It is another office that uses Apples. On the way, he stops briefly to point out Foghorn Leghorn, looks satisfied, and ducks out a gate marked "Employees Only." He rounds a corner and enters a small, one-story building. It's the cash control center.

Scott explains that attendants pick up their cash at the center in the morning and return with it at the end of the day. Runners are sent to pick up cash at the work areas as the day passes. Behind heavy mesh screens, across an open office area, is the room where the incoming and outgoing cash is tracked. Employees use two Apples to reconcile the cash at the end of the day, a major undertaking, according to Scott, who, without giving a figure, says that "a whole lot" of money goes through the system.

"Without a computer, you're talking about reams and *reams* of adding machine tape," he says.

Ride Control

The front doors of the cash control center face the end of a lane that cuts through the park but is not open to the public. It allows Marriott employees to get to work without getting stuck in park crowds. Shifts of workers come and go throughout Marriott's eleven- and thirteen-hour days as 10,000 to 30,000 customers roam the premises. Donald Duck walks into the company cafeteria, looking for lunch. A furry, doglike creature climbs the steps to the back door of an auditorium, where shows are performed every few hours. A saxophonist with his bowler hat pushed back on his head works on a riff under a shade tree.

The rides and admissions office is at the far end of the lane near a ride that sends customers into upside-down loops. As the open cars hurtle down the ramp, joyful terror is plastered on grinning faces and eyebrows seem determined to find new resting places. The twenty or so people who flash by scream, but it looks like fun.

The rides and admissions people, who are responsible for that and other rides, project and track attendance. They use data from previous years as well as the number and size of groups scheduled for the park that day.

Scott climbs the stairs to rides manager Kent Mitchell's second-story office. Mitchell stands at his desk, and an Apple sits on a small table in the corner.

"I use the Apple for budgets, attendance projections, attendance summaries and ride analysis—that's a ride's potential capacity measured against what it is actually doing," Mitchell says. He also does six reports daily on the Apple and has nearly completed a computer program for guest comments.

For example, the park opens at 10 a.m. At 11 a.m., the park attendance projection is reforecast and staffing adjusted if needed. Scott says it would take much longer if the admissions people didn't have the Apple.

The department must also keep track of its personnel. When the Log Run operator calls in sick the rides people have to know immediately who has been cross-trained in that ride. The Apple tracks who has passed the written and practical tests for the rides under their jurisdiction, and the computer can produce the list almost immediately.

Sharing Information

Rides and admissions, sales and marketing, cash control, and personnel overlap to some extent. In addition to shared sales data, basic information on employees is available to rides from personnel, and the rides people work with cash control on the cash overages and shortages at the gates.

It is a complicated, fluctuating system, in which scheduling must be flexible and managers fast on their feet.

Marriott's second park, about an hour's drive from Chicago, has followed Santa Clara's lead in the use of Apple computers. According to Scott, the Santa Clara park led all Marriott divisions in the use of microcomputers. The two parks keep each other up to date and compare results by transferring information via the Apples—a method Scott describes as timely and cost-effective.

Goodnight, Foghorn

Scott is on his way back to the personnel office, but detours to the video game arcade. The games interest him, and he is developing a program on the Apple to keep daily records of each of the arcade's several hundred machines.

He pauses to look at a game, then heads toward another employee gate. The personnel waiting room is empty of teenagers as Scott enters the building. The Apple computers sit unattended. For most people the work day is ending.

But at Marriott's Great America theme park, it is early. Rides will be ridden, games will be played, shows will be seen and food will be eaten until late into the night.

Some shifts are just beginning. A large rabbit walks down a lane between the buildings toward the park.

And somewhere, in a small saloon in Marriott's Great America, Foghorn Leghorn is still singing his songs. ✚

TECHNO MERRIL

Brokerage house Merrill Lynch is conducting business with Apple computers and a stockbroker-specific applications package, but this is just the beginning of a brave, new office world.

Ritch Gaiti is bullish on computers. And, when Ritch Gaiti talks, people listen; he is the vice president of Advanced Office Systems for Merrill, Lynch, Pierce, Fenner and Smith, the giant Wall Street brokerage and investment house.

Gaiti oversees the automation for all of Merrill Lynch's retail office systems, including on-line system development, neighborhood processing, office automation, and office technological development. The Apple Computer is an integral part of the system he is developing. Gaiti, and others like him, are taking the initial steps that may revolutionize the running of large office systems.

Broker's Edge allows the users to collect and sort the data according to numerous categories.

"Around 1980," he recalls, "account executives started fooling around with personal computers and trying to figure out how to make money with them. Before then, the additional hardware and software just weren't available.

"We're a prime market—we're affluent; we have the need and the entrepeneurs," says Gaiti. At the outset Merrill Lynch surveyed its account executives and found that very few of them actually had personal computers. Most of them were what Gaiti refers to as technicians—people deeply involved in account analysis. Seeing the potential to create a powerful new tool for its account executives, Merrill Lynch hired a team of experts and told them to develop a system that would support the needs of its account executives.

"At that time," Gaiti says, "there were 40 to 50 personal computers (in our offices) in the country. Most were Radio Shacks. But this changed quickly; Apple took over primarily because of its business appeal and the wide range of software it offered."

Specific Software

Software was specifically developed and licensed by Merrill Lynch for its account executives and was further supported by a newsletter and telephone hotline. Today, the system, *The Broker's Edge*, has been licensed to about 400 account executives.

The Broker's Edge is an excellent example of program development aimed at solving specific job-oriented problems, while remaining flexible enough to adapt to individual requirements and needs.

Essentially the problem was to create a package for the account executives, which would allow them to know where their customers were, to sort through the names for appropriate matches, and to assist in contacting customers quickly. Perhaps it was a stockbroker who came up with the saying "Time is money." It well expresses the stockbroker's ability to sink or swim in today's investment world.

The key to *The Broker's Edge* is that it allows each account executive to modify the package. Says Gaiti, "We told our account executives that if the information given doesn't suit your needs, here's a simple way to modify it."

In addition to storing and maintaining customer information, *The Broker's Edge* also allows the users to collect and sort the data according to numerous categories. It also will create contact and mailing lists and can even mail the envelopes for the account executive.

Gaiti further explains the application: "Say the firm has a new offering in municipal bonds, which an account executive knows would appeal to doctors in a particular tax bracket. The software would provide a list of those people who fall into this category. The account executive can send them a note, which the computer will automatically generate. It can also generate a contact list or flash the information right on the screen for the account executive's immediate use.

"It gives him a way to target, to zero in on clients. It enables him to look at clients he might have missed."

Learning Requires Perseverance

Gaiti says the reaction to the system has been extremely positive. "There's such an obvious need—the account executives love it, especially because it's customized for their needs."

However, he cautions account executives who expect to reap immediate benefits from their Apples. "My key goal is to make them successful users. First,

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The computer can generate a contact list or flash the information right on the screen for the account executive's immediate use.

they have to make a commitment. Then, they have to lower their expectations. Some of them expect to turn on the machine and have dollars come out the other end. This doesn't happen. New users must commit themselves to spending lots of weekends and nights learning the computer.

"They're getting a powerful tool that requires a considerable investment in time and learning. The real investment begins after the user takes the computer out of the box." As if to prove his point, Gaiti adds, "I have an Apple at home, and I still have a lot of learning to do—it takes a lot of perseverance."

Gaiti is well aware of the problems of the layman first confronting the complexities of the computer. He credits Apple with being very clever: "It wrote its manuals in a talky, down-to-earth style. This was the key to its success."

The use of the Apple in Merrill Lynch offices throughout the country only approaches the horizon of the brave new office world that Gaiti envisions. "In the current environment, the personal computer is a stopgap," he says. "In the long run, we have to integrate it. If we're smart, we leverage it and integrate it and plug it into our network. There will be a personal computer, or some source of computer power, at every account executive's desk. Personal computers are the way everyone will go."

The system in which he hopes to integrate the personal computer is already underway at Merrill Lynch. In its final stage, Gaiti envisions the total integration of all office functions: Word processing, communications with clients through the on-line system, which, alone, is a 14,000-terminal network on the mainframe, linked to over 400 branches throughout the world.

"I'm working toward the ultimate integration of all automation, because it makes sense economically," Gaiti says. "If we don't do this, what would result would be disparate, divergent, unintegrated systems."

Already, Merrill Lynch has taken the initial steps under Gaiti's guidance by standardizing the office environment to create a common, uniform base.

In the future the personal computer will become the management work station, no longer merely the collector and sorter of data. At such a time, experimentation will take place with what Gaiti calls "customer PC interaction."

Says Gaiti, "Right now technology is way ahead of our ability to make full use of it. Anything can be done. Just think about it, and write out the check." The result, Gaiti believes, is much more profound than merely saving time and effort by using Apple computers and other tools of the new technology. Office automation has brought about a fundamental change in how we approach business and the way it is conducted.

"From a management point of view," he says, "we've been in automation forever; we had to be just to survive. But did I ever think office automation would get where it is now? No, I never envisioned it.

"The rate of change is obviously increasing dramatically; we're conditioning ourselves to this pace and building a much more dynamic operation."

The dynamism Gaiti speaks of is not unique to the corporate world. With a smile, he tells of his own change in attitude toward the field he has worked in for 17 years.

"I've always enjoyed this field," he says, "but 6 or 7 years ago I was considering leaving it because I was bored and felt I had nothing left to do.

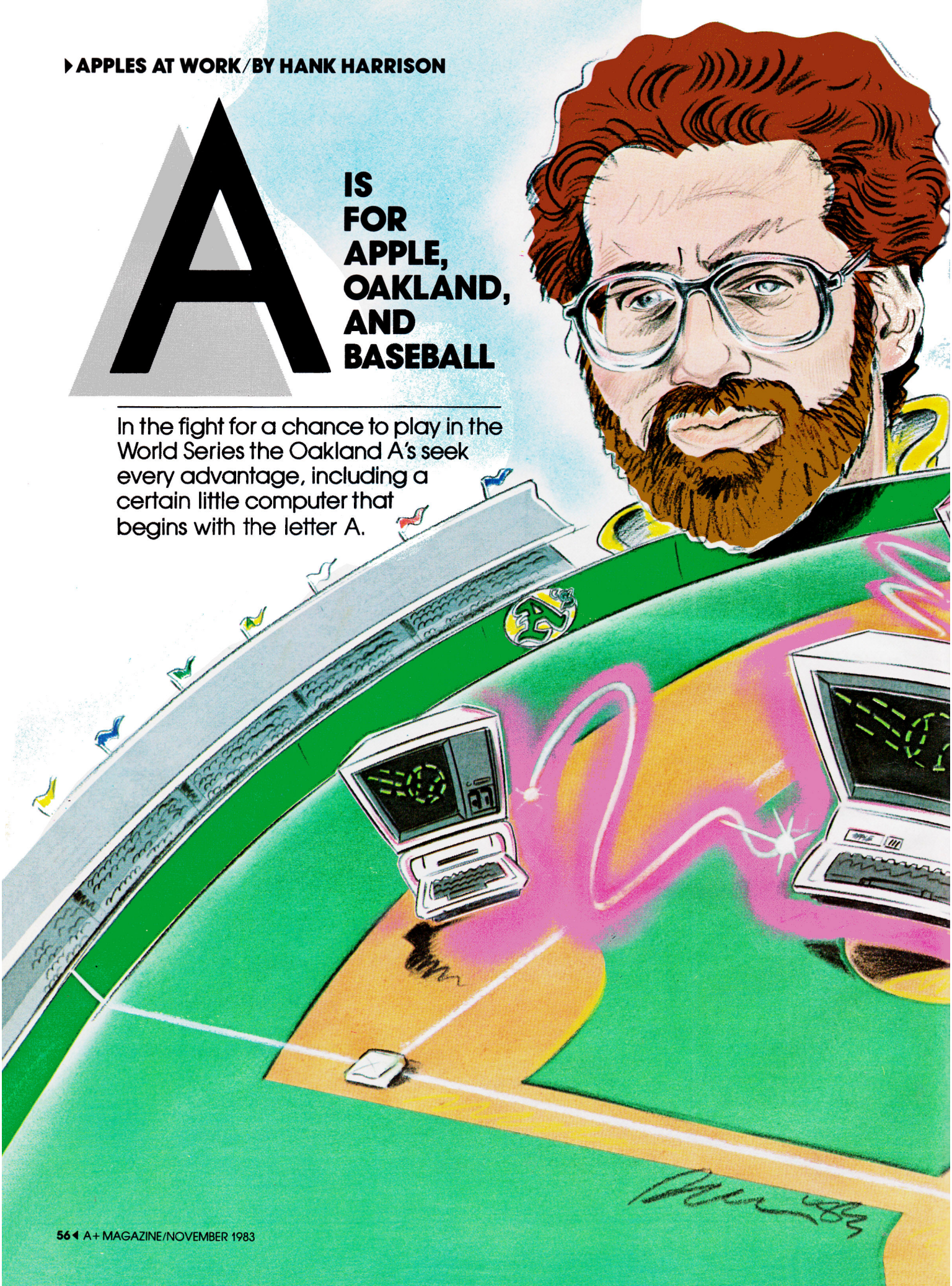
Apple wrote its manuals in a talky, down-to-earth style. This was the key to its success.

"And now, a mere 7 years later—this is a genesis. I've never been as busy, as thrilled, as motivated as I am right now. To me it's the rebirth of a whole industry."

And that feeling of rebirth explains why Ritch Gaiti, the man who buys Merrill Lynch's computers, is bullish on the future. ✚

A IS FOR APPLE, OAKLAND, AND BASEBALL

In the fight for a chance to play in the World Series the Oakland A's seek every advantage, including a certain little computer that begins with the letter A.



Wally Haas and his brother-in-law Roy Eisenhardt own the Oakland Athletics baseball team. To the cheers of thousands of Oakland fans and dozens of players, they took over from Charlie Finley in November, 1980.

The new owners are from the Bay Area, and though they said little about their plans, everyone sensed that a bright and progressive local management would replace Finley's absentee style.

The new owners have not just ushered in a new era in Oakland, they are part of a growing trend in baseball. They have had the temerity to introduce technology into this tradition-bound game. There is an Apple in Oakland's future.

Oakland isn't the only team with a computer and, to some extent, the Apple's presence is the result of a series of coincidences. Two years ago Haas and Eisenhardt hired a computer literate manager looking for a machine to give him an edge. A local software house had just designed a major league database management system, which they offered to the A's, who had hired a computer and baseball enthusiast to set up a system. Finally, Apple Computer's corporate headquarters is nearby, in Cupertino. Now, every player and interested party in the A's organization has data windows at his finger tips, before, during, and after any game.

Many other ball clubs are following suit. What is now a trend may become an avalanche over the next two years as computers such as the Lisa, which can be operated without typing skills, and the portable and rugged Mackintosh are phased in. Haas says the A's will never use a computer in the bull pen, but some teams seem to be moving in that direction.

The Computer Wave

Only a few teams now use an on-line Apple to help make important decisions, including the A's, the White Sox and the



Yankees, but many teams use some kind of computer to aid in secondary decision-making or are evaluating the addition of a system at this time.

Steve Boros, the A's manager, makes final decisions himself, but has the Apple II+ and its sophisticated software available to him.

Boros says the Apple is particularly valuable for scouting new players. The system gives him data instantly that would take years to accumulate by hand.

He hasn't been in the league long enough to know all of the players' statistics by memory, but with an Apple he can get figures on any player's performance over the past two seasons.

Tony LaRussa, who manages the White Sox, uses the same system, with impressive results. The White Sox were at the top of the American League West through most of the 1983 season.

LaRussa says he can set up a game before it is played and can get a clear picture of prior performance and a pitcher's likely choice of throws by placing any theoretical pitcher up against any theoretical batter.

One major league baseball manager occasionally uses a home computer on his own time. The club doesn't know he uses it, but he has had great success in pin-pointing opponents' fielding weaknesses by putting the tip of a light pen

PLAYERS WERE LOATHE TO ADMIT THE "DREADFUL BOX" EVEN EXISTED.

mounted in an Apple IIe with a Z-80 card at two points on the screen for each hit in each inning.

By the third inning a pattern starts to form and, by pressing a button, he can replay the entire game in fast motion. He takes the information from a simple paper score card.

This manager, who prefers not to be identified, gives some background on his system: Chewing an immense cud of tobacco, he says, "Yeah, my son wrote the menus and graphics in *GraForth* and we hooked it to a Pascal database. It's in the experimental stages now. This baby never travels with me." His face broke into a grin. "It's my secret weapon."



The Nature of Statistics

Baseball may be the most statistical of modern games. Many fans are drawn to the sport, not for love of the game, but out of lust for numbers.

For many fans the day does not start properly without a complete analysis of the box scores of yesterday's games. Some diehards resent the competition between computers and their own photographic memories, but computers will never replace gray matter. They simply provide a way to expand statistical speculation.

Baseball isn't the only spectator sport using computers. To understand just how dynamic these off-field applications can be in almost any sport, it is important to distinguish between "fan statistics" and "game-time-decision statistics."

Fan statistics are numerical tallies that are entertaining. They tell newscasters and fans how a batter, runner, quarterback, forward, or team is doing relative to a career or compared with other teams and past performances.

Game-time-decision statistics provide details useful to managers and players, such as players' health and recent workout reports.

A detailed and precise player status analysis could reveal a weak spot in a defense, and any team with current data could be coached to exploit weaknesses.

The A's Apple

The Oakland Athletics Apple II+ system is operated by a baseball wizard called Jay Alvez. Alvez works directly with Boros and will also consult with any player who desires access to his data banks. On request, Alvez can hook up to the mainframe in Philadelphia and get almost any current performance printout.

Originally from Half Moon Bay, California, Alvez was an early baseball fanatic. At the age of five, in the days before the A's came to Oakland, he astonished his parents by memorizing the names, numbers, and daily statistics of the San Francisco Giants. After high school, Alvez went to Arizona to play baseball and attend college, in that order. He got a degree in radio and television media and studied computer sciences. He hoped to be a professional ballplayer, but instead discovered his talent for computers and became a systems designer. His heart belonged to baseball.

Alvez joined the A's in 1981 after working for a few years in the Bay Area news media. His first goal was to set up a computer database that would provide

instant box scores for various news people, but quickly expanded the idea to encompass team statistics. Alvez says his new system can create an entire box score, with several added statistics, ready for release to the newspapers six minutes after a game ends.

The A's use an Apple II+ system that is directly tied to a Digital mainframe on the east coast by way of a Hayes Smart Modem running at 1200 baud. It runs a software package called *EDGE 1.000,* which was developed by Pacific Select Corporation of San Francisco.

The computer itself is not unusual. The Apple II+ runs an 80-column board and operates on normal Apple DOS, but it does have an odd triple disk drive arrangement.

The three disk drives are cleverly set up. Drive A is the boot and program disk, which holds all program material. The disks are write-protected.

Drive B holds material on the A's pulled from the mainframe and is updated after each game. Alvez says this comes in handy during a doubleheader, when it is difficult to update material from the last game on such short notice.

Drive C holds updated material on the opposing team. This material can be inaccurate, since new updates are always harder to get on the opposition than on your own squad.

All requests from players and managers are printed as hard copy before the game, but during the game, the system is occupied with tracking the real-time events.

Alvez says players at first were loathe to admit the "dreadful box" even existed. "But lately many players have seen the light and have been requesting reports of all kinds. I think they're coming around," he says.

In its current state, the system can tell a player when he is performing above or below par at bat and in the field and can give a complete graphics printout of every hit or pitch in the last game or any number of past games. A pitcher can see where he went wrong. A coach can see holes or overlaps in a defense and can make adjustments accordingly.

These reports are valuable for training batters and trouble shooting, but they can also boost player morale because they reduce anxiety. The computer can identify one real problem out of a thousand worrisome possibilities.

With the Apple and the *Edge 1.000* software, Steve Boros and other managers around the leagues can keep track of hundreds of cross references. Batter-pitcher correlations are a snap to do, and it's easy to find a hitter's zone of effectiveness, or a base runner's base-stealing effectiveness against a particular catcher, or an outfielder's position effectiveness against a particular batter.

THE APPLE IS PARTICULARLY VALUABLE FOR SCOUTING NEW PLAYERS.

The Computer Ball Paradox

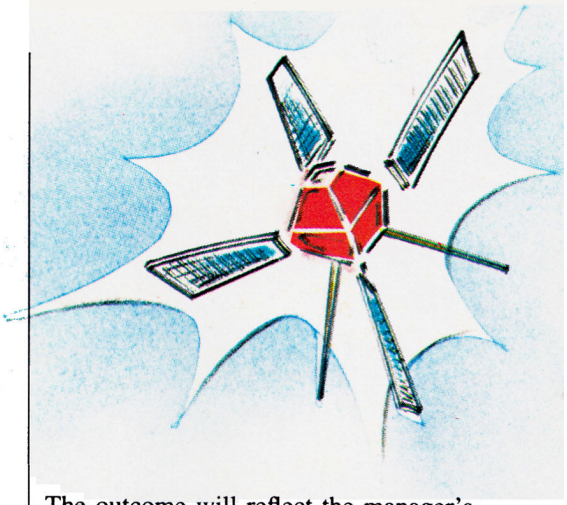
Oakland A's fans, who suffered first with Finley, then with "Billyball," stay loyal, though some worry that their game will soon turn into "computerball." The idea of computerball is as ridiculous as Billyball turned out to be, but the fear of computers as applied to baseball presents a problem. Will the fear and loathing of computers, especially of the innocent Apple, eventually divide the fans into two camps? Will seats in the stadium be reserved in two sections, one for computer lovers and one for computer aliens?

People who fear computers distort their importance and portray them as evil giants designed to take the fun out of a game, but anyone with any practical experience realizes that computers are rarely more than electronic file cabinets or housekeeping tools.

The *EDGE 1.000* program is an excellent example. It is a database that houses some sophisticated graphics routines, but it isn't magic. The A's and the White Sox use virtually identical programs, yet the A's have trailed the White Sox most of the season.

If the software and the computers that use it were as important as people fear, the two clubs would always be tied for first place. But they are not.

When two teams use an identical system, the overall outcome will rely on the human reactions to computer suggestions. Two managers may make two different decisions based on the same data.



The outcome will reflect the manager's baseball philosophy and depend on the player's raw talent, not on the computer. The computer can make suggestions, but it can't turn Jerry Lewis into Willie Mays.

Billy Martin, currently the manager of the New York Yankees, may be able to keep those statistics in his head, as he claims, but most of us can't. The computer helps managers and players not quite as gifted as Martin who may want to keep information organized or document a day's batting practice.

The Future

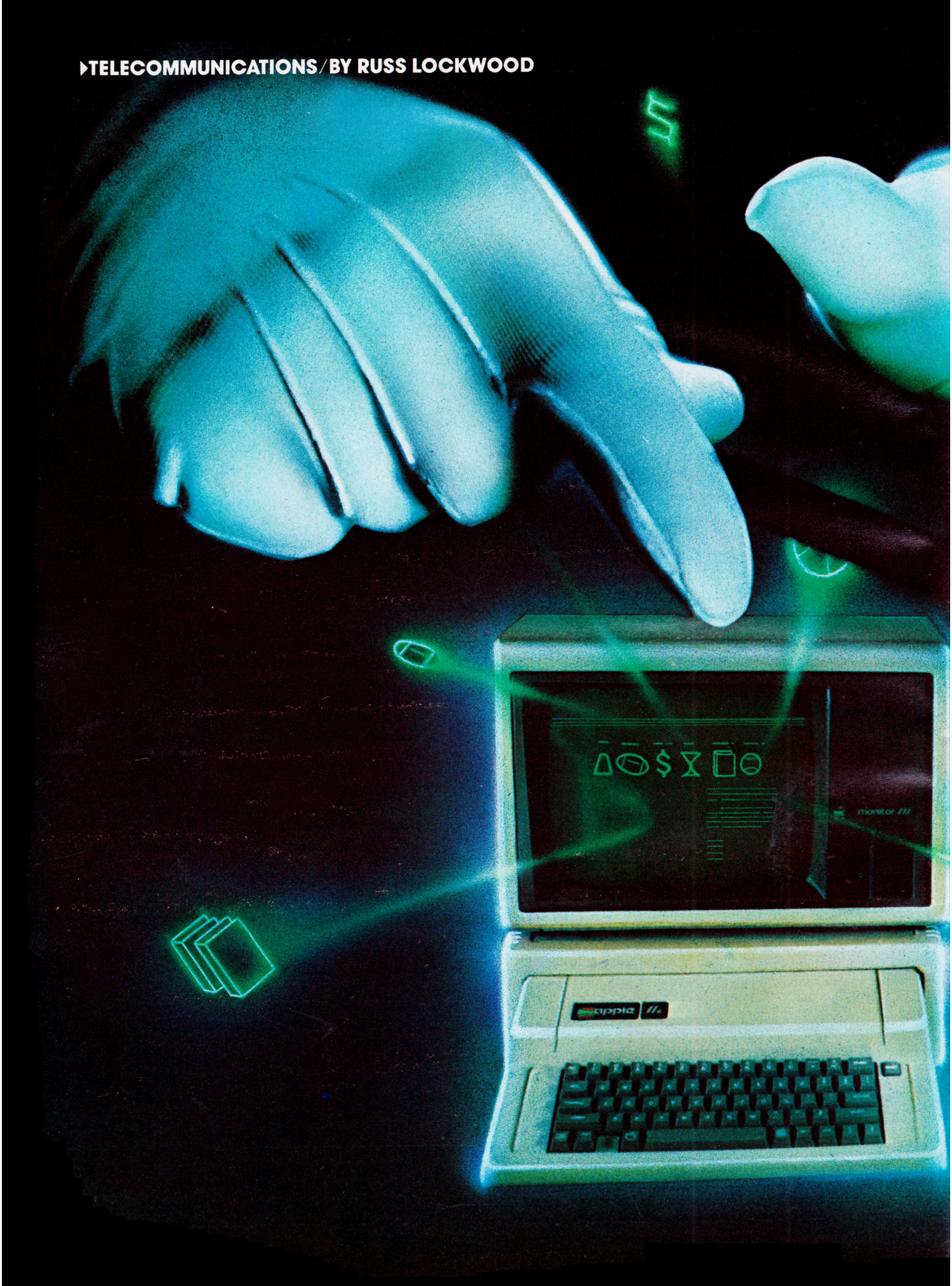
The computer is only one form of technology currently invading sports. Lasers are used to clock the speed of pitches and runners in the Olympics and they can also determine the exact point where a ball went foul. Sports medicine, which depends on sophisticated electronic equipment, is rapidly expanding our understanding of the body. Baseball does not need space-age technology to survive, but, like most traditional institutions, it can adapt. Perhaps an Apple a day will keep injuries away.

Sports software and hardware grows increasingly complicated and sensitive. Within two years it will be possible to plug any player into a sensory network using radio telemetry to monitor heart rate and measure any number of other physical exertions. A team manager on the road might have data on his players feeding into his wristwatch from a satellite, which would be in communication with the Apple and the mainframe back home.

Though some of these ideas are pure science fiction, high technology is invading baseball, and it's probably for the good of the sport. The computer has had a positive influence in other areas of modern life, so why not in baseball? The sport should not be immune to growth and change.

Technophobes have nothing to fear. The post-game bar bet will never die. ✚

▸TELECOMMUNICATIONS/BY RUSS LOCKWOOD





MODEM MAGIC CONJURES UP INFORMATION

The telecommunication powers of your Apple can cast a spell on these on-line information services that unearth vast worlds of facts, fun, and conversation.

Reaching out and touching an information service with my Apple computer shouldn't appear all that mystical. I hook up the modem, punch a few keys, and I'm on-line. I'm positive the whole process is grounded in scientific fact. But I'm also sure that once you start exploring the array of computer services that timesharing networks offer, the wealth of information, convenience, and enjoyment will continue to amaze you long after you hang up.

Four services—CompuServe, The Source, Knowledge Index, and Bibliographic Retrieval Services (BRS) After Dark—cater mainly to personal computer owners and charge fairly low prices during evening and weekend hours. A fifth service, Dow Jones News/Retrieval, is directed primarily toward businesses, so its rates are higher, but still reasonable. Others serve only business customers and charge accordingly—often more than $100 per hour.

These five companies offer a variety of services for the subscriber. Home budgeting, games, stock quotes, encyclopedias, news reports, electronic mail, and even shopping at home are all available through the magic of the modem.

Although all services may be ordered directly from the individual companies, you can sign up for CompuServe and The Source over-the-counter at retail computer stores. You can also buy Dow Jones' software programs, which include access to its News Retrieval service, at selected computer stores.

Since checks seem to be an almost unheard-of exchange medium in the information business, I suggest you ready your credit card. The Source reviews your application to determine the risk of billing. BRS After Dark requires you to establish a one-time, $250 noninterest-bearing account before it will start billing you. Knowledge Index offers only credit-card billing and CompuServe charges a fee for direct billing. Only the Dow Jones service bills directly without a fee. In fact, it doesn't even accept credit-card payments.

Each service charges a registration and start-up fee, then supplies you with an ID number, password, user's manual, and subscription to newsletters and updates. The services' manuals are three-ring, looseleaf notebooks except for Dow Jones', which is a paperback book. The manuals provide easy, step-by-step instructions on how to access and use their service. All are well-written, packed with examples, and designed for the telecommunications neophyte.

Calling on the Services

All the services can be accessed by dialing into either of the local communications networks—Tymnet or Telenet—which in most cases save you long-distance telephone charges. CompuServe, however, operates its own network, CompuServe Network Services, and will charge extra if you access its services via Tymnet or Telenet.

The Source, CompuServe, and Dow Jones can be used 24 hours a day, but their services sometimes may be taken off-line for maintenance and updating. BRS After Dark is available any day from 6 p.m. to midnight (local time). Knowledge Index operates from 6 p.m. to 5 a.m. Monday through Thursday, 6 p.m. to midnight on Friday, 8 a.m. to midnight on Saturday, and 3 p.m. to 5 a.m. on Sunday.

To gain access (otherwise known as *logging in*) to a service, dial the local Tymnet, Telenet, or CompuServe Network phone number, wait for a high-pitched tone, and place the receiver into the modem. The network will ask you to specify a computer terminal type, which for most home computer owners will be an A for CRT terminals. You then log in by typing the name of the service you want; for example, KI for Knowledge Index. The service will ask for an ID number and password. Providing the correct information will reward you with a welcome message and the log-in time. For those who bristle at the thought of having yet another number attached to their name, the services will allow you to change the password into something a little more personal, like RUSSELL or GANDALF or ABRA*CADABRA.

Once you're on-line, a main menu appears listing general topics. Selecting a topic—for example, 1 HOME SERVICES on CompuServe—generates a new menu of subtopics. Choosing a subtopic—for instance, 7 GAMES AND ENTERTAINMENT—calls up a listing of the programs available. Choosing a program from this list—for example, 1 ADVENTURE—begins the program. A faster method of navigating around the service is to bypass the menus by typing in commands. For example, typing GO GAM-11 gets you to the Adventure game. Each service supplies an extensive list of commands. The menu-driven approach works well, but with an on-line meter ticking away, you'll save time and money by learning the commands.

Before delving into all the electronic wonders that the advertising wizards promise, check the "latest news" section—//INTRO in Dow Jones, for instance. It describes the service's new features and changes and gives other important customer information.

Dow Jones News/Retrieval

Dow Jones & Co. Inc., which also publishes *The Wall Street Journal* and *Barron's,* operates the largest of the information services, with 85,000 subscribers. As to be expected, Dow Jones concentrates on providing a solid selection of business services.

The Dow Jones News database provides business and economic news from *The Wall Street Journal, Barron's,* and the Dow Jones News Service (The Broad Tape) dating back 90 days. It lists the recent articles first and allows you to

BULLETIN BOARD SERVICES

Your computer can contact electronic bulletin boards with free information, messages and jokes.

Like information services, bulletin board services (BBS) are accessed over the phone lines with a modem. Unlike information services, they require no password, no manuals, and no fees outside the cost of a long-distance phone call. They are usually run by users groups, clubs, and individuals. Some are available 24 hours a day, but most are not. Some BBS can only connect one user at a time, so busy signals are common.

The BBS lack the mystique of the on-line information services; after all they're mainly electronic message boards. Interested computer operators dial in and either read or leave news items, taunts, or gems of wisdom. I placed a call to Ohio into the Apple BBS of the Akron Digital Group. While scanning the numerous messages, I came across the subject heading "Can beer make you smart?" I expected a dissertation on the relationship between alcohol and the right and left hemispheres of the brain. But all I got for my request was "It made Bud Weiser."

Some BBS provide more than a message service. They offer unprotected programs that can be downloaded—that is, be read from the BBS' computer and stored on your own disk. Although any computer can access a BBS, the programs they may offer are like regular software, which will only work on certain machines. Sometimes, they don't work at all. I downloaded a terrific clock and calendar program that was 2 hours slow and 1 day behind. Maybe it missed daylight savings time during a leap year.

I liked the Apple BBS of the Akron Digital Group. It can be reached by calling (216) 745-7855. This bulletin board also listed other BBS and their phone numbers.

—R.S.L.

scan the headlines before selecting stories. Searching is accomplished by entering a company's stock symbol or the industry or government code. For a much higher cost per hour, you can use free-text searching to find articles dating back to 1979.

Similarly, *The Wall Street Journal* Highlights database provides summaries of major stories appearing in the last five issues. The Weekly Economic Update database gives a review of the week's top economic news and a glimpse of the month ahead.

Dow Jones offers several financial and investment services. The Corporate Earnings Estimator, compiled by Zacks Investment Research Inc. from the research of top analysts at 50 major brokerage firms, provides earnings forecasts for 2,400 of the most widely followed companies. Disclosure II holds just about everything you ever need to know about a publicly held company, including its subsidiaries, 5-year financial summary, and other information filed with the Security and Exchange Commission. Media General Financial Services offers detailed corporate financial information on 3,200 companies and 180 industries, and the Weekly Economic Survey provides commentary and analysis of current economic trends.

Dow Jones delivers current and historical quotes on common and preferred stocks and bonds, mutual funds, and federal treasury issues and options. Daily, monthly, and quarterly Dow Jones averages for industrials, transportation, utilities, and 65 stock composites are also available.

Dow Jones also furnishes information that is less business oriented. The service offers general national and international news, sports and weather, the Academic American Encyclopedia, movie reviews dating back to the 1930s, an electronic shopping service called Comp-U-Store, and transcripts of Louis Rukeyser's PBS television show, "Wall Street Week."

CompuServe

Consider CompuServe to be a thick electronic tome designed to keep you spellbound hour after inexpensive hour. Information on all subjects (from AMEX price quotes to yachts) by all sources (from Associated Press to the National Well Water Association) appears with each computerized incantation.

CompuServe provides general, financial, and sports news from *The Washington Post, The St. Louis Post-Dispatch, The Middlesex Daily News,* and the Associated Press. The *World Book Encyclopedia* is available on-line, as are movie and restaurant reviews, airline schedules, weather information, computer hardware and software reviews, stock reports, a complete guide to wine tasting, and many more general reference sources. And if you can't pinpoint the information you're seeking, write to Aunt Nettie, CompuServe's on-line Dear Abby. She may not be able to tell you where to search, but will soothe your soul with timeless advice and wisdom.

CompuServe lists about 40 games, most of which are rather simple, but some are absolutely frenetic. *Megawars* is a souped-up *StarTrek* played in real time versus real opponents—other CompuServe subscribers. You have to be not only clever, but dexterous, too. I was hit so many times while piloting the starship Nimrod that a fellow starship captain beamed in a message: U OK? Evidently not, for shortly thereafter, the Nimrod exploded like a supernova. A more sedate challenge is *Adventure,* a game of searching through an underground labyrinth to find treasure. This problem-solving game is already a classic and can easily become addictive.

Aunt Nettie, CompuServe's on-line Dear Abby, will soothe your soul with timeless advice and wisdom.

CompuServe lists about 50 special interest groups (SIGs) that operate over the computer lines. Game addicts can consult the SIG for games to learn tactical tips. The SIG for Apple computer users, called MAUG, provides a forum for trading hardware and software information.

Communication is via CompuServe's electronic mail, which allows you to use the computer lines to send private messages to someone's ID number. Live conversations, in which you're connected directly with someone else's computer, is possible with CB Simulation. Public messages can be displayed on the National Bulletin Board, which is often treated as a swap shop.

One of the nicest customer support services is Feedback, a free, on-line message service providing you with the opportunity to make suggestions to CompuServe, pose questions, report problems and order game rulebooks, SIG manuals, and other documentation. Responses are made via electronic mail, usually within 48 hours.

The Source

The Source can also be thought of as a thick, electronic tome packed with the same general information and communication and entertainment services as CompuServe, only it costs more. You can access CompuServe on apprentice's pay, but for The Source, you need the salary of, well, a sorcerer.

The Source is likely to enchant you upon first glance. Its manual is well organized, descriptive, and attractive, and the meticulous instructions and examples make everything crystal-ball clear. The computer commands are in English, not runes, and the entire system is as user-friendly as a guardian angel.

One feature of The Source that could be helpful to job seekers is a career network called Employ, which is like a Help Wanted section in a newspaper. (As could be expected, it listed plenty of opportunities for computer programmers, but none for writers.)

The Source also offers a network called Barter, which allows users to exchange goods and services; also an electronic bulletin board called Post, which does about the same thing. The Source provides an incredibly easy-to-use electronic mail service called Mail, and a live conversation service called Chat.

The Source's game selection is similar to CompuServe's, but it does not have *Megawars.* Like CompuServe, it has *StarTrek, Adventure,* expanded *Adventure,* and *Hunt the Wumpus,* a children's version of *Adventure.* Unlike CompuServe, it has a very serious and thorough I Ching fortune-telling program.

Knowledge Index

Knowledge Index is like a wizard's convention—it concentrates the wisdom of the ages within the space of one room. This powerful research tool is the offspring of Dialog, one of the over-$100-per-hour databases.

Knowledge Index contains 18 different databases, including three on computers and electronics. Inspec, produced by the Institution of Electrical Engineers in London, contains abstracts from 2,300 journals, conference proceedings, technical reports, and books. International Software Database describes 11,000 microcomputer and minicomputer programs. Microcomputer Index provides abstracts from over 40 popular microcomputer publications.

Corporate News, produced by Standard & Poor's News, offers tabular

information on over 9,000 publicly held U.S. companies. Business Information, by Data Courier Inc., discusses all aspects of business management and administration.

General news appears in Newsearch, which summarizes 1,100 newspapers, magazines, and journals, and in Magazine Index, which abstracts 435 popular American magazines. Government News lists documents currently for sale by the U.S. Government Printing Office and also indexes federally produced research and technical reports.

Other databases cover education, psychology, engineering, medicine, pharmacology, agriculture, and books in print.

Knowledge Index is the simplest system to learn and operate. All commands are in English, even if some of the abstracts are not. For example, in the Agriculture database, the first abstract under "Geese" describes the secretory function of the pancreas in geese (feeding experiments). The text of the abstract starts like this: "Ratsional'noe kormlenie osnova povysheniia. . . ." The language? Russian.

Knowledge Index is adding three more databases for trade and industry, the legal field, and biology. These additions will increase the total number of citations contained in all the databases to about 15 million.

BRS After Dark

BRS After Dark, an evening offshoot of the daytime Bibliographic Retrieval Services, is another brew of reference databases offering abstracts of articles. Although its corporate symbol is the night owl, users should prepare to be early birds: BRS After Dark does not offer any service past the witching hour.

BRS After Dark provides many of the same services as Knowledge Index, but at half the cost per hour. The agriculture, biology, pharmacology, business management and administration, medicine, government-produced technical reports, books in print, education, and psychology databases are exactly the same.

In addition, BRS After Dark offers other interesting and innovative databases. Patdata holds information about all patents registered with the U.S. Patent Office since 1975, including a description of what the patented object actually does. Family Resources, produced by The National Council on Family Relations, abstracts articles concerning marriage and family relations. PAIS, produced by the Public Affairs Information Service, indexes articles from all areas in the social sciences.

INFORMATION SERVICES AT A GLANCE

	CompuServe	*The Source*	*Knowledge Index*	*Dow Jones*	*BRS After Dark*
Registration	$40	$100	$35	$50	
Free Hours with Regist.	5	0	2	0	0
Cost Per Hr. Weekday[a]					
300 baud	$22.50	$20.75	No	$36–$72	No
1200 baud	$35.00	$25.75	Service	$72–$144	Service
Evening[b]					
300 baud	$ 5.00	$ 7.75	$24	$ 9–$54	$ 6–$16.50
1200 baud	$17.50	$10.75	$24	$18–$128	$ 6–$16.50
Graveyard[c]					
300 baud	$ 5.00	$ 5.75	$24	$ 9–$54	No
1200 baud	$17.50	$ 8.75	$24	$18–$128	Service
Extra Costs for some Services?	Yes	Yes	No	Yes	No
Minimum Monthly Charges	None	$10	None	None	$12
Monthly Memory Storage Costs					
128K	$ 0	$15.80	No	No	No
256K	$32	$27.15	Service	Service	Service
Billing					
Credit Card	M/V	M/V/AE	M/V/AE	None	M/V
Direct	$42/yr.	None	None	Free	$250 acct.
Toll-Free Customer Hotline?	Yes	Yes	Yes	Yes	Yes

[a]Weekdays 7 a.m. to 6 p.m. (local time) Monday through Friday.
[b]Evenings 6 p.m. to midnight weekdays, and all weekends, and designated holidays.
[c]Midnight-7 a.m. daily.
M: Mastercard. V: Visa. AE: American Express.

However, BRS After Dark virtually ignores general information. It has nothing comparable to any of the other services and certainly not to Knowledge Index's extensive Newsearch. BRS After Dark tends to ignore information about computers, too. Its DISC, which contains only the table of contents of microcomputer magazines, pales next to Knowledge Index's three extensive computer-oriented databases.

Although its corporate symbol is the night owl, BRS After Dark does not offer any service past the witching hour.

BRS After Dark also suffers from a higher than average number of typos. It's not BRS' fault, but rather the fault of the individual databases. BRS serves primarily as a conduit of information and cannot exercise editorial control over the content. However, these typos leave a general impression of haste and sloppiness.

BRS After Dark plans to add communications services starting with an on-line electronic newsletter. A bulletin board, listing computer hardware and software for sale or swap, and an electronic mail system are scheduled to start operating.

Rates and Charges

So what does all this electronic necromancy cost? If you use the services judiciously, a reasonable amount. If you don't, plenty.

Dow Jones News/Retrieval costs $50 for registration and from $9 to $54 per hour, depending on which service you use. Connections to its News, *The Wall*

Street Journal Highlights, and Weekly Economic Update cost $12 per hour; free-text searching for news costs $36 per hour. Dow Jones charges $9 per hour for stock quotes and $18 per hour for general news, sports and weather, the encyclopedia, movie reviews, "Wall Street Week" transcripts, and shopping service. Its Corporate Earnings Estimator, Disclosure II, and other financial and investment services cost a whopping $54 per hour. Disclosure II also carries a $2 surcharge for each company you request. Double these rates if you use a modem at 1200-baud. During the prime daytime periods, rates run from $36 to $72 per hour.

CompuServe charges a $40 registration fee and $5 per hour; it is the least expensive of all the services. Registration includes 5 free hours on the service. Some of the financial services have a surcharge attached to them. Using a 1200-baud modem will escalate the rate to $17.50 per hour. Prime daytime usage is $22.50 per hour with a 300-baud modem, $35 per hour with a 1200-baud modem. CompuServe charges an extra $2 per nonprime hour and $10 per prime daytime hour if you log in via Tymnet or Telenet rather than its own network. CompuServe charges an excessive $42 per year for direct billing, but does not charge a monthly minimum. CompuServe gives 128K of storage space free and charges $4 per week for each additional 64K.

The Source has an exorbitant $100 registration fee and costs $7.75 per hour from 6:00 P.M. to midnight and $5.75 from midnight to 7:00 A.M. Add $3 per hour for 1200-baud service. Prime daytime usage costs $20.75 per hour for 300-baud, $25.75 per hour for 1200-baud service. The Source charges a $10-per-month minimum. Storage rates depend on size, but 128K costs $15.80 per month and 256K, $27.15 per month. Some financial services cost $14.75 per hour during evenings and $9.75 per hour from midnight to 7:00 A.M. Add $5 per hour for 1200-baud service. Prime daytime service costs $29.75 per hour for 300-baud modems and $34.75 per hour for 1200-baud modems.

Knowledge Index charges a $35 registration fee and a flat $24 per hour. Registration includes 2 free hours on the service. Knowledge Index does not charge extra for 1200-baud service and does not charge a monthly minimum.

BRS After Dark charges $50 for registration and from $6 to $16.50 per hour, depending on the database. BRS After Dark does not charge extra for 1200-baud service, but does charge a $12-per-month minimum.

Reflections on Electronic Magic

Even after learning their price, I still say these services contain powerful magic. Merlin himself could not call up the collective wisdom of millions of pieces of information within a few seconds, or allow thousands to communicate coast to coast. A modem and a password turn your computer into a powerful research tool, communications hub, and entertainment gizmo.

But unless a budding alchemist has discovered the secret of turning lead into gold, these services could empty your wallet while enriching your mind. Choosing which service to use depends on your purpose.

Businesspeople and investors can do no wrong by signing up for Dow Jones News/Retrieval. They'd find that not only does it provide timely business and financial news—the high price per hour is essentially tax deductible.

CompuServe and The Source are like newspapers and telephones. Many of their features can be found on the front page, sports page, puzzle page, and in the yellow pages. They also give you access to a town library—not very large or extensive, but adequate through high school. Chatting over the computer lines is interesting, but I think Ma Bell or MCI is livelier and cheaper.

In a contest between CompuServe and The Source, I'd recommend CompuServe. The Source charges more for the same services and has a monthly minimum billing. I personally feel that a monthly minimum somehow indicates a company's lack of confidence that the customer will be satisfied enough to continue using the service.

If CompuServe and The Source are town libraries, then BRS After Dark is a county library and Knowledge Index a university library. BRS After Dark and Knowledge Index do not offer communications or games yet, but they do have a wealth of information. Although they have some services in common, BRS After Dark seems to emphasize the sciences and education, while Knowledge Index concentrates on computers, business, and general information. The key to using these two reference services is to plan ahead. You can save time and money by narrowing your search before logging in. Remember, these reference services only provide summaries of articles and publications. Their value is in identifying sources, not in providing full texts. Although you still must do the legwork at the library, the services at least provide an excellent jumping-off point for research.

In a contest between BRS After Dark and Knowledge Index, I'd give the edge to Knowledge Index. Even though it costs about twice as much per hour, it offers the types of information home computer operators can use most. BRS After Dark could do much better by offering a more diversified selection of databases—and by dropping its monthly minimum.

I'm not Nostradamus, but let me offer some predictions. Hooking up to an information service will someday be as common as hooking up to Ma Bell. The best students will be the best information managers. New competitors and a larger base of customers will drive the price per hour down. Are these flights of fantasy? I think not. All things are possible through the magic of the modem. ✚

Editor's note: New on-line services are coming out every day. Upcoming issues of A+ will include information on these services.

SERVICE INFORMATION

The following information services are mentioned in this article. Please contact them for further deails.

Bibliographic Retrieval Services
1200 Route 7
Latham, NY 12110
(800) 833-4707

CompuServe Inc.
Subsidiary of H&R Block Co.
5000 Arlington Centre Blvd.
Columbus, OH 43220
(800) 848-8990

Dow Jones News/Retrieval Service
Subsidiary of Dow Jones & Co., Inc.
P.O. Box 300
Princeton, NJ 08540
(800) 257-5114

Knowledge Index
Service of Dialog Information Services Inc.
Subsidiary of Lockheed Aircraft Corp.
3460 Hillview Ave.
Palo Alto, CA 94304
(800) 227-5510

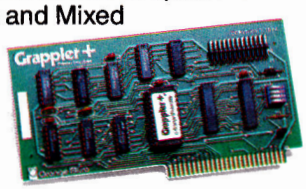
Source Telecomputing Corp.
Subsidiary of The Reader's Digest Association, Inc.
1616 Anderson Rd.
McLean, VA 22102
(800) 336-3366

Satisfying Over With Innovation



Grappler™ + Printer Interface

The Original Apple® graphics printer interface. Since its introduction three years ago, the Grappler has been imitated by many, but never matched. Now with Dual Hi-Res Graphics for side by side reproductions and Mixed Mode screen dumping, the Grappler + remains the most intelligent interface available. Over two dozen commands give Apple users full control over any graphics or text on the Apple screen, including a new 80 column text dump. Performance, reliability and support have made the Grappler + the #1 selling intelligent Apple interface.



Bufferboard™

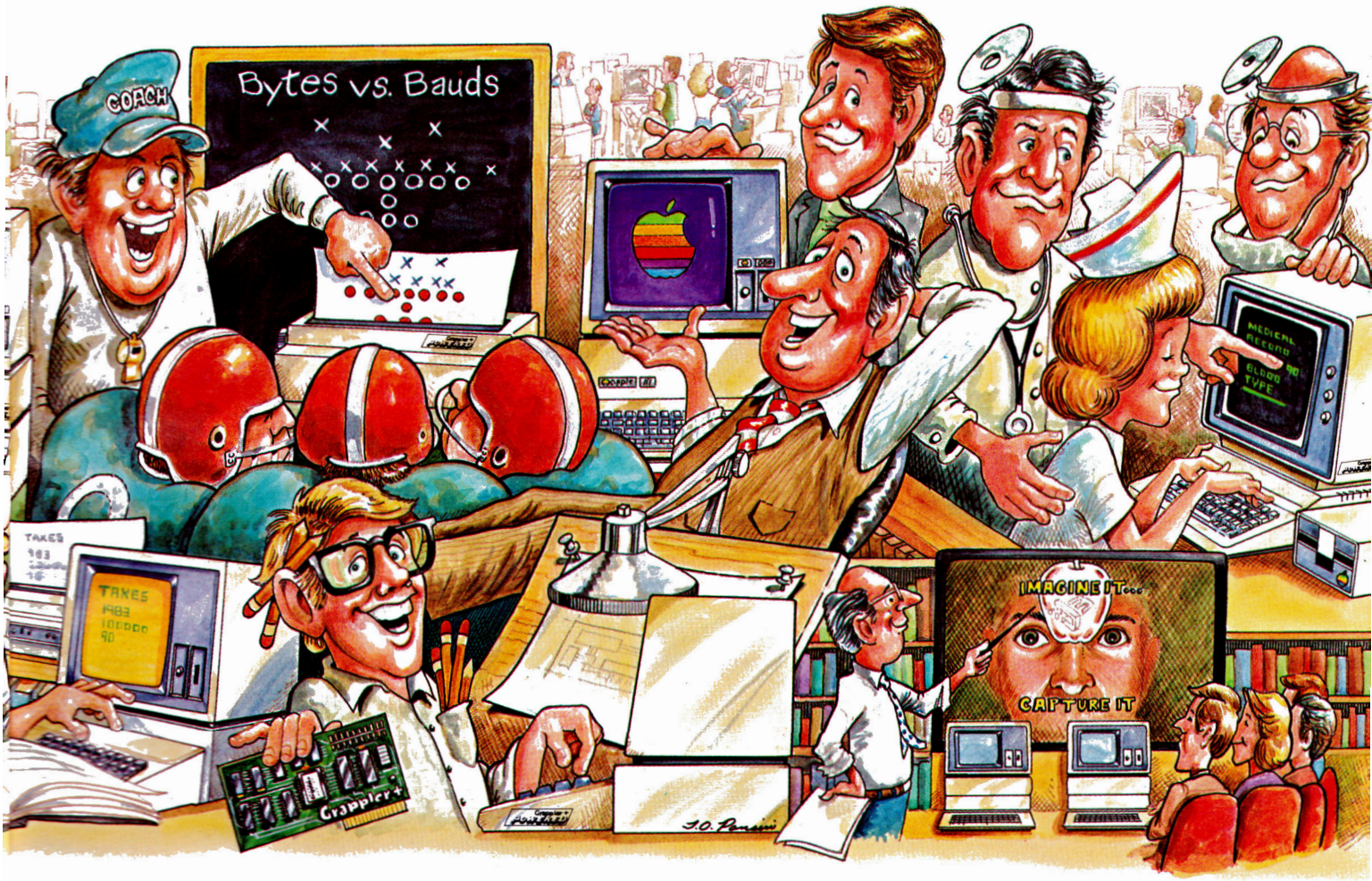
For Apples and Printers

The economical way to add printer buffering. The Bufferboard easily adds memory to your current Apple interface system, freeing your computer for additional input. Easily upgradable from 16K, the Bufferboard can store up to 20 pages of text. It fits neatly inside your Apple, "docking" onto your existing printer interface.* No clumsy boxes or cables, no external power supplies…just convenience and economy. With the Bufferboard, you might never wait for your printer again.



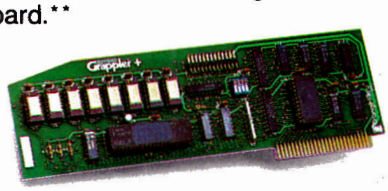
*Versions for standard Grappler + , Epson APL and Apple Parallel Interfaces.

90,000 Apple® Owners And Excellence.



BUFFERED Grappler + ™

The most sophisticated buffered Apple printer interface available. The New Buffered Grappler + combines the industry leading features of the Grappler + with the time saving economies of the Bufferboard.**



With this much interface power, you'll never need anything else. And the price will surprise you, too.

**Not available for IDS printers.
Apple is a registered trademark of Apple Computers, Inc.

Over 90,000 Apple computers are using Orange Micro products. Innovation and excellence have made us the #1 manufacturer of intelligent printer interfaces. The top selling Grappler + has become an industry standard, recommended by more software houses and Apple dealers. To meet the users' latest needs, Orange Micro will continue to introduce new products. Recent innovations include the Grappler + for IDS color printers and the new Orange Interface, with text screen dumps and formatting at a low price. There is an Orange Micro product designed for your application.
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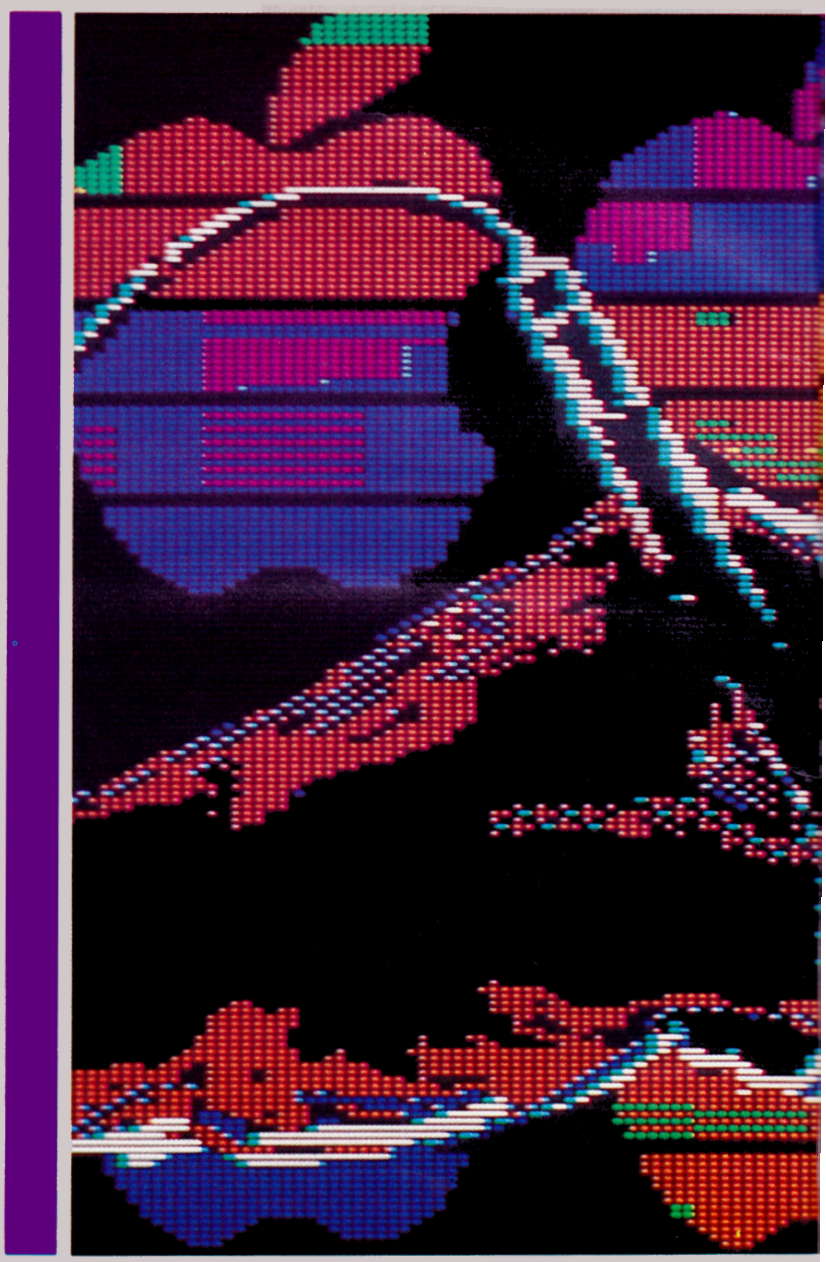
CIRCLE 130 ON READER SERVICE CARD

ELEMENTARY GRAPHICS

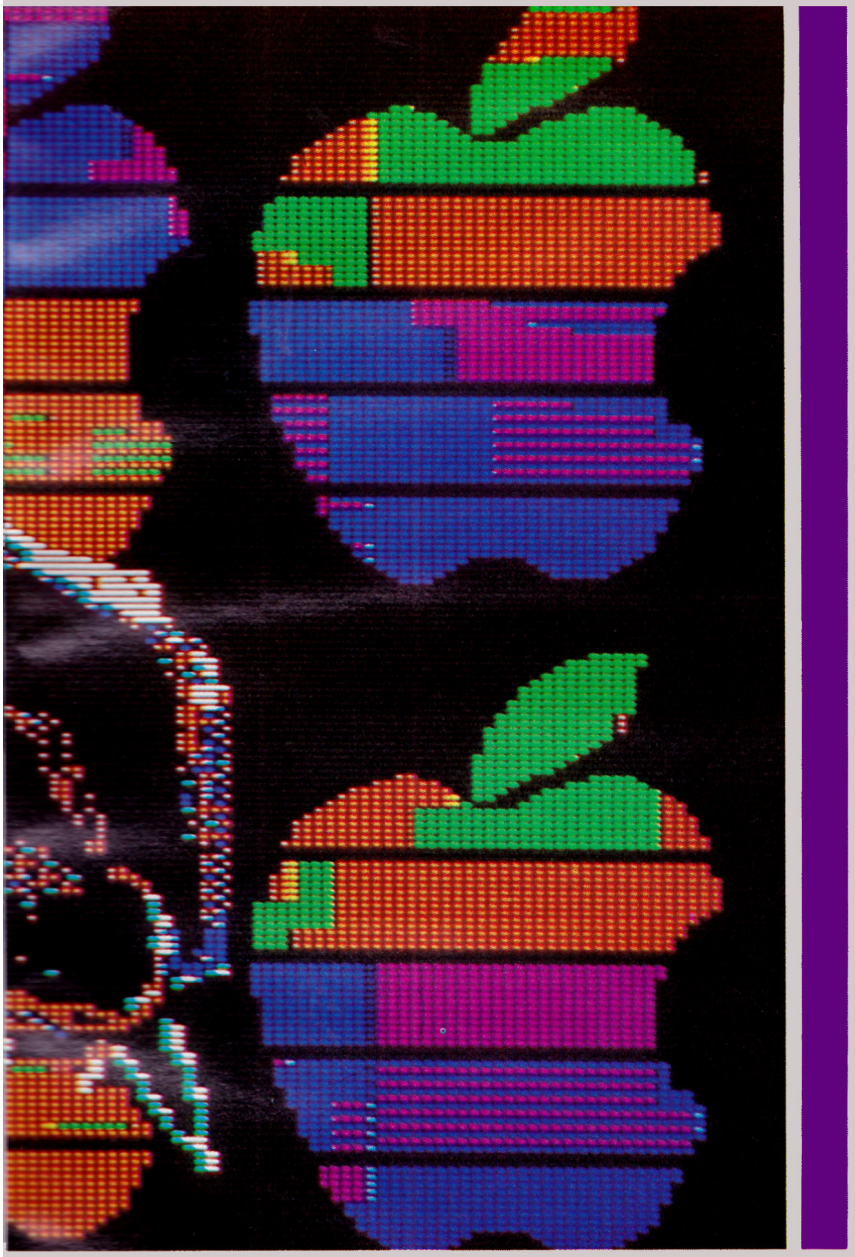
An Illustrator's Foray into the World of Graphics.



With the vast amount of hardware and software now available, the personal computer has many uses. It is a word processor, an accountant, an electronic file cabinet—and it can even treat you to a rousing game of *Zaxxon*. Yet despite its down-to-earth functions, computers tend to intimidate the uninitiated.

I have found that color graphics ease some of the fear the first-time user has when approaching this newly ubiquitous feature of everyday life. The comforting glow from the screen, so similar to the very familiar television set, can be a link between you and this often-misunderstood machine.

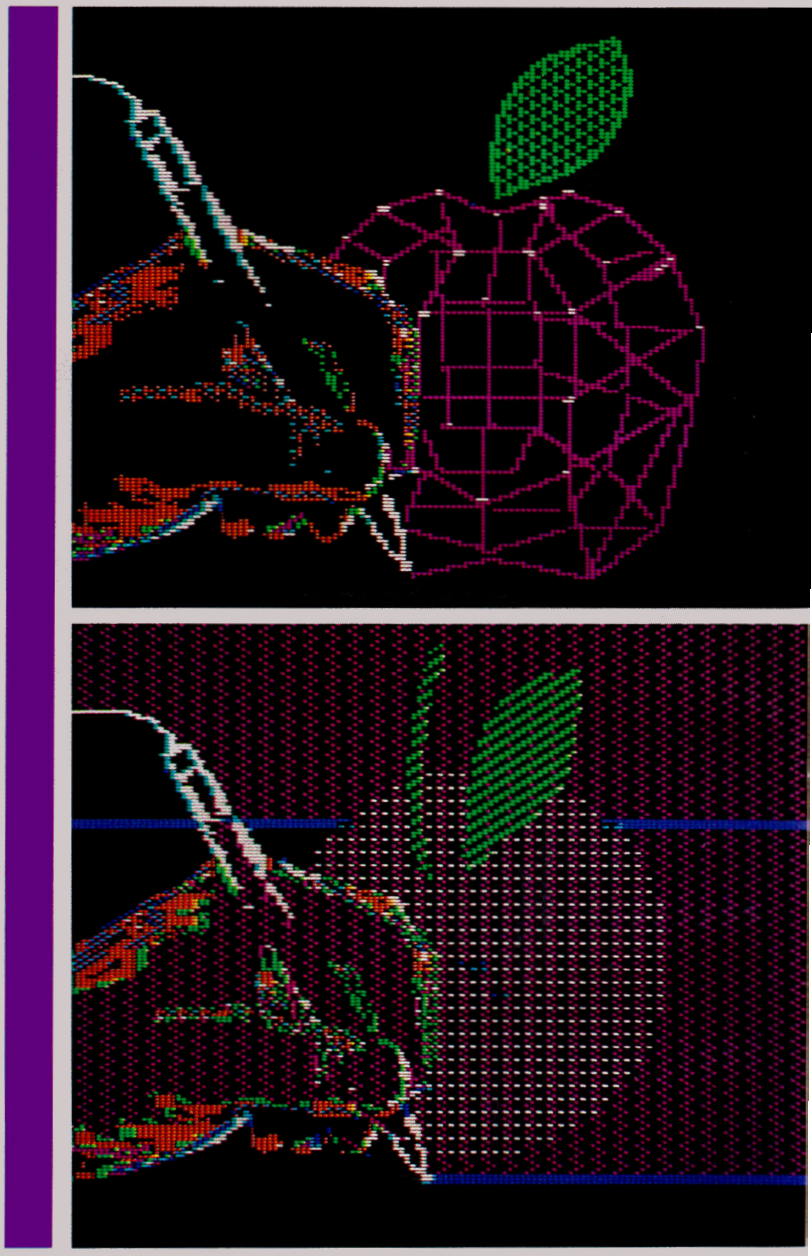
Apple Computer, under the direction of Steven Wozniak and Steven Jobs, foresaw the great importance these features would have in making the computer accessible to the home and small-busi-



ness market. They were the first to offer a personal computer with color capabilities. They were right, and their computer may be the second-most-influential apple in history.

The development of color graphics is one of the main reasons for the overwhelming popularity of video games in the last couple of years. The intense colors and designs, enveloping sound, and spine-tingling situations make a visit to a video arcade a hypnotic experience.

Most of the technology that now allows people to draw pictures was developed by the Defense Department under the auspices of the U.S. government. The technology evolved as a training aid for the testing of subjects in simulated war maneuvers. The project was called Sketchpad, and it was installed under a military contract at the Lincoln

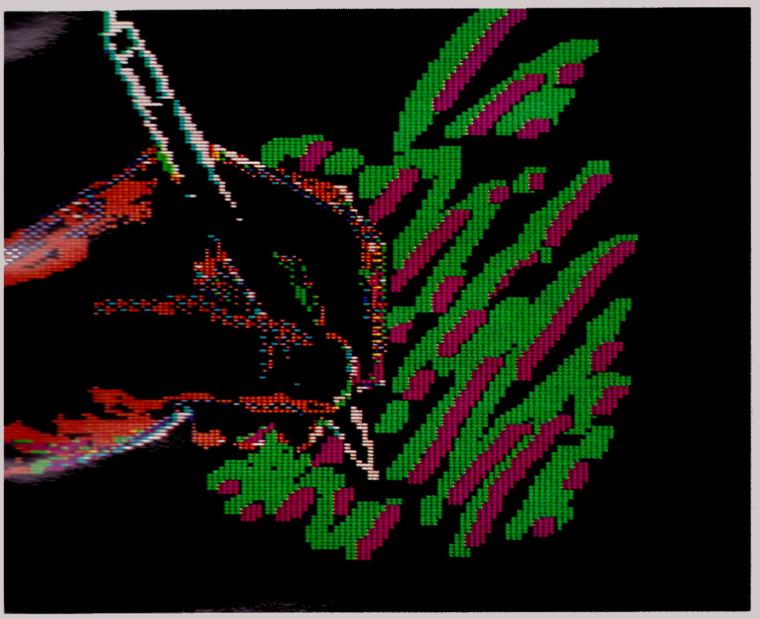


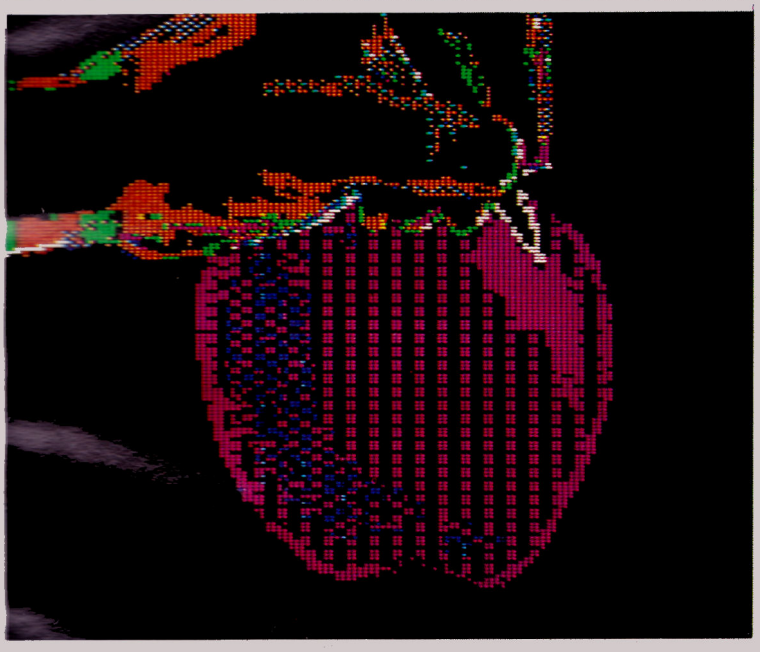
Laboratory at M.I.T. in Boston. It used the facility's TX-2 computer, a cathode ray tube (CRT) display, and another development, the light pen. Ivan Sutherland's software created a powerful engineering design tool.

Until recently, exorbitant prices have limited color graphics technology to large corporations and institutions like the military. But now the rapid evolution of hardware, software, and complete graphics systems is revolutionizing the entire graphics arts industry. New developments are making possible the creation of graphics by artists, students, business people, architects, and engineers at modest costs.

As a commercial artist, I spend much of my time formulating concepts for different projects. I present pencil or marker comps to the client for discussion and

There is more room for experimentation and a wider scope of choices.





approval. This means physically creating mock-ups of finished products like logos, brochures, advertisements, or illustrations. Extreme schedule constraints and tight deadlines force me to use my time judiciously.

My ideas are more quickly realized with the aid of a computer. I've found there is more room for experimentation and a wider scope of choices. Since the images can be stored at any time during the creative process and easily recalled, there is less possibility of wasting time on one image, only to have to go back and start over.

The idea that artists are intimidated by technology is slowly fading, as knowledge replaces misinformation. The introduction of the camera in the nineteenth century worried some artists. They thought the new image-producing won-

der would end their commissions. It did not. Instead the camera had a profound impact on the expansion of the graphic arts. The integration of the computer—like the camera years ago—into the graphic arts industry as a fully productive and accepted tool is inevitable.

Uses of Computer Graphics

Computer graphics are solving the problems facing engineering and architectural firms. Computer-aided drafting/design and computer-aided manufacturing (CAD/CAM) systems were some of the first uses of the computer in a creative environment in the 1960s and 1970s. Although these systems were powerful and sophisticated, they were limited to large corporations and institutions. With these systems the designer can actively participate in the creation of a drawing. Electronic, automobile, and product design are a few of the available applications.

The computer has become the star of trade shows and is a logical choice for training films, because it can illustrate difficult ideas visually, step-by-step.

The business graphics field is being revolutionized by the new technology. In 1982 experts estimated that the marketplace bought $500 million worth of business graphics. Industry watchers indicate that this figure will increase to over $6 billion by 1990.

The computer has become the star of trade shows and is a logical choice for training films, because it can illustrate difficult ideas visually, step-by-step. Graphics have also become an asset in the production of training aids, sales presentations, and product demonstrations.

With the proliferation of computer and software manufacturers, costs are coming down. Educational institutions have received the benefits of this development, as more and more schools and universities try to make their students "computer literate." Now students are being trained on the equipment they will use when they graduate, and the need for more educational material is rapidly expanding.

Through the media, computer graphics have invaded our cultural and personal environments. Television graphics, commercials, and magazine advertisements rely heavily on these flashy neon-like images. In publishing, *Time* magazine is experimenting with a system that will allow art directors and editors to assemble words and images electronically on a video monitor at their desks for later transmission to the printer miles away.

The need for special effects in motion pictures has created a group of wizards who blend computer-generated images with live action to advance the "credibility" of modern-day fiction. JEX FX of San Rafael, California, used an Apple and a Gibson Light Pen to create unearthly images. A five-watt argon laser was used to create the liquid effects for "Star Trek I," "Raiders of the Lost Ark," and "Poltergeist."

For the cloud effect, the desired movement is first drawn with the pen on the video monitor and then stored to disk. With a program written by Gary Leo, the Apple is coupled with the laser motion control, and the pattern is then played back directly into the camera to be filmed. The laser beam can be mixed with a variety of gasses and dyes to produce any color in the spectrum. The results are stunning. Headed by Gary Platek, JEX FX has assembled a crew whose credits include "Star Wars," "Return of the Jedi," "E.T.," "The China Syndrome," and "Dragonslayer."

To date, the most extensive use of computer-generated images in a motion picture has been in the film "Tron." Its crisp, geometric world was produced with state-of-the-art computers to give us images that the advertisements promised would remind us of something we had never seen before. You can't sit down with an Apple and get those kind of graphics . . . yet.

Patrice Wagner, associate editor of *Computer Graphics World* magazine, considers computer graphics the first art form that combines the talents of artists and scientists. She thinks the concurrence of art and science is rare in history, and that the results should prove exciting. Under her direction, *Computer Graphics World* has devoted space to the microcomputer and its graphic advancements. There is also a monthly Gallery section, highlighting computer artists and their work.

Configuration of Hardware

There are far more sophisticated computer systems than the ones I am about to discuss. These graphic workstations, however, can range in price from $10,000 to over $100,000. The major advantages of the larger systems, aside from more computing power, are larger storage spaces, better image resolution, and an extremely fast speed of function. The disadvantages are that these systems are specialized in their functions, require a tremendous amount of knowledge to operate them, and are expensive. Complicated systems have complicated, costly problems. Also, because so many manufacturers are entering the field, it is difficult to predict which ones will remain over the long run to back up their products.

To start, you need an Apple II, II$^+$, or IIe with at least 48K of RAM. I will be limiting the scope of this discussion to these computers. The Apple is capable of producing low- and high-resolution graphics unassisted by outside software, but I won't go into detail here. (Refer to your Apple tutorials if you're interested in exploring the subject.)

Built-in high-resolution graphics are available only in Applesoft. The Apple II$^+$ and IIe have Applesoft built-in, and the Apple II requires an Applesoft firmware card or Apple language card. There are no intrinsic commands of this kind in BASIC. With *any* language you use on the Apple, the capability for high-resolution graphics exists.

You will need at least one 5.25 disk drive with a 16-sector controller card. A second disk drive is recommended, not only for general uses but for storage retrieval as well. Although a color monitor is preferred, a television set can be adapted with a simple switch.

The integration of the computer into the graphic arts industry as a fully productive and accepted tool is inevitable.

A graphics tablet is an electronic drawing board. Game paddles or a joystick can be used, but a graphics tablet has its own interface card and allows more control.

The Apple Graphics Tablet was introduced in 1979, and an updated version is on its way. The tablet is a square, flat device that converts the position and movement of its spring-loaded pen into

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numbers the computer can understand and manipulate.

A strange eye-hand coordination problem occurs in the beginning for users unfamiliar with working flat on the tablet and seeing the results on the screen. It takes getting used to, but becomes second nature with practice. Software is supplied with the tablet, and most of the more sophisticated graphics software are, in fact, best used with the aid of the tablet. The Apple Graphics Tablet and some of the better digitizers on the market range in price fom $500 to $1,000. If this price range is not within your budget, never fear.

Koala Technologies Corporation of Los Altos, California, has developed a low-cost touch tablet called the Koalapad Touch Tablet. This hand-held unit is small and light-weight. With the accompanying software, *The Micro-Illustrator*, written by Steve Dompier, it serves as a sketchpad. The user draws on the chalkboard-like surface with a finger or stylus.

A software menu is provided to help the user to select points, lines, circles, and rectangles as well as colors and "paint brushes" to create images on the screen. It also functions as a game controller and, with custom overlays, can be programmed to be a custom keyboard for combinations of characters and graphics. The Koalapad is expected to expand computer-generated graphics to personal computers. It's a bargain at $125.

The Gibson Light Pen is a high-resolution light pen system that lets you realize your images on the monitor by drawing directly on the screen. Developed by Gibson Laboratories in Laguna Hills, California, the pen comes with an interface card and software that allow it to perform many of the same functions as a graphics tablet. The heart of the system is PenTrak, a powerful machine language driver that allows individuals to write their own programs to enhance the built-in functions. The Gibson Light Pen costs $350.

Software

Apple has increased the variety of software available to both amateurs and professionals. Most of the software is menu driven. Users can select a function by placing the cursor over the desired listed item with the pen or joystick and pressing down. Menus are sometimes three and four layers thick, consisting of options that can slow the process—but which provide quite a selection.

Some of the current software offers the user a visual treat with the manipulation modes that are available. Loaded with a full set of brushes and an option to design your own, programs can store images on a separate disk for later recall.

The brush functions include such words as smear, airbrush, finger paint, and pixel dry brush. The working area is called the canvas. The choice of words is an obvious attempt to bring the language of computer graphics closer to the realm of traditional art.

These programs also allow you to create pie charts and graphs, insert text, paint with letters and numbers, and digitize for area and distance. They include a function to store pictures.

Another form of graphic input is video digitizing. By placing copy on a flat surface and pointing a video camera down at the image, the computer changes the video camera input into a form the computer can understand. Colors can be manipulated to extraordinary effects.

Many manufacturers are developing entire systems using the Apple as the base for performing functions that were once the domain only of the larger systems.

Prints and Printers

Once you and the Apple have created your masterpiece, the simplest technique to save it for posterity is to photograph the scene directly from the screen. Although this method has its drawbacks, people have had good results, and you may want to try it. The slide can be easily projected once the image is in 35mm slide form.

There are expensive computer cameras that can produce high-quality 35mm slides or instant prints. Designed to interface with most computers, these light-weight portable devices produce an image directly from your terminal. The display quality is excellent.

If you want to videotape your graphics, there are companies that make video boards. A video board cleans up the signal from the Apple before reproducing the images on videotape.

A myriad of printers are out on the market. A printer with graphics capabilities can serve as a satisfying way to make hard copies of your work, whether for presentation or for reproduction.

The image produced with black and white dot matrix or letter-quality printers is composed of graphic symbols. By overlapping and varying the density of these symbols, you can create values of black, thus simulating the original.

Color printers come in many forms. There are multicolor pen plotters, and ink-jet and impact printers. Most of these printers are extremely expensive and are difficult to interface with the Apple at this time.

Many manufacturers are developing entire systems using the Apple as the base for performing functions that were once the domain only of the larger systems. T&W Systems in Huntington Beach, California, is offering a CAD/CAM system for the Apple II family called the CADAPPLE. It provides computer-aided drafting for the architectural, civil, mechanical, electrical, and graphic arts industries.

The CADAPPLE is used to create drawings using a tablet, a joystick, or the keyboard for input, and an X-Y plotter for output on bond, vellum, or mylar. It is menu driven and features a "help" function, which displays a condensed portion of the reference manual on the screen for easy understanding.

All the basic geometric shapes are provided and text can be placed on the drawing for identification and labeling. Individual objects can be moved, copied, rotated, scaled, and deleted simply by touching the object with the cursor. All the levels of an architectural drawing, for example, can be stored and displayed separately or together (i.e., floor plan, electrical wiring, air-conditioning, etc.). The entire system can also be speeded up to make it more competitive with larger systems. The package, which includes four diskettes, all the reference manuals, and the CADAPPLE interface card, costs about $2,000.

One of the drawbacks of using personal computers in the production of graphics in the past was their low image resolution. Now the hardware available can increase the resolution dramatically, and the quality is much closer to that of an expensive work station.

Visual Data Enterprises of Los Angeles, headed by Nick Pavlovic, chairman of the Los Angeles chapter of ACM SigGraph, has developed the *V Series* of high-resolution graphics software using the Number Nine Graphics System. The system is for high-quality, relatively low-cost graphic capabilities. It doubles

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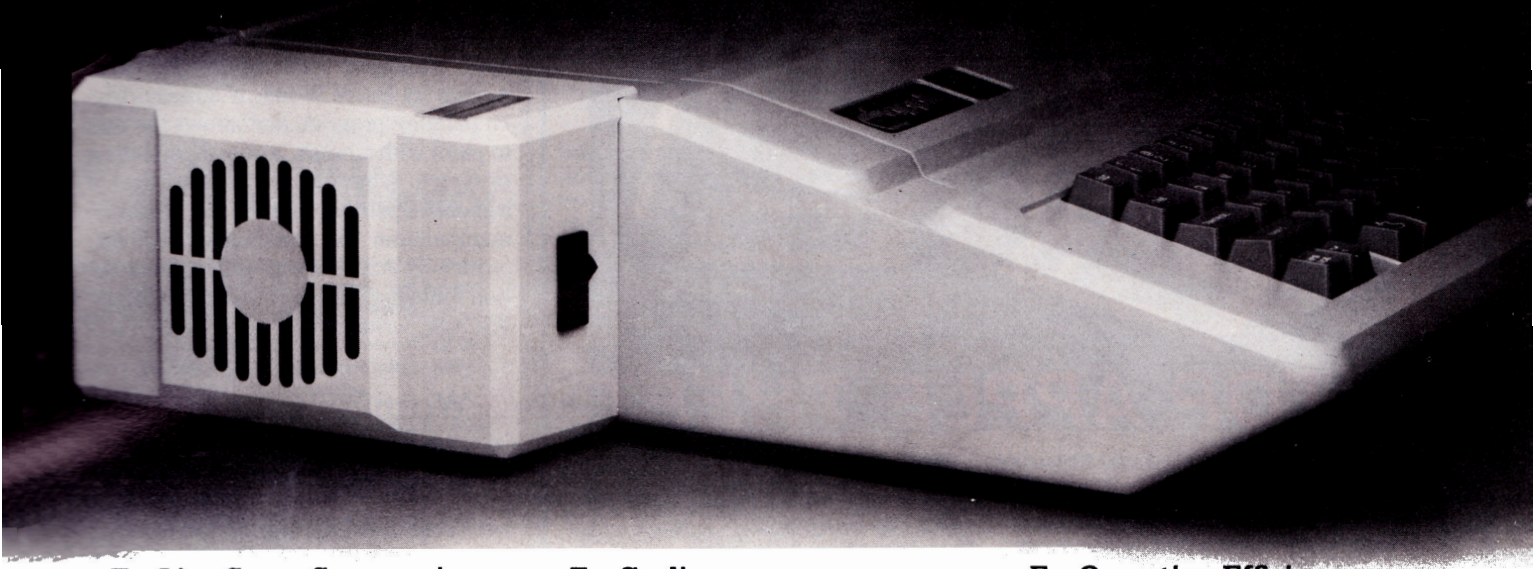

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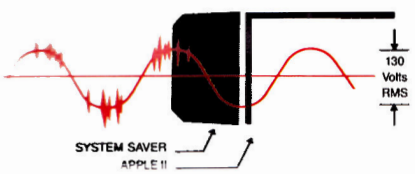

By connecting the Apple II power input through the SYSTEM SAVER, power is controlled in two ways: 1) Dangerous voltage spikes are clipped off at a safe 130 Volts RMS/175 Volts dc level. 2) High frequency noise is smoothed out before reaching the Apple II. A PI type filter attenuates common mode noise signals by a minimum of 30 dB from 600 khz to 20 mhz, with a maximum attenuation of 50 dB.

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As soon as you add 80 columns or more memory to your Apple II you need SYSTEM SAVER.

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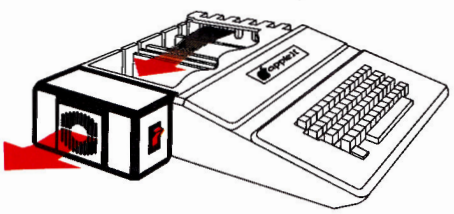

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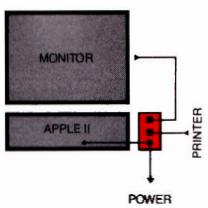

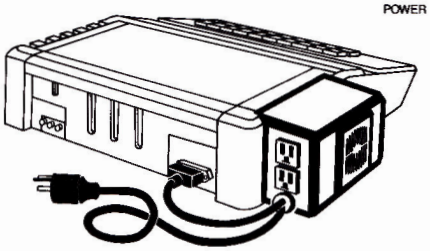

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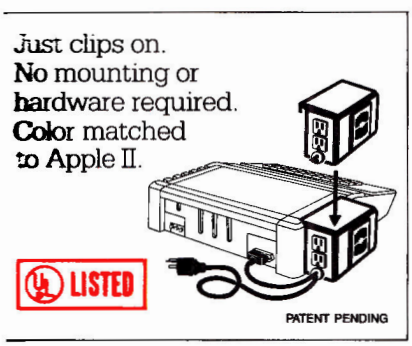

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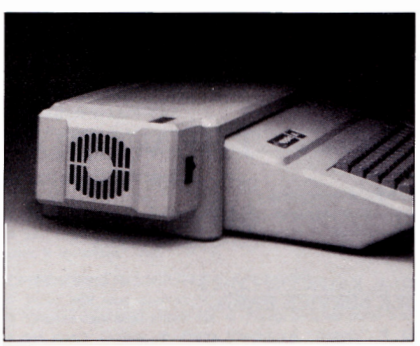

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the line resolution to 512 × 512 and expands to sixteen colors using the NEC CDC 128K board, which also increases the memory storage capacity. This high-resolution system costs $895.

A series of software packages is sold and packaged individually. *VPAINT*, written by Barry Wood, is a menu-driven painting program that allows the user to paint with a brush, airbrush, and draw or sketch. It has the functions and feel of a more expensive system and the color manipulation is remarkable. *VTYPE*, written by Alan Somen, is a high-resolution font/shape generator and test writer. *VSCAN*, written by Eric Popejoy, is a high-resolution camera digitizing package. *VPRINT*, written by Joe Silva, is a picture printing system for black-and-white and color printers. All the programs can be run through a reasonably priced RGB monitor, which provides excellent color and resolution and uses an Apple Graphics Tablet for input. This is the most impressive system for the Apple I have seen.

Wozniak's computer may be the second-most-influential apple in history.

We are in the midst of a technological revolution. Sales of personal computers are expected to triple to $5 billion this year and $7.5 billion the next. The attention the personal computer has received for its graphic capabilities has been overwhelming and is certainly a clue to the diversity we can expect in the future.

Next month I will be reporting on some of the best graphics-producing software available for your Apple. Some of the products are currently on the market, and others are just around the corner. ✚

A native of Los Angeles, California, Craig Calsbeek is a graduate of the Art Center College of Design and has worked as a freelance illustrator since 1976. His award-winning work has appeared in numerous magazines and on book covers and record jackets, and he has done work for major advertising agencies. As a principal in Nexus Graphics, a graphic design firm based in Los Angeles, he divides his time between illustration assignments and various design projects.

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2. Saves CPA write-up fees.
3. Allows "before year-end" tax planning.
4. Saves accounting time; provides input for journals, ledgers, and reports. The program also doubles as a mini-accounts receivable, inventory keeper, and job cost system.
5. Saves interest expense by keeping exact balances.
6. Saves NSF charges.
7. Saves credit card interest charges.
8. Changes your financial attitudes; puts you in control.

Who can use it? Anyone using a checkbook: Lawyers, investors, doctors, general partners, professionals, small business, mini-corporations. It's ideal for people with multiple sources of income, trustee accounts, pension and profit sharing plans, and owners of real estate.

Take farmers, for example: they can treat each crop or herd as a separate profit center. Stan Vasa of Lincoln, NE, says: "I use Money Street to keep my farm records and find the program to be excellent."

Why not get the best? Sure, you can buy a cheap program just as you can buy a cheap clock. But is it really worth it?

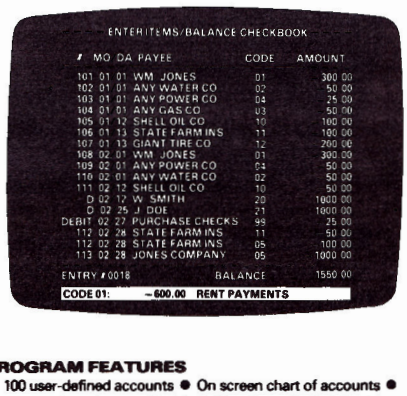
Many customers report that "home accounting" programs are difficult to learn, clumsy to use, and obsessed with budgeting; that only Money Street gives the speed, the ease of use, and the many reports needed.

Bill Sampler, Fairfax Station, VA puts it this way: "One way I judge a program's worth is how easy it is to use after you have been away from it for a couple of weeks. Money Street is no problem, it runs like a fine jeweled watch."

So, Money Street pleases customers just as a Porsche pleases drivers. Top quality costs more; that's a fact of life. But isn't quality always worth it?

One of our customers, Buzz Buggerman of Orlando, FL said: "We use Money Street in our law office. We figure it's not the cost of the program that's important, but how much time it takes to set it up, learn it, and run it. Money Street's a breeze."

How it works. On your computer screen, you create a facsimile of your checkbook. You see 17 items per screen, and can scroll for more. As the computer balances your checking account, you give each check or deposit its own category code.



PROGRAM FEATURES

● 100 user-defined accounts ● On screen chart of accounts ● Account sub totals, grand totals ● Handles unlimited checking accounts ● Three minute year-end rollover ● Credit card accounting ● Full editing, even after entry ● Check search and scan screen ● Help screen ● Wildcard searches

PROGRAM LIMITS

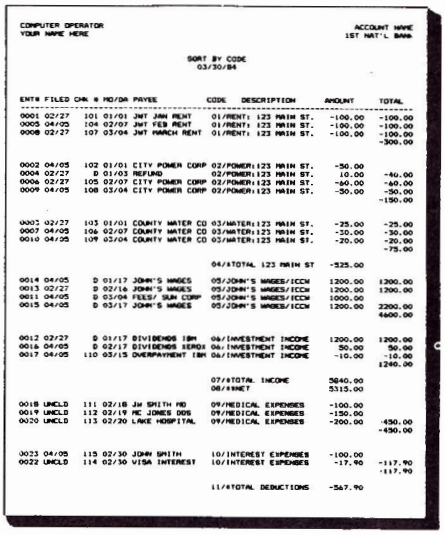
● 2400 checks per data disk ● 200 uncleared items ● Scan speed: 6 per second ● Amount limit: $999,999.99 ● 100 account categories

DOES MANY JOBS

● Finds tax deductions ● Single entry accounting ● Job costing ● Budgets and estimates ● Mini accounts receivable ● Mini inventory ● Tracks personal loans ● Real estate rentals ● Stock purchases/sales ● Increases "float"

CHECKING ACCOUNT MANAGER

● Prints trial reconciliation ● Balances checkbook and statement ● Creates cancelled check file ● Prints detailed audit trail ● Includes check register ● Prints checkbook "history" ● Captures monthly income ● Easy to use


COMPUTER OPERATOR
YOUR NAME HERE

ACCOUNT NAME
1ST NAT'L BANK

SORT BY CODE
03/30/84

ENT#	FILED	CHK #	MO/DA	PAYEE	CODE	DESCRIPTION	AMOUNT	TOTAL
0001	02/27	101	01/01	JWT JAN RENT	01	/RENT: 123 MAIN ST.	-100.00	-100.00
0005	04/05	104	02/07	JWT FEB RENT	01	/RENT: 123 MAIN ST.	-100.00	-100.00
0008	02/27	107	03/04	JWT MARCH RENT	01	/RENT: 123 MAIN ST.	-100.00	-100.00
								-300.00
0002	04/05	102	01/01	CITY POWER CORP	02	/POWER:123 MAIN ST.	-50.00	
0004	02/27	D	01/03	REFUND	02	/POWER:123 MAIN ST.	10.00	-40.00
0006	02/27	105	02/07	CITY POWER CORP	02	/POWER:123 MAIN ST.	-60.00	-60.00
0009	04/05	108	03/04	CITY POWER CORP	02	/POWER:123 MAIN ST.	-50.00	-50.00
								-150.00
0003	02/27	103	01/01	COUNTY WATER CO	03	/WATER:123 MAIN ST.	-25.00	-25.00
0007	04/05	106	02/07	COUNTY WATER CO	03	/WATER:123 MAIN ST.	-30.00	-30.00
0010	04/05	109	03/04	COUNTY WATER CO	03	/WATER:123 MAIN ST.	-20.00	-20.00
								-75.00
					04	/#TOTAL 123 MAIN ST	-525.00	
0014	04/05	D	01/17	JOHN'S WAGES	05	/JOHN'S WAGES/ICCM	1200.00	1200.00
0013	02/27	D	02/16	JOHN'S WAGES	05	/JOHN'S WAGES/ICCM	1200.00	1200.00
0011	04/05	D	03/04	FEES/ SUN CORP	05	/JOHN'S WAGES/ICCM	1000.00	
0015	04/05	D	03/17	JOHN'S WAGES	05	/JOHN'S WAGES/ICCM	1200.00	2200.00
								4600.00
0012	02/27	D	01/17	DIVIDENDS IBM	06	/INVESTMENT INCOME	1200.00	1200.00
0016	04/05	D	02/17	DIVIDENDS XEROX	06	/INVESTMENT INCOME	50.00	50.00
0017	04/05	110	03/15	OVERPAYMENT IBM	06	/INVESTMENT INCOME	-10.00	-10.00
								1240.00
					07	/#TOTAL INCOME	5840.00	
					08	/#NET	5315.00	
0018	UNCLD	111	02/18	JW SMITH MD	09	/MEDICAL EXPENSES	-100.00	
0019	UNCLD	112	02/19	MC JONES DDS	09	/MEDICAL EXPENSES	-150.00	
0020	UNCLD	113	02/20	LAKE HOSPITAL	09	/MEDICAL EXPENSES	-200.00	-450.00
								-450.00
0023	04/05	115	02/30	JOHN SMITH	10	/INTEREST EXPENSES	-100.00	
0022	UNCLD	114	02/30	VISA INTEREST	10	/INTEREST EXPENSES	-17.90	-117.90
								-117.90
					11	/#TOTAL DEDUCTIONS	-567.90	

15 Ready-to-print reports! Press four keys and the program will print any of 15 different reports. Just select from the Report Menu, and the program does the rest. Start-up to print time is usually 20 seconds. Reports include:

● Monthly code totals ● To-date code totals ● Sort by amount ● List code dictionary ● Sort by payee ● List deposits ● List uncleared checks ● List uncleared deposits ● List all entries ● Sort by date cleared ● Print check registry ● Print selected month ● Print selected code ● List code totals ● List monthly totals

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TK!SO
EXPLA

TK!Solver does for equations what word processing did for words. The first thing you should know about the TK!Solver™ program is that it is not a spreadsheet. Instead, it does something completely unheard of (until now)—it turns your personal computer into a voracious equation processor.

The next thing you should know is that if the TK!Solver program can't make life with your personal computer easier (and pay for itself), even if you use it only 15 minutes a week, you are a very rare person.

And finally, you should know exactly what equation processing is, and how it works. If you keep reading this, you will.

Equation processing with TK!Solver, or problem solving made easy. The best way to understand what the TK!Solver program *is*, is to understand what it *does*. The following simple example is designed to do just that.

Begin by setting up your problem. The TK!Solver program lets you do it quickly, easily, and naturally. For example, a car costs $9785. What would be the monthly payment on a three-year loan if the down payment is 25% and the interest rate is 15%?

STEP 1. Formulate the necessary equations to solve your problem and enter them on the "Rule Sheet" simply by typing them in (see screen photo). For example: "price−down = loan."



STEP 2. Enter your known values the same way on the "Variable Sheet." For example: "9785" for price. You may also enter units and comments, if you want.*

STEP 3. Type the action command ("!" on your keyboard) to solve the problem.

STEP 4. TK!Solver displays the answer: the monthly payment is $254.40.

Backsolving, the heart of TK!Solver. Now that you've defined the problem and solved it, TK!Solver's unique backsolving ability also lets you think "backwards" to solve for any variable, regardless of its position in the equation. For example, if you can only afford a monthly payment of $200, you can re-solve the problem in terms of that constraint. The TK!Solver program will solve the problem, displaying your choice of a higher down payment, a longer loan term, or a lesser interest rate. This unique backsolving capability forms the basis of TK!Solver's remarkably flexible problem-solving ability.

*You can easily define appropriate unit conversions on the unit sheet at the same time.

OLVER™
AINED:

Also, as you can see from the example on the screen, TK!Solver deals not only with single variables, but with entire equations and sets of simultaneous equations. It also deals with much more complicated problems than this one. How complicated? That's up to you. What kinds of problems? That's up to you, too, but popular applications include finance, engineering, science, design, and education.

Other extremely useful and interesting things TK!Solver does. Aside from its basic problem-solving abilities, the TK!Solver program performs a number of pretty fancy tricks. Like: *Iterative Solving;* in which TK!Solver performs successive approximations of an answer when confronted with equations that cannot be solved directly, (like exp (x) = 2 – x • y and sin (x • y) = 3 – x – y). Like: *List Solving;* in which TK!Solver attacks complete lists of input values and solves them all, allowing you to examine numerous alternative solutions, and pick the one you like best. Like: *Tables and Graphs;* using the values you produced with the List Solver, the TK!Solver program will automatically produce tables and graphs of your data. You can look at your formatted output on the screen or send it to your printer with a single keystroke. And like: *Automatic Unit Conversion;* in which TK!Solver lets you formulate problems in one unit of measurement, and display answers in another. Very convenient what with all this talk about going metric.

The TK!Solver program also provides a wide variety of specialized business and mathematical functions like trig and log and net present value.

Then, there's TK!Solver's on-screen Help facility that provides information on commands and features any time you want it. Just type "?" and a topic name.

And of course the TK!Solver program combines all these features in one *integrated program.*

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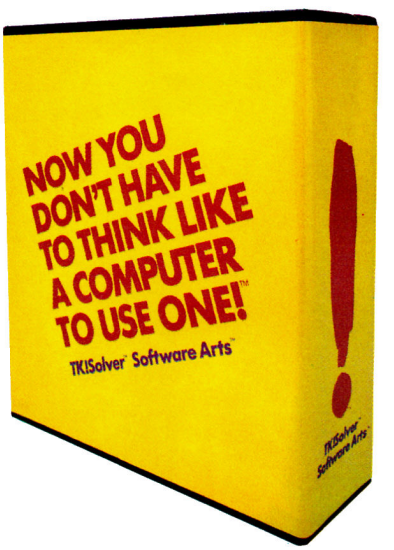

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P/N 100-092 P 8/83

BOOK EXCERPT/BY LESLIE E. SPARKS

INVESTMENT ANALYSES WITH YOUR MICROCOMPUTER

You must understand the various forms that money can take before using your Apple to compare investments that differ as much as apples and oranges.



Microcomputers can be useful tools in making investment decisions since a considerable number of calculations must be done when applying financial theories. However, radically different conditions in each investment situation—involving taxes, cash flow, risk, and whether profit is expected only when an asset is sold—require an investor to understand which theories are appropriate when evaluating a particular opportunity. Good judgment must be used before numbers are sent through a computer to make a meaningful choice of investments.

In his book, Leslie E. Sparks addresses both the computer and the investor; the text includes numerous listings of BASIC programs that execute financial theories, as well as discussions that inform the reader of the meaning and appropriate use of these theories.

The programs in this book are written in Microsoft BASIC; an appendix explains how to convert the listings to run properly with other versions of BASIC. The three longest programs each require a computer with 48K RAM. These three are INVEST1, to analyze investments that generate income; INVEST2, to analyze investments where most profit would come as capital gain when the investment is sold; and INVEST3, a version of INVEST2 that includes risk analysis.

This book excerpt includes none of the program listings. Instead, it focuses on teaching the basic principles and methods of investment analysis.



Steps in Investment Analysis

Investment analysis is a multistep process that ends with the selection of the investment or investments that are best for you. The steps are:

- Define your investment objectives. Remember that your objectives are not the same as someone else's investment objectives.
- Determine the types of investments that meet your objectives. Because investment analysis is a time-consuming task, you want to limit the analysis to those investments that meet your objectives.
- Determine the cost and return for all investments that meet objectives. This is a crucial step.
- Analyze cost and return to find the best investments. This step is closely related to the preceding step. It may be efficient to loop between these two steps: first make optimistic assumptions about cost and income, then analyze cost and return; reject unsatisfactory investments, refine costs and returns, and repeat the analysis.
- Analyze risk, which always is present in investments. Analysis of risk must be one of the steps in investment analysis. Computer assistance in analyzing risk is discussed later.
- Select the investments you prefer based on the preceding quantitative analysis, together with qualitative analysis that determines if you are comfortable with the investments.
- Manage the investment to make sure costs and returns are as projected. This is not a step in the analysis procedure, but it is important if you are to meet investment objectives.

The emphasis of this book is on the analysis of projected costs and returns to determine whether the investment is a good one. The basic thrust of this analysis is based on the concepts of time value of money. Because the analysis is most objective and because it requires a considerable amount of computation, the computer is especially helpful in this step. Most of the other steps involve at least some subjective judgment, which is not susceptible to computer analysis. The analysis of projected costs and returns, on the other hand, is basically objective and involves some tedious methematics; but this is what computers are good at.

The second area receiving emphasis is projection or forecasting of expected returns and expenses. A computer can be of assistance here; several programs for forecasting are provided. However, this area requires considerable subjective analysis. Thus it does not yield as gracefully to computer analysis.

Although these two areas are to receive the most emphasis, other steps are not totally neglected. Discussions are limited but do point out where the computer can help; in some cases computer programs are provided.

INVESTMENT OBJECTIVES

The first step in investment analysis is to define the objectives of the investment. Any investment that does not meet your personal investment objectives should be rejected. If you properly define your objectives, you will be able to eliminate several possible investments with little or no additional analysis.

Although you may have several objectives for investing (such as retirement or a vacation), you must realize that the first objective of any investment is to increase your future wealth. Unless the investment meets this objective, nothing else matters. You are better off spending the money now, not investing it for future gain.

Although it seems obvious that an investment must increase future wealth, people often make investments that aren't designed to do so. People forget the primary objective of investment and as a result make poor investment decisions.

The emphasis of this book is on the analysis of projected costs and returns to determine whether the investment is a good one.

In order to meet this primary objective you should choose investments that increase your future purchasing power, i.e., investments that keep ahead of inflation. The only way this can happen is if your investments make money.

Yet many investments don't meet this objective. Many so-called tax shelters, sold with the promise of reduced income tax, are good examples. At some levels of income the only way to reduce taxes is to increase expenses or losses. Since at best, a dollar lost only gives fifty cents in tax savings, you can cut your taxes and end up broke.

Again, the objective of investment is to increase future wealth. The only way this can happen is for the investment to earn money. Thus find the investments that earn the most money and pay the extra taxes. And enjoy the extra wealth you have earned.

If you cannot find investments that meet these objectives, spend your money now and enjoy it.

You may find it useful to make up a work sheet to help you define your investment objectives. Remember that you may have conflicting objectives—don't worry about that. You are the only person who can resolve the conflicts.

Total amount to invest is $100,000.

	A	B	C
CAPITAL	$70,000	$100,000	$30,000
DCFROI	15%	14.5%	10%

Fig. 1

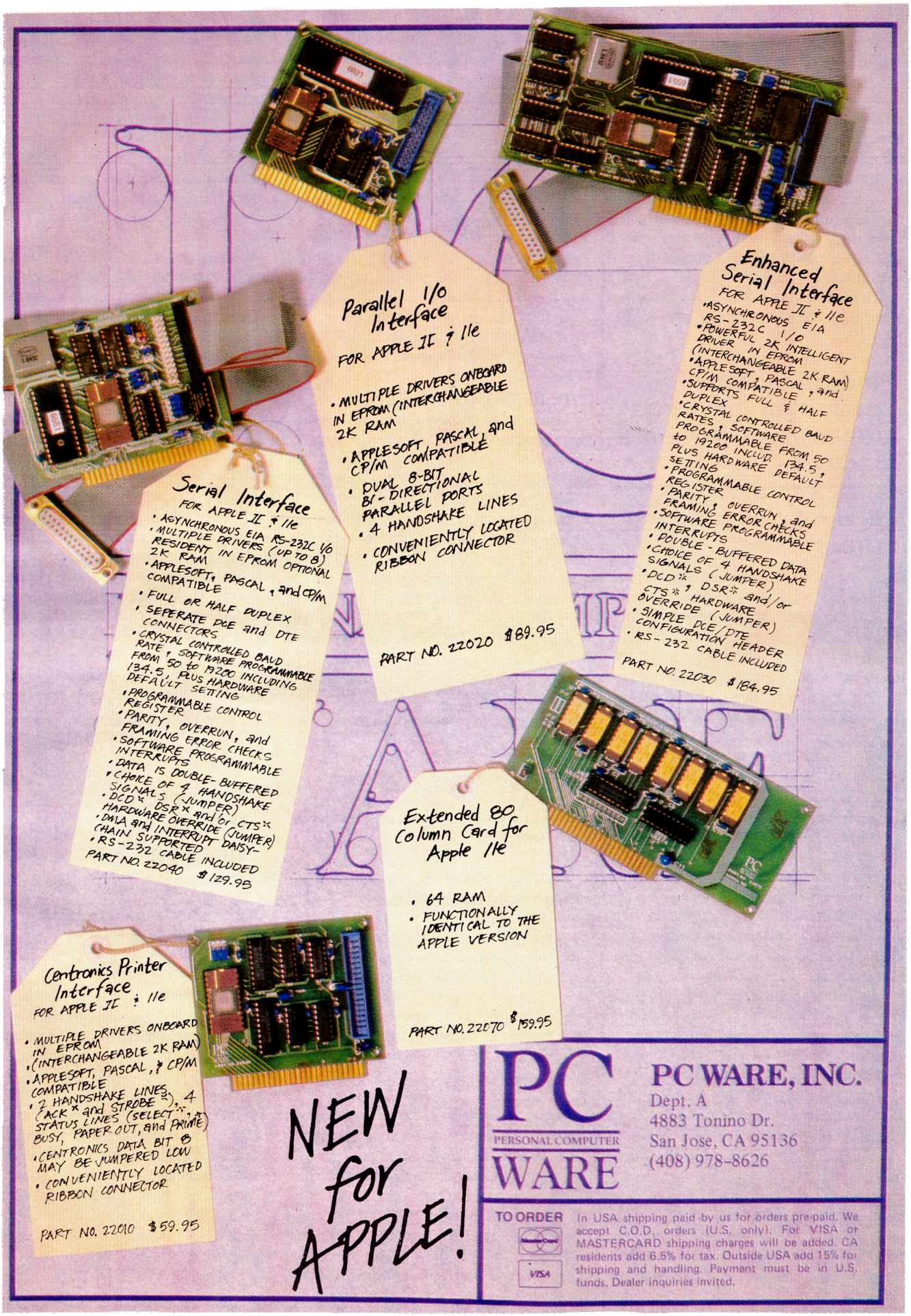
ELEMENTS OF INVESTMENT ANALYSIS

"Does this investment increase my future wealth?" is the question that must be answered by a rational investor. If more than one investment is being analyzed (as should be the situation), an additional question, "Which investment increases my future wealth the most?" is introduced.

The answers to these questions require analysis of three factors: money, time, and risk. All investments, whether in the stock market, gold, real estate, or comic books, involve consideration of these three factors.

The money factor is the easiest to analyze and is often the only factor considered. The essential questions are how much does the investment cost, and how much money does it return. The main thing to remember in analyzing the money factor is to be sure that all costs are included in the analysis.

The time factor is harder to analyze than the money factor—mainly because the mathematics involved is tedious. Yet careful consideration of the time factor is the heart of investment analysis. It is the factor that determines whether you will increase your future wealth. The essential questions are when must the investment be paid for, and when is the income



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from the investment paid.

Because all investments involve giving up present wealth or spending in exchange for future wealth, consideration of the time factor is essential to good investment decisions. A personal computer removes most of the hard work from time factor analysis.

You must understand the relationship between time and money to make good investment decisions. If you don't, you are very likely to find that your personal wealth has decreased.

Risk is the one factor that cannot be quantified. The essential question is, what is the chance that I will not get my money back? Risk is generally evaluated intuitively. You must make your own decisions about how much risk you are willing to accept and what the risk involved in a given investment is.

The analysis of projected costs and returns involves some tedious mathematics; but this is what computers are good at.

An important point to remember about risk is that risk and return are closely related. Low risk means low return and high risk means high return. There is basically no way to get high investment returns without accepting risk.

The amount of risk that you are willing to accept depends on the objective underlying a given investment. If you are investing for your retirement, you should accept less risk than if you are investing for a need which is not as important. You should only accept high risk if you can afford to lose all of the money invested. Be sure that you know how much risk you can accept before you proceed too far with an investment. But don't expect to find an investment with low risk and high returns.

OTHER FACTORS

Money, time, and risk are the three main factors that every investor should consider. These factors can be more or less quantified, and a computer can help in analyzing them. However, there are numerous other factors to consider. Most of them depend on the individual investor.

Most of the other factors are intangible, yet they are as important, if not more important, than the tangible factors of time, money, and risk. It is often the intangibles that determine whether a given investment will actually pay off for you. For example, if you don't want to be a landlord, then an investment in rental real estate will probably not work out—no matter what the quantitative analysis indicates.

If the thought of risk makes you stay awake at night, then you should stay away from risky investments, no matter how good they look.

In the final analysis you should select investments that you can live with. The computer, I'm afraid, won't be of much help.

THE RATIONAL INVESTOR

The rational investor must consider all three factors—time, money, and risk—in making an investment decision. In general, rational investors have the following preferences:

- For a given rate of return, they prefer the investment that returns money the earliest. Thus if the choice is $100 next year or $100 next month, the preferred investment is the one that returns $100 next month.
- For any given rate of return, they prefer the investment with the least risk.
- For any given degree of risk, they prefer high returns to low returns.

The last two preferences state that a high rate of return is required for risky investments.

The computer can help you sort all the factors involved in a given investment, and thus can help you make rational decisions.

HOW COMPUTERS HELP

First, remember that a computer is a tool. How it is used and how well it is used depend on you. The computer cannot make the decision for you. The final decision is yours and yours alone. (I realize that I have said this before, and I will say it again. However, I feel that we all tend to forget that the computer is a tool and begin to believe the calculated results too much. We must always be on guard against putting too much faith in the computer.)

Second, remember that no matter how impressive computer output looks—and it does look impressive—the analysis depends completely on the data and programs you provide for the computer. Often this is the hardest thing to remember. The computer printout tends to blind us to the fact that the computer is using the information we supplied, and the calculations are all based on our assumptions, some of which may be built into the program. The major danger of computer-aided investment analysis is that we all tend to read too much into the computer output.

Finally, remember that the computer cannot calculate subjective factors. It can only analyze factors that can be quantified in an objective manner. Don't expect the computer to help you with problems that concern subjective factors.

With all the warnings out of the way, let's look at what this powerful tool can do.

First, it can do a tremendous amount of calculation quickly. This fact alone has persuaded large companies to use their computers to help make investment decisions. Speed of computation is also the main justification for using a personal computer for investment analysis. The time factor is so important that we need all available tools to meet this issue adequately.

Second, the speed and ease of calculations means that several investments can be analyzed in a short time. Thus we can carefully analyze all pertinent investments. We are not limited to analyzing investments that are simple to analyze, nor are we limited to analyzing only a few factors affecting the investment. We can use the computer to make sure that all important factors are considered; that alone is worth the cost of the computer and the time we must spend working with it.

You must understand the relationship between time and money to make good investment decisions.

Finally, the speed of calculation allows us to estimate the risk involved. We can study the effects of various factors such as inflation rate, interest rates, higher expenses, etc.

After you have worked with a personal computer for awhile, I think you will find that it is more powerful than a mainframe computer for investment analysis, because you work interactively with a personal computer. You can get an intuitive idea about the investment that is impossible with other methods of investment analysis.

Of course if the programs are not written to allow interactive use of the

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computer, you'll miss most of the benefits of using a personal computer.

To make most effective use of a computer, whether it be mainframe or micro, you have to build a computer model of the investment in which you're interested. A computer model allows you to simulate the performance of the investment for several years using different assumptions about income, expenses, inflation, and other important factors. Thus you will be able to see the effects of a 10 percent increase in expenses without actually having to make the investment.

Once the basic model is built, you can use the computer to help manage your investments. This is done by updating the information supplied to the computer and by changing the model if necessary. For example, if an investment is not working as well as you hoped, you can see what has to be done to make it work better, whether you should terminate the investment as soon as possible.

The key questions have four parts:

1. How much does the investment cost?
2. How much does it cost to obtain the money necessary to purchase the investment?
3. What are the ongoing expenses and income from the investment?
4. Finally, and perhaps most important, what is the timing of future income and expenses?

Risk is the one factor that cannot be quantified.

In this chapter we will look at the first three of these questions.

HOW MUCH DOES IT COST!

You may think this an obvious or a trivial question. No one, you might say, would make an investment without knowing how much it costs. Yet we often do.

It is generally easy to determine what the selling price of something is. For example, if you purchase a stock you know what the selling price of the stock is. But the selling price is not the total cost of the investment. There are often other expenses that must be paid before you can purchase an investment. For example, there may be commissions, taxes, finder's fees, advertising costs, and numerous other costs that must be paid in order to purchase a given investment, and these costs are often hidden. Thus the first step in investment analysis is to determine the total cost of acquiring the investment. Using a worksheet is a good way to insure that all costs are considered.

THE COST OF MONEY

There are two sources of money for investment: yours and someone else's. In theory and in the absence of taxes, an investment decision is independent of the source of money. However, in the real world taxes exist, we cannot always borrow as much as we'd like, and so on; hence the source of funds does influence the investment decision.

BORROWED MONEY

The cost of borrowed money is easy to determine. It is the interest rate you must pay for money. The interest rate is specified in the loan agreement and can be calculated. If the interest rate is variable, you can still estimate it.

Because interest expense is an allowable business expense, the true cost of borrowed money is less than the interest rate on the loan. For example, if you are in the 50 percent tax bracket, the after tax cost of a 20 percent interest rate is 10 percent. Of course if you are in a lower tax bracket, your after tax cost of borrowing money is closer to the pretax interest rate.

YOUR OWN MONEY

The cost of using your own money is somewhat more difficult to determine. You might think there is no cost in using your own money. After all it's your money; you don't have to pay interest if you want to spend it.

It is important to remember that if you use your money for one investment, it is not available for other investments, nor is it available to earn interest. For example, if you decide to purchase stocks, then your money is not available to purchase a term certificate of deposit. In other words, you have lost the chance to purchase a certificate of deposit and gain the interest it would pay.

Suppose that you have the choice of investing $1,000 in Sam's get-rich-quick scheme or putting your $1,000 into an all-savers' certificate that pays 12 percent interest tax free. If you invest in Sam's get-rich-quick, you pass up the all-savers' certificate and it costs you 12 percent (the amount you have forfeited by not collecting interest).

The loss of money for other investments is called *opportunity cost*. In our example, the numerical value of the opportunity cost is the return on the cer-

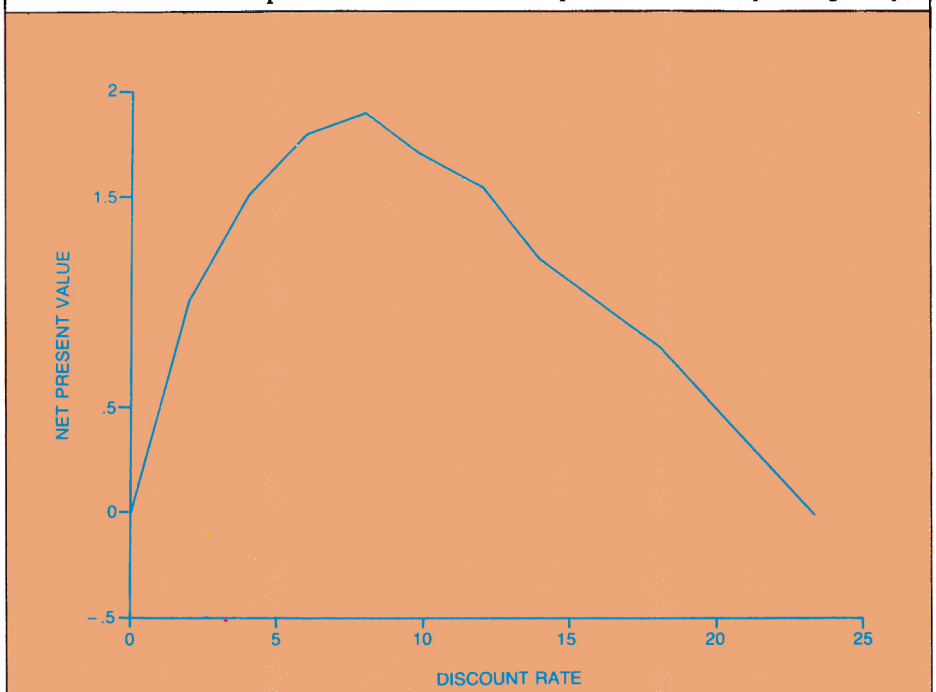

Fig. 2

I think you will find that the personal or microcomputer is a useful tool for investment analysis. And you will soon wonder how you ever managed to get along without one.

The Money Factor

The key questions about any investment are how much does it cost and how much does it return. These are the only questions that really matter. All other investment questions are primarily aimed at answering these questions.

tificate of deposit or 12.0 percent of the cost of the certificate.

In general a good value for the opportunity cost is the return that can be expected from a risk-free investment. If you are considering a risky investment, you should add a slight amount to the opportunity cost to compensate for the risk.

Although the opportunity cost and the interest rate on a loan may be close, their true after-tax costs may be quite different. Tax laws that allow deduction of interest reduce the real cost of borrowing and thus favor the use of borrowed funds.

EQUITY AND BORROWED CAPITAL

Most investments are composed of a combination of borrowed money and equity (a fancy way of saying your money). The cost of using such a combination of funds is given by:

$$C = (BI + EV)/T$$

where C is the total cost of capital (given as a percentage), B is the amount that must be borrowed, I is the interest rate that the funds are borrowed at, E is the amount of equity, V is the opportunity cost, and T is the total amount of the investment.

For example; suppose you have an opportunity to buy real estate. Assume the cost of the property is $100,000 and includes all commissions, closing costs, etc., and assume you can borrow $80,000 at 20 percent (so you need $20,000 equity). You can invest in tax free government bonds that pay 8 percent interest. And your marginal tax rate is 40 percent. The after tax cost of borrowing is 12 percent. The average cost of capital for the investment is

$$C = (80{,}000 \times 12 + 20{,}000 \times 8.0)/100{,}000 = 11.2\%$$

This means that an investment must have an after tax return of 11.2 percent to recover the cost of making the investment.

As you will see later, it is important to know the cost of capital. The cost of capital combined with the concepts of time value of money tell us whether an investment has made a profit.

CASH FLOWS

The flow of money into and out of an investment is called the *cash flow*. Cash flow is made up of income, called cash *inflows*, and expenses, called cash *outflows*, and depreciation. The sum of the cash inflows, depreciation, and cash outflows determines the overall cash flow. If the cash inflows exceed the cash outflows, you have a positive cash flow and might have a good investment. If the cash flow is negative, you have a loss and a bad investment.

One major problem you face in investment analysis, and the one most books on investment analysis discuss is projecting cash flows for the life of the investment. Once you have made an investment, you have the problem of insuring that the cash flows actually occur. We will examine the problem of forecasting; however, the problem of how to make sure cash flows actually occur is outside the scope of this book.

Remember that no matter how impressive computer output looks the analysis depends completely on the data and programs you provide.

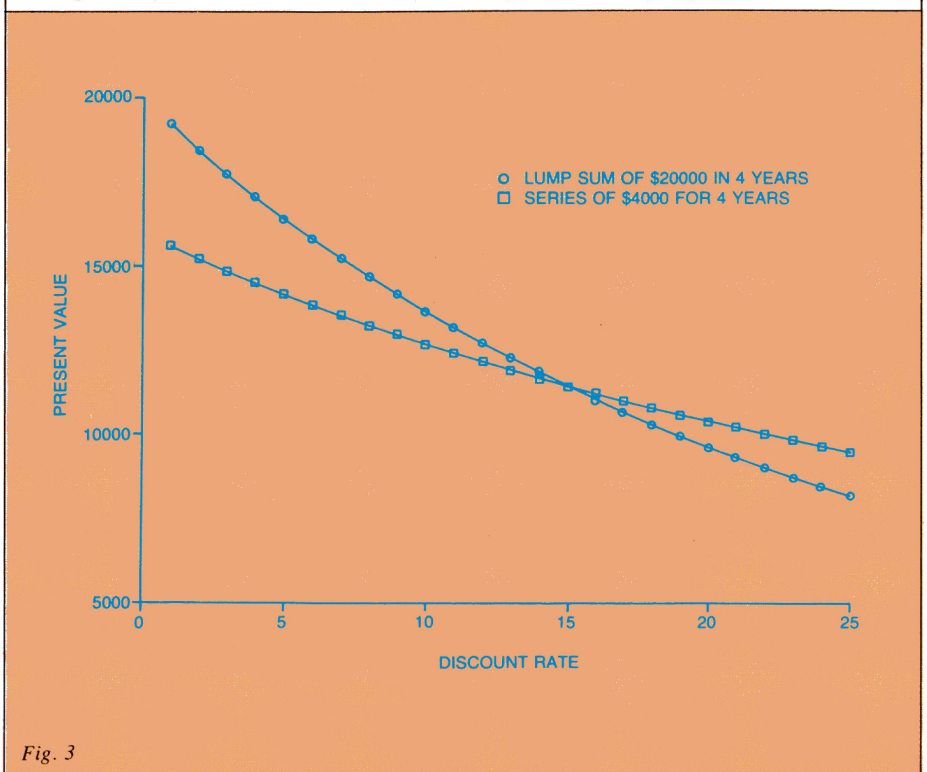

Fig. 3

Cash flow can vary from year to year. For many investments cash flow in the first years of the investment is negative, meaning expenses exceed income. (Of course this difference must be accounted for, which usually is done by borrowing additional funds.) After several years of operation cash flow becomes positive. For the investment to be a good one, the final total of yearly cash flows must be positive. Otherwise, you will have lost money.

There are two important types of cash flow: spendable cash flow and taxable cash flow. It is possible for an investment to produce negative spendable cash flow and positive taxable cash flow, which is not a very good idea. The reverse is also possible and is more desirable.

These two types of cash flow are not the same. Spendable cash flow is the money that we actually have to spend. Taxable cash flow is the money that the IRS wants to tax.

The tax laws are the reason for the differences between spendable and taxable cash flow. The tax laws allow us to deduct certain expenses from income that are not out of pocket expenses, and prohibit us from deducting other out of pocket expenses from income. The worst possible situation is when the IRS says you made a profit (so you have to pay taxes) and yet you have lost out of pocket money.

Depreciation is the major tax law expense that is not an out of pocket expense. That is, you do not write a check for depreciation. Although depreciation can reduce our taxable income, it does not necessarily reduce our spendable income. (If we set aside funds for replacing depreciated equipment, then depreciation can also reduce our spendable cash. However, this is not often done.) This is why cash flow is usually defined as after tax profit plus depreciation. In this book I will call the taxable

cash flow "cash flow." I will always use the term "spendable cash flow" when I'm talking about the spendable cash flow. This should avoid confusion.

Principal payments on a loan are the major spendable expense that is not an expense for tax purposes. An investment that is financed with borrowed money must produce enough income to make both the interest and principal payments. Otherwise, you would have to find additional funds to make the required loan payments.

In mathematical terms the two cash flows can be described as:

Taxable cash flow = income − expenses + depreciation − taxes

Spendable cash flow = income − expenses − principal paid − taxes

SPENDABLE AND TAXABLE CASH FLOWS

Suppose you have an investment that produces $1,000 income per year. The allowable depreciation on the investment if $600, the interest payment is $200 and the principal payment is $400. Your tax rate is 50 percent. The tax paid on the investment is calculated by determining the net taxable income, which is $1,000 (gross income) − $200 (interest) − $600 (depreciation) = $200 taxable income. The tax paid is $100. The net after tax profit is $100. The after tax cash flow is $100 (net profit) + $600 (depreciation) = $700. The after tax spendable cash flow is given by $1,000 (gross income) − $200 (interest payment) − $400 (principal payment) − $100 (tax paid) = $300. Note that the investment yielded $300 for your pocket.

In general over the life of an investment, spendable cash flow and taxable cash flow from a profitable investment are both positive. However, it is important to realize that for individual years of the life of the investment, you may find that you did not earn enough to make the principal payments on your loan. In such situations, you should carefully examine the investment. Principal and interest payments must be made, so if you keep the investment you will have to find additional funds to make the necessary payments. Such funds will increase the cost of the investment.

ESTIMATING CASH FLOWS

Estimating the future cash flows from an investment is a critical step in investment analysis. This step is discussed by most books on investment analysis. The methods used to make estimates vary with the type of investment. Only a general discussion will be given here.

The first cash flow that must be estimated is the initial cost of the investment, composed of the cost that the seller is asking and the cost that the investment is worth.

It is fairly easy to determine the price the seller is asking. It is somewhat more difficult to determine the price that you should pay for an investment. Techniques for estimating the value of an investment vary with the type of investment. For example, a technique that works for estimating the value of common stock or a business probably would not work for determining the value of rental property.

A computer model allows you to see the effects of a 10 percent increase in expenses without actually having to make the investment.

No matter what you're buying, the first step is to determine the price of similar investments. If the asking price for your investment is out of line with that of similar investments, be careful.

Once you've determined that the selling price is reasonable compared to similar investments, then you refine your estimate of the appropriate price. The steps you should go through depend mostly on the type of investment.

The next step is to estimate expenses and income for the life of the investment. Income can be of two types: income from the investment and income from the eventual sale of the investment. Many investments have income from only one source. For example, an investment in a new piece of equipment for a business would be expected to produce income from increased business. But it would not normally be resold for a profit. On the other hand, many common stocks do not produce income; they do not have dividends, but are expected to be resold at a profit.

There are two questions that must be answered in order to project the income and expenses from an investment. First, what are the expected first year income and expenses from the investment? These can best be determined by careful analysis of the income and expenses of similar investments. The basic idea is that income and expenses from similar investments should be about the same. Any investment that has projected income or expenses different from those of similar investments should be examined with great care, as something is probably wrong.

Once first year income and expenses have been estimated, the next step is to estimate the growth of income and expenses over the life of the investment. You should begin by looking at past trends in the particular investment you're considering. Also look at past trends for the type of investment you're interested in.

The techniques used to make cash flow estimates depend on the type of investment. You should carefully study the techniques available for a given type of investment and then use the techniques best suited for you. A brief discussion of estimating cash flows for rental property followed by a short discussion of common stock have been chosen because they are two of the most common forms of investment.

ESTIMATING CASH FLOW FOR RENTAL PROPERTY

First let's look at rental property investments. The first step is to examine the expense and income history of the particular property you're interested in purchasing. Analyze pertinent books for the past several years. Use forecasting techniques to determine data trends. Verify whether some expense, for example maintenance, is too low or too high. A low value for an important expense may overstate the profit from the property. A high value may indicate a problem with the property.

Next, evaluate the past income and expense history of rental properties near the units you're considering. Start with properties in the neighborhood of your units, then look at property throughout the rest of the city. If you see that your units are out of line with the competition, find out why. Otherwise, you may have a serious problem. You should use forecasting techniques to estimate the trends for these properties too. The trends should be similar to those of your property. If they are not, look at all the figures to determine the reasons for discrepancies.

It is important to remember that if you use your money for one investment, it is not available for other investments.

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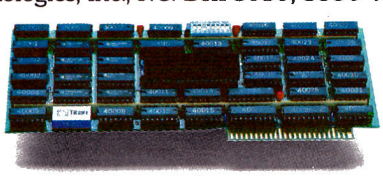

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CIRCLE 179 ON READER SERVICE CARD

Examine the age and condition of the various rental units. Compare with the age and condition of the property you're interested in. Remember that rental income can be expected to decrease as the age of the units increase, especially if the condition of the units falls below that of the competition. Also note that expenses for many properties can be expected to increase as a property ages.

Several techniques have been developed to help estimate income and expenses for real estate investments. You should be familiar with these if you are to take maximum advantage of the help you can get from a computer.

The final projection for real estate investment is the estimation of the future selling price. There are several techniques for making the projection; all give you an expected appreciation that can be used with the programs in this book.

The final step in estimating the future price of a property is to put yourself in the place of the buyer. Ask yourself if you would purchase the property. If you wouldn't, then why would someone else?

You should remember that the value of an investment is closely tied to the income and expenses produced by the investment.

CASH FLOW FROM COMMON STOCK

The cash flow from common stocks is the dividend paid by the stock and the capital gain from the eventual sale of the stock. Generally there are no expenses to estimate other than commission due when the stock is sold.

There are two basic techniques for estimating the future price of common stock, fundamental analysis and technical analysis. Fundamental analysis is based on the idea that careful study of the present and future prospects of a business can tell you the present and future value of the business' common stock. If the present price is less than the future value the stock is a good investment.

Technical analysis is based on the assumption that the present price and past price trends of a stock contains all the information necessary to determine the future price. If the future price is projected upwards, then the stock may be a good investment. If the future price is projected downwards, then the stock should be sold.

You should consult one of the many books on common stock evaluation to determine which method is best for you. Probably the best idea is to pick a method and stick with it.

SUMMARY

Estimating future cash flows can be a lot of work. Much information is needed and a considerable amount of study is required. The only way to reduce the effort required is to lower the number of investments that must be studied. An efficient way to do this is to make a best case study of all the investments you're considering. The information for this type of study is easy to obtain. Then use programs to analyze the investments. Reject all investments that the analysis shows are poor. If the investments are poor under best-case assumptions, there is little to be gained by making more realistic assumptions.

Go back and refine the projections for the investments that remain. Take considerable care in making the projections for these investments. Then rerun the analysis programs and select investments that meet your needs.

The worst possible situation is when the IRS says you made a profit and yet you have lost out of pocket money.

Methods of Investment Analysis

Several methods of analyzing investments have been developed. Some have been found useful and have survived; others have not. Some of the more common methods of investment analysis and their advantages and disadvantages are presented in this chapter.

SIMPLE RETURN ON INVESTMENT

Simple return on investment, or ROI, is one of the more common methods for evaluating an investment. Simple return on investment is the sum of all profits from the investment, divided by the capital cost of the investment times the number of year of the investment.

Example: Simple ROI

For example, let's assume that the total cost of the investment is $50,000. The profits from the investment are $10,000 the first year, $20,000 in both the second and third years, and $5,000 the fourth and final year. The return on investment is:

ROI = ($10,000 + 20,000 + 20,000 + 5,000) / (4 × 50,000)
= 55,000/(200,000) = 0.275 or 27.5 percent

The advantages claimed for the simple ROI method are:

- The calculation of simple ROI is easy.
- Simple ROI involves profit, and investors are used to thinking in terms of profit.
- It considers all profits in the life of the investment. (The payback method discussed below does not do this.)

The major disadvantages of the method are:

- There are no universal definitions of invested capital or profits so there is no assurance that everyone is talking about the same things.
- The method provides for a single initial investment followed by a series of yearly profits or losses. It does not provide for additional investment during the life of the investment.
- It does not include the time value of money. Profits earned during the early years are given the same weight as profits earned later. This is a poor way to treat cash flows for two reasons. First, future cash flows are more uncertain than near-term cash flows and thus are riskier. Second, the time value of money shows that near-term cash flows are more valuable than long-term cash flows.

Because the simple ROI method neglects the timing of the cash flows, it must be considered a very crude tool for investment analysis and decision making.

PAYBACK PERIOD

The *payback method* is a popular way of analyzing investments. You simply ask how soon the income from an investment equals the cost of the investment. Investments with the shortest payback period are selected.

The payback period is calculated from the annual cash flows for each year of the investment. The annual cash flow is given by:

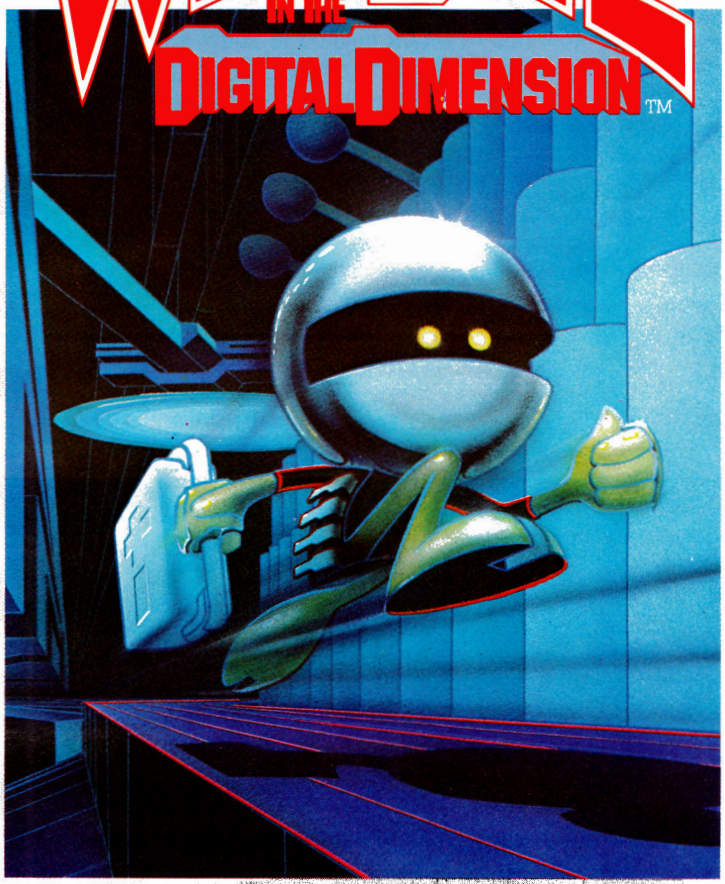
profit for year + depreciation − tax paid.

For example, assume you have a chance to invest $10,000 in a new business. The investment will earn $2,000 a year. The payback period is then five years.

The main advantage of the payback period is that it tells you how soon you will get your money back. The main disadvantages of the payback period method are:

- It does not identify the profitability of an investment, which is what really matters. I don't know anyone who invests to minimize payback time.
- It ignores the timing of cash flows.
- It completely ignores all cash flows that occur after the payback period. Thus

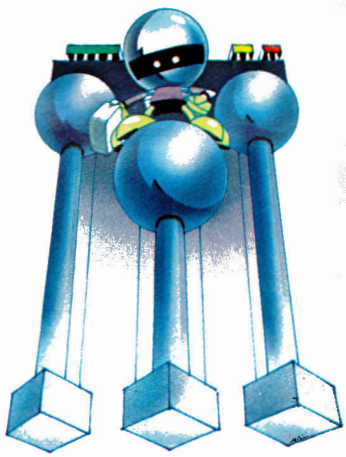
WILLY BYTE IN THE DIGITAL DIMENSION™



CHARACTERS

Willy Byte: electronic hero
Hex Luthor: digital archvillian
Cybil Nibble: 13 year-old player of Willy Byte in the Digital Dimension
Sidney Nibble: 16 year-old brother

Scene – A suburban home in the 1980's on a late Sunday evening. A teenager, Cybil Nibble, has been playing (for the umpteenth time) Willy Byte in the Digital Dimension, the newest creation in computer software from Data Trek, Inc. She decides to go to bed and quickly enters into a deep sleep that plunges her into the Digital Dimension. She finds herself on the ground gazing at eight towering electronic circuit poles, each emitting an orange glow that consumes the entire sky. Fascinated and perplexed by the sudden change in



environments, Cybil notices an animated object, high in the heavens, swinging from pole to pole.

Cybil (whispering to herself): The lightning speed, the energetic response, the total commitment, it must be Willy Byte!

(At that moment the game's charismatic electronic hero, Willy, sees Cybil and slides gracefully down the pole to meet his newest acquaintance.)

Willy Byte (cheerfully): Greetings, Cybil! Welcome to the Digital Dimension.

Cybil: The Digital what?

Willy: You know my home, the inside of your computer. Watch this!

(Off he scampers about the keyboard room, pulling and tugging on each bit while dodging the stinging sensation of static charges. As soon as Willy completes his task and the byte has safely left the keyboard room, a pale expression comes over Willy's face.)

Cybil: Are you alright?

Willy Byte (concerned): Problems in the Power Room.

Cybil (confused): What problems?

Willy Byte (assertive): Follow me!

(As Willy and Cybil sprint toward the I/O port, a sinister laugh is heard from above – the laughter of Hex Luthor. Suddenly a bolt of static charge is seen thundering its way toward Willy Byte.)

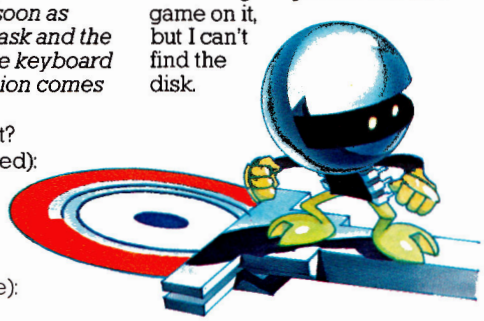
Cybil: Watch out, Willy!

(Cybil awakens from her dream to find her brother Sidney standing in her doorway.)

Sidney (concerned): Cybil, are you alright?

Cybil: I guess I was dreaming.

Sidney: As I was walking to the kitchen I noticed that the computer was left on. The screen's got a picture of a new game on it, but I can't find the disk.



Cybil (animatedly): Yeah, it's Willy Byte in the Digital Dimension. Mom and Dad bought it for us. I'll show you.

Sidney (sarcastically): They did what!?

Cybil *(on a sudden upsurge of emotion)*: Dad says that when I play Willy Byte I **learn** all kinds of stuff about computers.

Sidney: Like what?

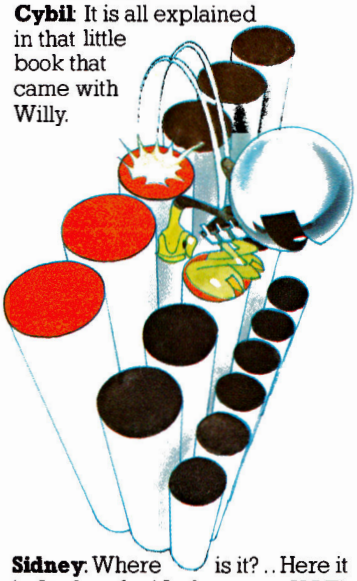
Cybil: First you jump into the CPU room. And then there are lots of other game rooms to explore, and each is a part of the computer.

Sidney: Oh really?

Cybil: Yeah! And in **this** game you guide Willy on his wild adventures while he skydives into the Power room, operates a crane in the RAM room, bounces in and out of the CPU, and zips around the Disk Drive room. I got extra points for flowcharting Willy's . . .

Sidney (perplexed): Flowcharting? What's flowcharting?

Cybil: It is all explained in that little book that came with Willy.



Sidney: Where is it? . . Here it is. Look at that! Is that cover HOT! It looks like an album cover. From the looks of all these pictures, . . . This looks great . . . Got to Play! Where's the disk? . . . Cybil!

Cybil (dashing to the computer): Mom and Dad will let us play as long as we want and I'm first.

Sidney (impatiently): Go for it!

Look for Willy Byte in the Digital Dimension at your nearest dealer or call DTI Data Trek toll-free at **(800) 654-SOFT.** In California, call toll-free **(800) 652-DATA.**

Suggested Retail: **$39.95**

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CIRCLE 187 ON READER SERVICE CARD

an investment with a two-year payback period followed by no income would be preferred to an investment with a three-year payback period followed by three years of high profits. This doesn't sound like a choice most people would make.

- It does not apply to many types of investments in which the main profit is from capital gains, for example a real estate investment.

Despite all its disadvantages, the payback period method is favored by many investors. It is useful as a rough screening method. However, the fact that it totally ignores the time value of money must be considered a fatal flaw.

DISCOUNTED CASH FLOW RETURN ON INVESTMENT

The discounted cash flow return on investment or *the internal rate of return method* is one of two methods of investment analysis which considers the time value of money. The idea is to find the discount rate that makes the present value of total cash flows for the life of the investment equal to the present value of the cost of the investment. The method requires trial-and-error calculations, but these are easy with a computer. Without a computer the calculations would be tedious and probably make the method unusable, especially if several investments must be examined.

A personal computer is more powerful than a mainframe computer for investment analysis, because you work interactively.

The major advantage of the discounted cash flow return on investment method is that you don't have to assume a discount rate. The method produces a number that has real meaning and is useful for decision making. To use the discounted cash flow return on investment method to rank investments, choose the investment with the highest discounted cash flow return on investment.

The major problems with the discounted cash flow return on investment method are:

- Good investments might be missed when funds are limited. To see how this might happen consider the case shown in Figure 1. Note that investment A has the highest internal rate of return. You want to invest all available funds, so you will select investments A and C. However, an examination of the combined rate of return from A and C shows that investment B is best for all your money. There are ways to modify the discounted cash flow rate of return method to allow for the case shown in Figure 1. However, these make the computations even more difficult.
- The method can produce two values of discounted cash flow return on investment. This is a serious problem if some of the cash flows during the life of the investment are negative and some are positive. Figure 2 shows this.

NET PRESENT VALUE

The final method is the *net present value method*. This is the other method that considers the time value of money. In the net present value method, all future cash flows from the investment are discounted with a predetermined discount rate. If the net present value of all future cash flows is greater than the present value of the cost of the investment, the investment is considered profitable.

The biggest problem with the method is in determining the value of the discount rate to be used. The general advice is to use the larger of the cost of capital and the maximum risk free return. The investment criterion is that an investment with a present value greater than or equal to the cost of the investment will be accepted. If more than one acceptable investment is found, then the investment with the greatest net present value will be selected.

When the present value of future cash flows is less than the cost of the investment, the earnings from the investment were less than you would receive, had you put your money into the investment represented by the discount rate. If you consistently find that your investments are not producing a high present value, you should be sure that you are using the correct discount rate.

THE EFFECT OF DISCOUNT RATE CHOICE

The value used for the discount rate has a large effect on the calculated net present value. The effect of this on investment decision making is discussed in this section.

The *net present values* (present value of all cash flows less present value of cost of investment) for two investments are plotted as a function of discount rate in Figure 3. At low discount rates investment A is superior; at high discount rates investment B is superior. Investment B's ranking improves as the discount rate increases because investment B has higher early cash flows than does investment A. At low discount rates, the value of investment A's later year cash flows is still high. However, as the discount rate increases, the value of future year cash flows greatly decreases.

This example is meant to show the importance of selecting the correct discount rate. To do this you must know the cost of capital and the available returns on risk free investments.

The major advantage of the discounted cash flow return on investment method is that you don't have to assume a discount rate.

HIDDEN ASSUMPTION

There is one significant assumption made in the discounted cash flow methods that needs to be discussed. This assumption is that incoming cash flows from the investment can be reinvested at the discount rate. For the discounted cash flow return on investment method this means that you are assuming you can invest all profits at the discounted cash flow return on investment rate.

For the net present value method the assumption is that one can reinvest at the cost of capital. This should be fairly close to the truth, which means that in the long run the assumption in the net present value method is not as radical as the assumption in the discounted cash flow return on investment method.

The main danger of using the discounted cash flow methods of investment analysis is that you can be so confident of the details of the calculations that you forget other important factors.

Leslie E. Sparks is involved in utility research and development. He has published numerous articles in technical journals and microcomputing magazines. He has a Ph.D. in engineering from the University of Washington.

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CIRCLE 761 ON READER SERVICE CARD

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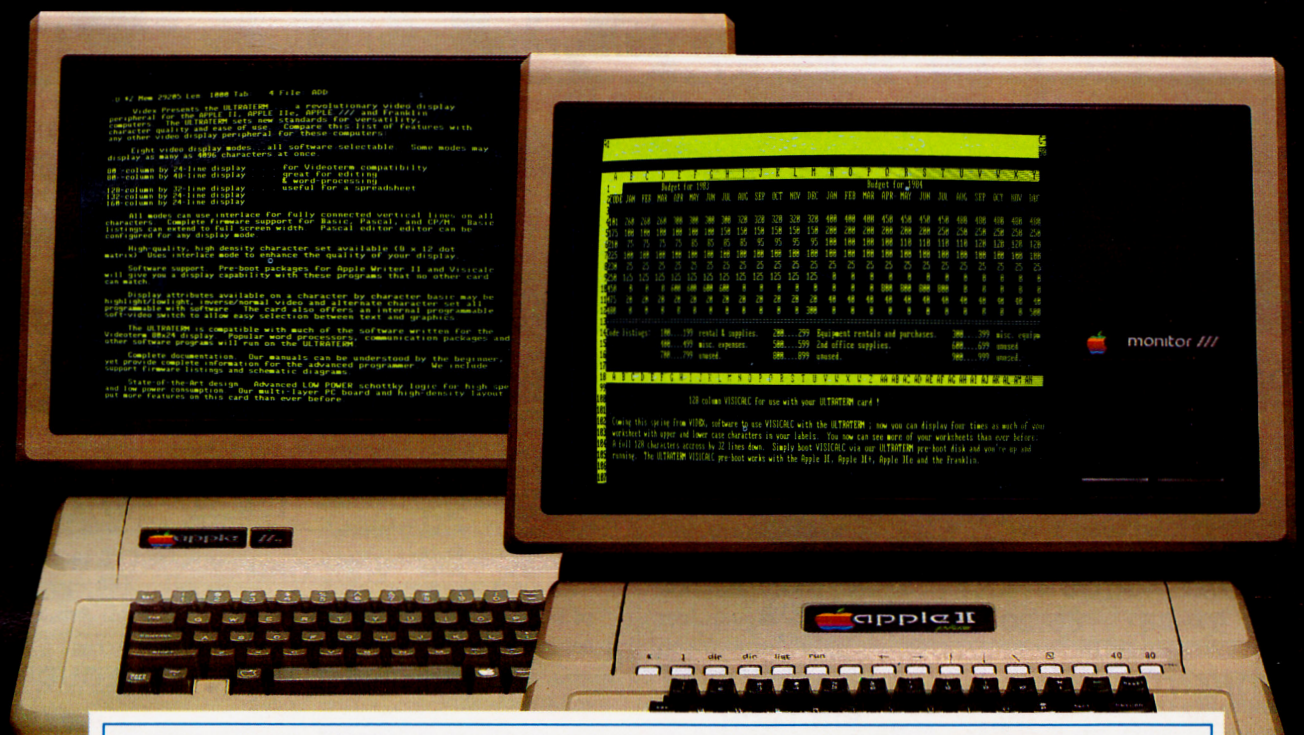

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CIRCLE 142 ON READER SERVICE CARD

A+ THAT'S ENTERTAINMENT

HARD HAT MACK

Hard Hat Mack
Electronic Arts
2755 Campus Dr.
San Mateo, CA 94403
List Price: $35.00
Requires: 48K, IIe II+ II
one disk drive.

CIRCLE 796 ON READER SERVICE CARD

Hold on to your hard hats and make way for Mack, a bona fide blue-collar construction worker fueled by cupcakes and an unshakable belief in the work ethic. Mack works on a skyscraper, but loose rivets, swinging girders, vicious vandals, nosy OSHA inspectors, and an open furnace threaten to turn his project into a towering inferno. This man of steel leaps five stories in a single bound, tosses girders around like beer cans, scambles up and down hanging chains, and wrestles runaway riveters to the ground floor.

Hard Hat Mack, a frenetic arcade-style game, puts you in Mack's steel-toed shoes. You maneuver him across three sequential screens of feverish activity, each more challenging than the last. Each structure is graphically superb. Mack, the good guy, wears a white hard hat. Vandals look like inmates in a punk rock asylum and Office of Safety and Health Administration (OSHA) inspectors appear to place their thumbs in their ears and wiggle their hands to taunt him. Steam engines puff up and down, exposed wiring crackles with blue and orange electricity, and deadly flames flicker from a furnace. A catchy, driving beat accompanies Mack as he tiptoes between blobs of concrete and scurries out from under stamping machines.

If he fails to negotiate a fast-moving conveyor belt, he's promptly electrocuted by the exposed wiring.

Handles Vandals

In the first screen, Mack must install four sections of steel beams on four floors, grab the runaway riveter, and rivet the beams into place. He moves from floor to floor by dashing up and down chains, taking an elevator, or bouncing off a trampoline. Outwitting the OSHA inspector or the vandal is fairly easy, but loose rivets present a real danger as they bounce down through the structure. These random rivets are like guided missiles fixed on Mack's head. A direct hit from one of these steel beanballs and Mack enters a graceful death pirouette.

On the second screen, Mack must collect six tool boxes. He starts by darting between cement blobs and onto a conveyor belt, which brings him to a central girder that rises and descends three floors. Mack must be very careful jumping from girder to floor and back, for a mistimed leap can cause him to fall to an inglorious death in the cement mixer. The most diabolical obstacle of the game are the pliers of death. They open and close rapidly, obligating Mack to hop in and out only when the pincers are wide open. When the tool





boxes are collected, Mack leaves the screen by leaping onto a conveyor belt, which whisks him to a moving electromagnet that picks him up by his hard hat. If he miscalculates the speed of the magnet, the belt tosses him into a furnace, where he bursts into a fireball before plummeting to his doom.

On the third screen, Mack must collect six steel boxes from four floors and toss them into a rivet-making machine. He can again move from floor to floor by a central escalator, chains, or by bouncing off a pair of trampolines. Should Mack bungle a leap, he falls through the roof of a port-a-potty and lands with a splash. Vandals or OSHA inspectors keep Mack on his steel-clad toes, and if he fails to negotiate a fast-moving conveyor belt, he's promptly electrocuted by exposed wiring.

If he completes the third task, Mack returns to the first screen, where he faces more vandals and OSHA inspectors and faster-falling rivets.

Learn by Falling

Hard Hat Mack can be played with joysticks or from the keyboard. Keyboard controls are very responsive, and the game allows you to choose which key performs a given action. The game also allows you to start at a higher level screen, which is good for mastering the sinister pliers of death.

My complaint is the lack of instructions. Designers Michael Abbot and Matthew Alexander tell you how to move, but provide only sketchy details on overcoming obstacles. They apparently prefer to let you learn from experience. Many a less-than-dexterous Mack fell during the learning process.

Hard Hat Mack is a fast and exciting game that will keep you riveted to your seat. Its apparently simple tasks challenge your reflexes constantly. *Hard Hat Mack* towers over most arcade games and rates a full 100 stories.

FROGGER

Frogger
Sierra On-Line Inc.
36575 Mudge Ranch Rd.
Coarsegold, CA 93614
List Price: $34.95
Requires: 48K, Apple II, Apple II+, Apple IIe DOS 3.3, joysticks optional.

CIRCLE 795 ON READER SERVICE CARD

Ah, the trials and tribulations of being a peace-loving frog these days. It's safer back home in the swamp.

Consider this: Why would a frog cross the road? There are rampaging trucks and out-of-control cars zooming every which way, and not a CHiPs patrol in sight. Why, for that matter, would a frog want to cross the river? Oh, sure, there are some hospitable logs on which to hitch a ride and even a few friendly turtles willing to offer a floating platform. But watch out—there are snakes on the logs, the turtles sometimes decide to dive below the water, and there are carnivorous otters and hungry crocodiles.

What frog would go through all this to get to a lily pad on the other side?

Well, never mind the whys and wherefores. This is another dumb arcade game that defies explanation. It also happens to be a whole frog pond full of fun. *Frogger* is a first-rate translation of an arcade favorite, complete with music, sound effects, and clever graphics. It has survived its transition to the small screen of an Apple II.

Frog No Chicken

The point of the game is to maneuver your frog from the bottom of the screen to one of 5 lily pads at the top. In the first challenge you have to zig-zag across five lanes of traffic. The lanes alternate direction and move at varying speeds. Halfway across the screen is the bank of the river. Here you must shift gears and have your frog jump onto passing logs and turtles en route to the lily pads.

The game is not easy and should appeal to all age levels. Perhaps best of all, *Frogger* is not a shoot-em-up or a beat-em-down game. The frog zigs and zags to a nice little hopping sound; a mishap with a truck yields a splat noise, and a bounce into the river produces an audible splash. There is also a clock; you get extra points for completing a round quickly. The frog even has his own theme music to signal his first appearance on screen, the transition to a higher level of play, and his final passing. (I did, though, play the game enough to get tired of the music and I sorely missed a control to shut off the sound—a feature available on the IBM PC version of the same game. The absence of a silent mode also makes it difficult to make the boss think you're pounding away busily at a *VisiCalc* spreadsheet instead of negotiating the swamp.)

Perhaps best of all, Frogger is not a shoot-em-up or a beat-em-down game.

Keyboard or Joystick

The game can be played from the keyboard, with user-selectable keys for up,



down, left, and right, or from a joystick. I tested the *Frogger* with the Apple IIe joystick and found the response sluggish and unpredictable. From the keyboard, response was quick and sure. I used the up and down cursor keys on the IIe for those movements and the Z and X keys under my left hand for left and right movement. On Apple II machines without cursor keys, the user may choose whatever combinations are comfortable, perhaps even an adaptation of a diamond arrangement like *WordStar's* E-S-X-D combination.

The game can be stopped during play by using the Esc key, and play can be slowed by the shift and 1 combination. There is no choice of game levels or background colors—two options available on other machine versions of *Frogger*. The program is copy-protected and uses its own operating system. A registry of high scores on the disk is missing. You can retain only the top rating for the day, until the power is shut off.

These small problems notwithstanding, a hopping good time can be had by all. *Frogger* has a leg up on most games brought down from the arcades to the home computer.

CHAMPIONSHIP GOLF

Championship Golf
Hayden Software
600 Suffolk St.
Lowell, MA 01853
List Price: $24.95
Requires: 48K, Apple II with Applesoft, disk drive.

CIRCLE 799 ON READER SERVICE CARD

It is an experience that tries the mettle of even the strongest person. It probes deeply into the core of your consciousness and deeper still into the hidden passages of your subconscious, relentlessly seeking unsuspected weaknesses and character flaws that it can expose suddenly to a disapproving world. It can be a scourge, but it can also bring dreams of glory vividly to life. It can take you to the heights of ecstasy, where you will feel godlike, but it can also torture you as if you were a soul in the pit of Hades.

I am, of course, referring to golf.

Golf is a hard subject to write about unemotionally. It is a game you either hate or love and, though if you have the good sense to hate it from the very start, it is a game you can try once or twice and walk away from. For the rest of us, hating or loving the game is immaterial. Once you are hooked on the game you play it, whether it is a delight or a torment.

Hayden Software's *Championship Golf* manages with remarkable accuracy to capture those aspects of fun and frustration that characterize the game as it is actually played. Even more remarkable is that it is a simulation that is strictly strategic and requires no eye-hand skills.

Championship Golf begins with a screen prompt that offers to display the rules. If you use this option, ten screens that explain how the game is played follow. As in real golf, the object is to get your ball from the tee to the hole in as few strokes as possible. Sounds simple, doesn't it? It sounds even simpler when you consider that there is only one penalty situation in the entire game: one stroke is assessed when you hit your ball out of bounds.

In your computer golf bag you have twenty clubs, including woods numbering from 1 to 9, nine irons, a pitching wedge and a sand wedge. To select any of



these clubs you use a simple code. For example, if you want to use a 1 wood, you key in the code 1W. To make an approach shot with your 7 iron, you key in 7I. In the booklet that comes with the game disk there is a handy chart that calculates the average distance each club will send the ball when swung at full strength.

Once you have read the rules you are prompted to select the number of players—you can have as many as four in your party—and your handicap, which is really a skill level rating of from one to eighteen. You are now ready to stride up to the first tee.

Actually, the computer does the striding by bringing the first hole to you on the video screen in a high-resolution graphic showing the hole from the top and in profile. The in-bounds area is indicated by a green outline. When you shoot a ball that hits the line, you incur the extra stroke penalty. The tee is marked by two orange dots; your ball, which is not marked on screen as you tee off, lies between those dots. At the other end of the hole is a small green circle with a little dot in the center marking the cup; this, of course, is the green. Flanking the green will be one or more irregular orange blots, denoting the sand-trap. Once you know where you are, it's just a matter of figuring out how to get your electronic club out of your electronic golf bag, size up the shot and hit the ball.

To do this you look at the bottom of the screen, where a text window gives the number of the hole you are on, the length of the hole in yards, and the number of strokes you have used so far. You will also see the prompt, "Player 1, it is your turn. Player 1, what club will you use?" If you key in a "C" you will be taken to a command menu. Options on that menu allow you to flash the ball on the graphic display, display the club performance chart, display the scorecard, and end the game.

With the ball flashed and spotted, the next task is to decide how hard you want to hit it. Text window prompts offer you from 1 to 10 factors of strength. This choice will determine how far the ball will fly when it's been hit. Study the layout of the hole carefully. Sometimes it is wiser to use less strength to keep the ball in bounds.

Now that you know what club you are using, where the ball is, and how hard you want to hit it, you must decide which way to hit it. If you remember high school geometry, you'll recall that a circle is divided into 360 degrees. So is the display. The ball is at the center of the circle, north is at 360 degrees, east at 90 degrees,



south at 180 degrees, and west at 270 degrees. To answer the prompt "Which direction? (0-360)," you decide where you want the ball to land, calculate the direction from the location of the ball, and key in the value in degrees.

In play it can be surprisingly difficult to figure out in degrees the exact direction that the ball must travel to reach the pin. On the other hand, it is not at all difficult to land the ball out of bounds. If you do, the computer will courteously place the ball where it went out and assess you an extra stroke. When you are in the command mode you can opt for a current total of your strokes, broken down by individual holes, back and front nines and match totals. This can be a real advantage because for some golfers addition is the hardest part of the game. There is, by the way, no way you can cheat on your scorecard, a feature that may win only faint praise from real golfers.

Assuming you've managed to get within a short iron's distance from the green, say from 14 to 25 yards, you must select an iron to chip onto the green with. Picking, for example, a 9 iron or your pitching wedge (coded 10I on the selection chart), you have to decide how strong your swing must be. Recall that a pitching wedge is rated at an average of 110 yards at full strength and you may decide that a force of 5 points out of 10 will be sufficient. Fine. You set the direction and the ball arcs gracefully on the video display . . . right over the green and out of bounds. You have to remember that the distances quoted on the charts are averages and that the club may perform under or over rated levels.

A new screen displays the green as a green circle, the cup as a black square and the ball as a black dot. The computer has already selected the putter; you have to select the force level and direction. If you hit the ball too hard, too soft or slightly off course, you will see it lip the cup and roll away.

In *Championship Golf* Hayden has created a simulation which, though it calls for no athletic or eye-hand skills, has captured the feeling of the actual game. Every hole is laid out differently, for variety, and details like the sand-traps, the potential of chipping out or making a hole-in-one add to the sensation that you are really playing golf.

Perhaps the final test is whether or not you can be hooked on the simulation as you might be on the real game. The answer, I'm afraid, is yes. It was very hard to get away from the game long enough to write this profile. In fact, I think I'll drop what I'm doing right now and try to fit in a quick nine holes before lunch. Fore!

COSMIC BALANCE

The Cosmic Balance
Strategic Simulations Inc.
465 Fairchild Ave., Suite 108
Mountain View, CA 94043
List Price: $39.95
Requires: 48K, Apple II+, Apple II with Apple soft, disk drive.

CIRCLE 798 ON READER SERVICE CARD

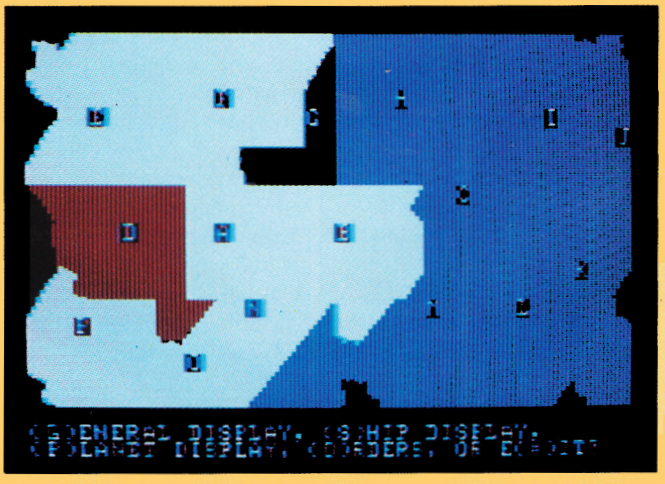
If humans ever take their wars into space, battles will be fought at mind-boggling speed. A commanding officer will have only a split second to make judgements that will decide the fate of his ship and of his crew. All that's in the future. Today's space battles are all fought in simulation—may it ever be so—and even a game designed for fast play like *The Cosmic Balance* moves along at a stately pace. Good thing, because this rapid fire game takes time to master.

Cosmic Balance is a wargame from Strategic Simulations Inc., set in the distant future. The scenario is a conflict between two star empires, the Alliance and the Brotherhood. Four ship-to-ship battles, a planet bombardment, and an invasion are simulated. In each of the scenarios, the computer can play the Brotherhood role.

The game begins with a menu that allows you to select a two player or solitaire mode and one of six scenarios. Once you've chosen the game you want and indicated the level of difficulty (from 1 to 4), you begin one of the most enjoyable aspects of the game, the ship's design, in which you tailor a warship to meet your specific needs. You start with the hull, picking from 5 sizes ranging from corvette to dreadnought. The larger the size you select, the more space you have inside the ship to install weaponry, star drive, marines, robot fighters, and so on.

Limitations and Compromise

Building a starship is a real exercise in compromise. Ideally, you would want a ship that is very fast and fully-armored, that can launch every conceivable type of weapon, and that has plenty of room for marines in case you feel like beaming a platoon over to the enemy's bridge in the middle of the battle. Unfortunately, you will never have enough space, no matter what size ship you decide to build, to pack in all the weapons and extras that you'd like. You must sacrifice speed for weapons, the number of weapons for cargo, and



so on. The best designs for each scenario will emerge after you've had practice designing ships and trying them out against the computer opposition.

Play begins with the orders phase, in which you set the course and speed of the ship.

The range of weaponry is wide. There are light and heavy seekers, guided bombs that home in on enemy ships; fighters, robot crafts that also home in, attacking over and over until they or the enemy are destroyed; three grades of phasers, energy beam weapons; photon torpedoes, plasma torpedoes and disruptors, which are long range weapons. Your main defensive weapons are belts, the small craft that orbit your ship to intercept seekers and fighters, and electronic countermeasure systems.

Ship design can be the longest part of the game because the tempation to tinker is irresistable. Eventually, when you have the perfect ship, you can save that design for recall in future games by using a scratch disk, which the *Cosmic Balance* program will initial for you.

Making Your Moves

With the ship design set, the next phase is the game itself. Play begins with the orders phase, in which you set the course and speed of the ship (it always begins with your ship facing the oncoming enemy at a speed of zero), activate electronic countermeasures and fire weapons. Using commands from a special menu, you can refer quickly to maps showing your position relative to the enemy's and calculate your future position based on your latest course changes. The move you plan is divided into 16 time points. You can begin a course change at any one of those points and fire your weapons at any time point. During the orders phase you can also transport marines or launch guided weapons. You may also use this phase of the game to repair damage to the protective screens by recharging them with energy.

When you've completed your move, the computer displays a graphic of the battle scene. You select the ship to attack and the attack's scale. Manuevers of the opposition ships and the firing are represented one time point at a time. If there is no firing during a specific time point, the following points will be displayed immediately, giving the graphic an animated look. If there is firing, the graphic will pause until your next keystroke, allowing you time to evaluate what has happened.

After each weapon is fired a message will appear on the screen announcing results, including destruction of enemy targets. Victory points are displayed at the end of the game. If one side has been wiped out, the winner is obvious, but victory points are handy when the game ends with both sides still operating but damaged. Points are calculated on the basis of damage inflicted and, if the battle was in an unfriendly sector, the ability of the invading ship to escape.

SSI promotes *Cosmic Balance* and the other games in the Rapid Fire series as action-oriented, fast-playing games. The company claims that a complete game of *Cosmic Balance* can be played in just ten minutes. I was able to play just that fast a game, but only by using saved ship designs from a scratch disk, playing a computer opponent, and bringing several hours of prior experience with *Cosmic Balance*.

The key is experience. Luckily, *Cosmic Balance* is an engrossing game that will permit you to acquire so much experience that you soon will be dashing off fast, action-packed games with skill and daring of a steel-nerved starship captain.

HOW TO WIN THE DECATHLON

Microsoft
Bellevue, WA 98004
(206) 828-8080
Price: $29.95
Requires: Apple II or IIe. Uses 48K or 64K respectively. Color monitor optional.

CIRCLE 760 ON READER SERVICE CARD

As the world sports community gears up for next year's Olympics in Los Angeles, armchair athletes may find their niches in *Decathlon*, a game based on the rigorous, 10-event track and field competition originated by the ancient Greeks.

The popular game has been on the market since 1980 and is an ingenious suite of 10 computer games patterned after the original decathlon. As we will see in next year's Olympics, the decathlon competition is among the most illustrious events and, like the original, the modern event takes two full days to complete. The computerized simulation condenses the decathlon into a game which can be played within one or two hours.

The publisher of *Decathlon*, Microsoft Corporation of Bellevue, Washington, has adopted all the events of the decathlon for its simulated version—everything from the 100-Meter Dash to the 1,500-Meter Run. The other competitions are the Long Jump, the Shot-Put, the High Jump, the 400-Meter Dash, the 110-Meter Hurdle, the Discus Throw, the Pole Vault, and the Javelin.

As in the real-world situation, *Decathlon* must be played against actual opponents, and, as in the Olympics, brute strength and physical skill will not, by themselves, produce a winning score. In addition to agility, the player must have a series of strategies and be especially keen in eye-hand coordination.

Although the demands of the game are high, it is designed for the entire family. To accommodate different abilities, the opening menu offers the beginner means of practicing without an opponent. And, to fit into the family budget, it retails for $29.95. The game requires strong keyboard skills and quick thinking as well as paddle and joystick dexterity. To win, the player must push buttons, twirl knobs and press keyboard selections appropriate to the 10 different events.

Physical Education and Otherwise

In keeping with ethical game design, *Decathlon* draws on many skills. By exercising eye-hand coordination, the game provides a comprehensive computer



orientation, a valuable by-product for educators.

When trying *Decathlon* in a schoolroom full of 12-year-olds, I noticed that children normally reluctant to use a computer were eager to participate.

I also have noticed that *Decathlon* promotes increased participation from students who have had computer arcade and joystick experience, but no actual keyboard skills. Instead of the usual zapping of bugs and shooting down of Martians, the children using the keyboard for the first time were, for the first time, playing a game applicable to their world.

The game is a two-dimensional simulation of real track and field skills, and it does approximate the human dimension within the restrictive confines of the programming art for the 6502 chip, the BASIC language, and the Apple.

The designer actually consulted texts and reference books on education, sports, medicine, and related issues while writing the game.

Decathlon seems best played on a high-resolution color monitor. And, although it can be used on many systems, my family plays it on an Apple II$^+$ which has a color monitor.

Knowing the Field

The high quality of the color graphics is one of the many pluses of the simulated game. They first show up after booting the system. Then the manufacturer's logo and product banner appear on the screen and later the traditional five-ring Olympic insignia shows up. The graphics are accompanied by a synthesized music sequence of the Olympic theme song. You'll get used to the tune soon enough. Because it plays each time you boot the system and it can't be shut off, the jingle can be annoying to listen to.

After the music stops, you and your opponents can then select from the log menu whether you want to play or practice. If you decide to play a game, you then select the number of players and type their names.

Ideally, the game is set up for two players but the software is written to handle statistics and scores for as many as six. If there are more than two players, be warned that the game becomes increasingly lengthy and complex. The program accepts only two players at a time and eliminates competitors for each event as the session progresses. Additionally, because of the pace of the game, playing with three or more people sometimes can create an aggravating situation.

Next, the game's name must be selected. The name will be the one used by the system to keep scores and to move players around. It cannot be changed after the competition begins. Selection of the name is up to the players, of course. Examples used in recent games are: David and Goliath, The Vatican and Bulgaria, Apple and IBM and, for a three-way match, Ireland, Canada, and Holland.

After the players are logged on, the program tells them what they need to perform each sequence.

And They're Off!

On the 100-Meter Dash, the first event, an oval track appears and each player takes a position as designated by the screen. The word READY then flashes on the screen and, after a momentary pause, the image of a firing gun indicates the game has begun. The computer's speaker emits a slight burping noise as the gun sounds a bang.

To move the athletes along the computer track, the player must press the designated cursor keys in rapid, rhythmic up-and-down motions. After an event ends, scores and standings are compiled and the game automatically moves on to the Long Jump, the next event.

From the Inside

Rather than review each event as it occurs, it may be more helpful to look at the game as programmers see it.

In both the game and the real Olympic event, the 10 parts can be broken down into three groups. They are running, jumping, and throwing events.

Because of this breakdown, the programmers needed to design three subprograms rather than 10. Using the three fundamental environments, they fit each of the events into the broader Olympic categories of throwing, running and jumping.

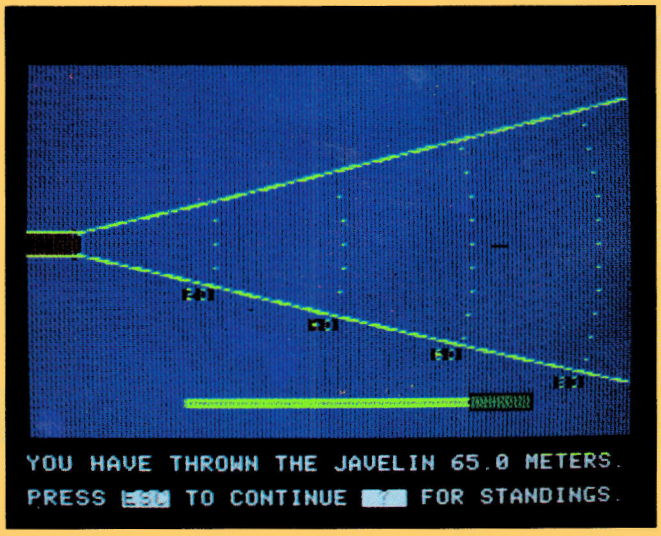
The three basic environments in place, the programmers simply wrote overlays to modify each event in keeping with its appropriate length, geometry, and velocity.

The running events use a track and preset parameters, but the throwing and jumping are set up from individual factors determined by the competitors. When a player sets an option, such as run-up speed in the Long Jump, the program executes accordingly. The player is actually programming the system indirectly.

Running Blues

The running events have the fewest options and demand very little strategy. With the exception of the 110-meter High Hurdle, which requires 2 paddles and 2 buttons, the running games can be tedious. And yet, like running, the simulated sequences demand the most physical exertion.

Generally, smooth, alternating keystrokes at the designated cursor keys usu-



ally win the race. This is fun in the 100-Meter Dash and acceptable in the 400-Meter Run. But because the 1,500-Meter Run is at the end of a 10-event sequence, it soon becomes a finger-stubbing marathon. This can drain the enjoyment from the game.

Unlike running, which taxes the legs and lungs the most, *Decathlon* can cause fingers and the keyboard to poop out after four full laps at the cursor controls.

Of the 4 running events and the 3 exclusive jumping competitions, only the 100-Meter Hurdle combines both activities. In the game simulation, the 110-Meter High Hurdle is played with 2 paddle accessories. Either the joystick or rheostat part of the paddle is used. Only the buttons, which control one of the runner's legs, are pressed. To propel the simulated Olympic athlete along the course, as depicted on the screen, the player must press the buttons smoothly and in proper running sequence. Simultaneously, he must hit both buttons as the screen athlete encounters each hurdle. Pressing both buttons causes the simulated runner to leap from stride and fly over the hurdles. By using the back-and-forth pumping motion, the runner will resume stride. If the player hits both buttons too soon, the runner leaps too quickly, often landing on top of a hurdle. If the player triggers the leap too late, the runner can hit a hurdle and knock it down. Three hurdles down means disqualification from that event with a null score.

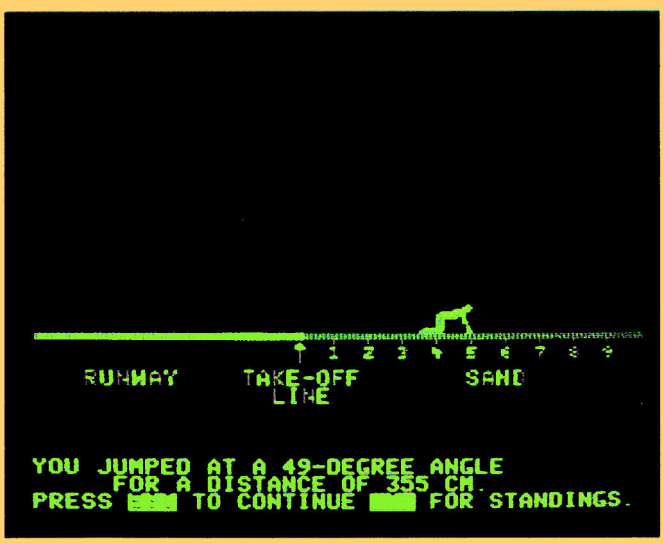
Sky's the Limit

The Long Jump, High Jump, and Pole Vault are the three jumping events. To set a jumping event in *Decathlon,* the player must estimate his run-up velocity and set the jumping point and angle, accordingly. Many prompts on the screen aid this.

When setting the velocity, the computer runner pauses. Then, when the player hits the key, the athlete's image enters the field of view. To then create a jump, the player must plant the athlete's foot by manipulating one key and send the Olympian into the air using another key.

To achieve this simulation, the game designers have included a fast-moving protractor module as a subroutine. In each jumping event, the player must judge angle and velocity. In so doing, he gets a lesson in practical physics.

The best tip here is always to use maximum run-up speeds and be sure to know where to set the jumper's foot or the pole.





Also, be sure to pause between the set foot signal and the protractor thrust. The length of the pause will allow the protractor to unwind a few more degrees. Too long a pause will cause the jumper to crash into the bar. One too short will send the jumper flying straight up in the air without clearing the bar, only to fall flat on the hard, cold runway.

In all events, each player gets three chances. But in the jumping events, the top player can set the bar at any height to challenge the others.

Three Throws

The three throwing events also call on the protractor but require the special degrees of adjustment found only on paddles.

In the Shot-Put, two screens are used. The set-up screen shows a close-up of a male figure preparing for the event. The program commands the player to set the two paddles to zero and explains that the event will start after one or both of the knobs are rotated.

The player must then estimate an x–y axis, which simulates the upper forearm action of the graphically reproduced athlete on the screen. The trick here is to start the upper arm in motion slowly, then move to the forearm. This will cause the angle to set and the arm to unwind. The player must then return to the upper arm motion for a final thrust.

Once the final thrust is made, the screen switches to a wider view, and the player sees the actual path of the shot-put relative to the pit.

Many funny things can go wrong here. The most frequent blunder is to drop the shot-put either behind the athlete or directly on his toe. More embarrassingly is to throw the shot straight up, only to watch it fall on the athlete's head.

The Javelin requires the player to set a foot and use the protractor to judge distance, while controlling the spear and setting the angle before the throw.

The Discus event is based on the same simulation principle, but the field of view is longer, and the player is required to turn the athlete's body on the screen.

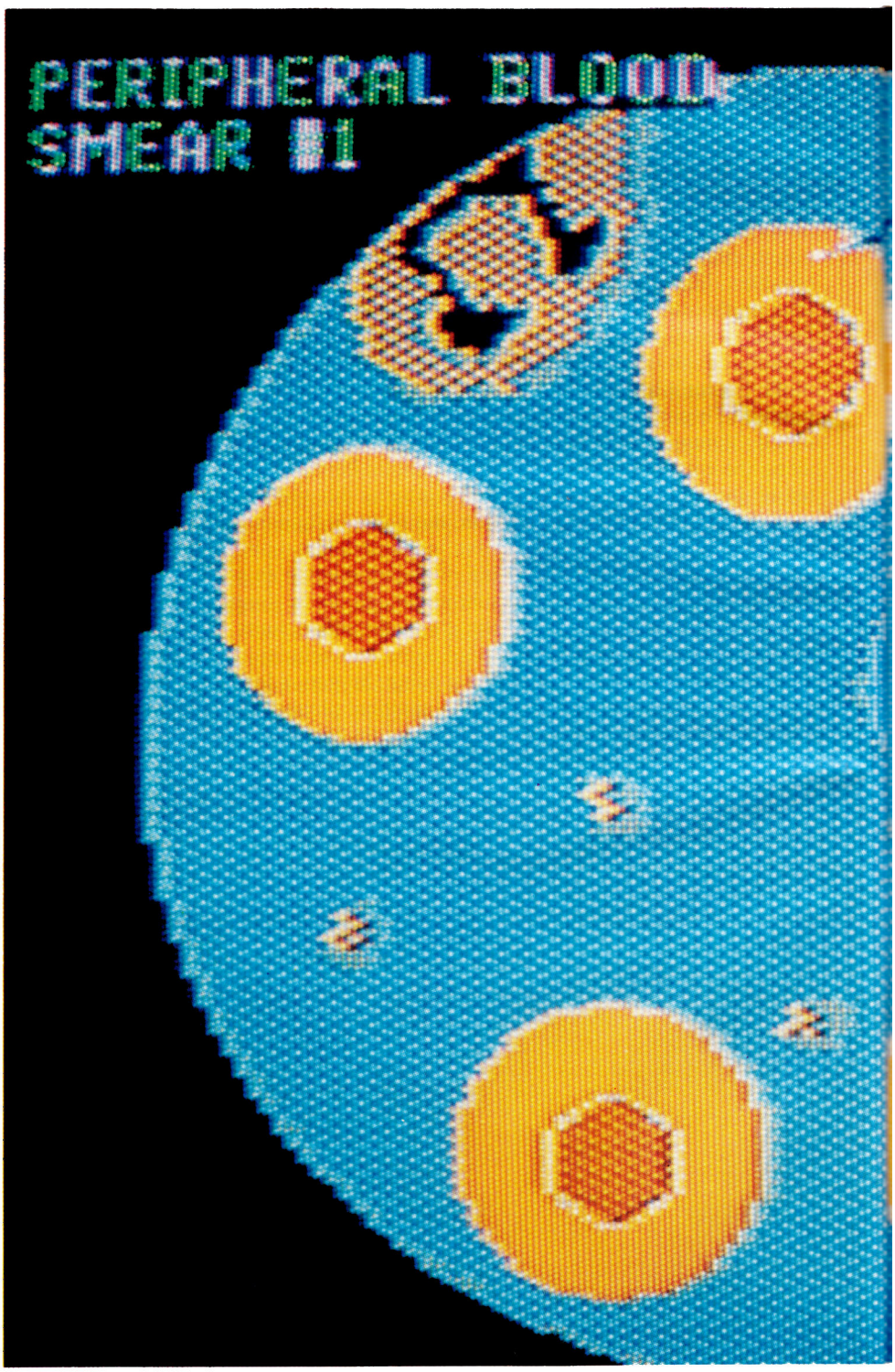
At the Scoreboard

Remember that the computer game tries to stay within the scoring parameters of the true Olympic event. Like the sport, the player can win the decathlon without being the high scorer in any of the individual competitions.

Aside from the game's few flaws, *Decathlon* is well designed, educational, and fun to play. ✚

AN APPL

An Apple computer analyzes blood, measures medicine, helps teach medical students and more



The Apple II had just hit the market when Dr. Ronald Bash caught his first glimpse of it. The pale plastic typewriter-like gadget fascinated most people, but Bash had trouble taking it seriously.

"I thought it was just a game with a keyboard, and a very unprofessional keyboard, at that. They had *Little Brick Out* running and the graphics capability was nice, but it's all bells and whistles, I thought; lots of icing on the cake and really not much substance," he said with a smile during a recent interview.

Bash entered the home computer scene with serious intentions, but was not adverse to a bit of recreation on the tube. Still, spending several hundred dollars on a glorified pong game made little sense to him.

SOL Brother

The New York-born doctor's love affair with computers began some 9 years ago when his interest was sparked by a couple of pioneering computer publications. He took the plunge and bought a 32K SOL 20 that boasted an 8080 processor and was "solidly built, clearly something one could do very serious things with, if one wanted to, and so I bought it for doing very serious things." Today, the SOL 20 is an extinct species, but Bash, who collects fossils and has a passion for dinosaurs, keeps it around and affords it as much reverence as he would a favorite protoceratops.

"It's still a nice machine. I used the SOL for a long time, and this is absolute heresy, but I used it primarily as one would a bicycle with training wheels," he said as he nodded affectionately toward the machine.

In the mid-1970s there was virtually

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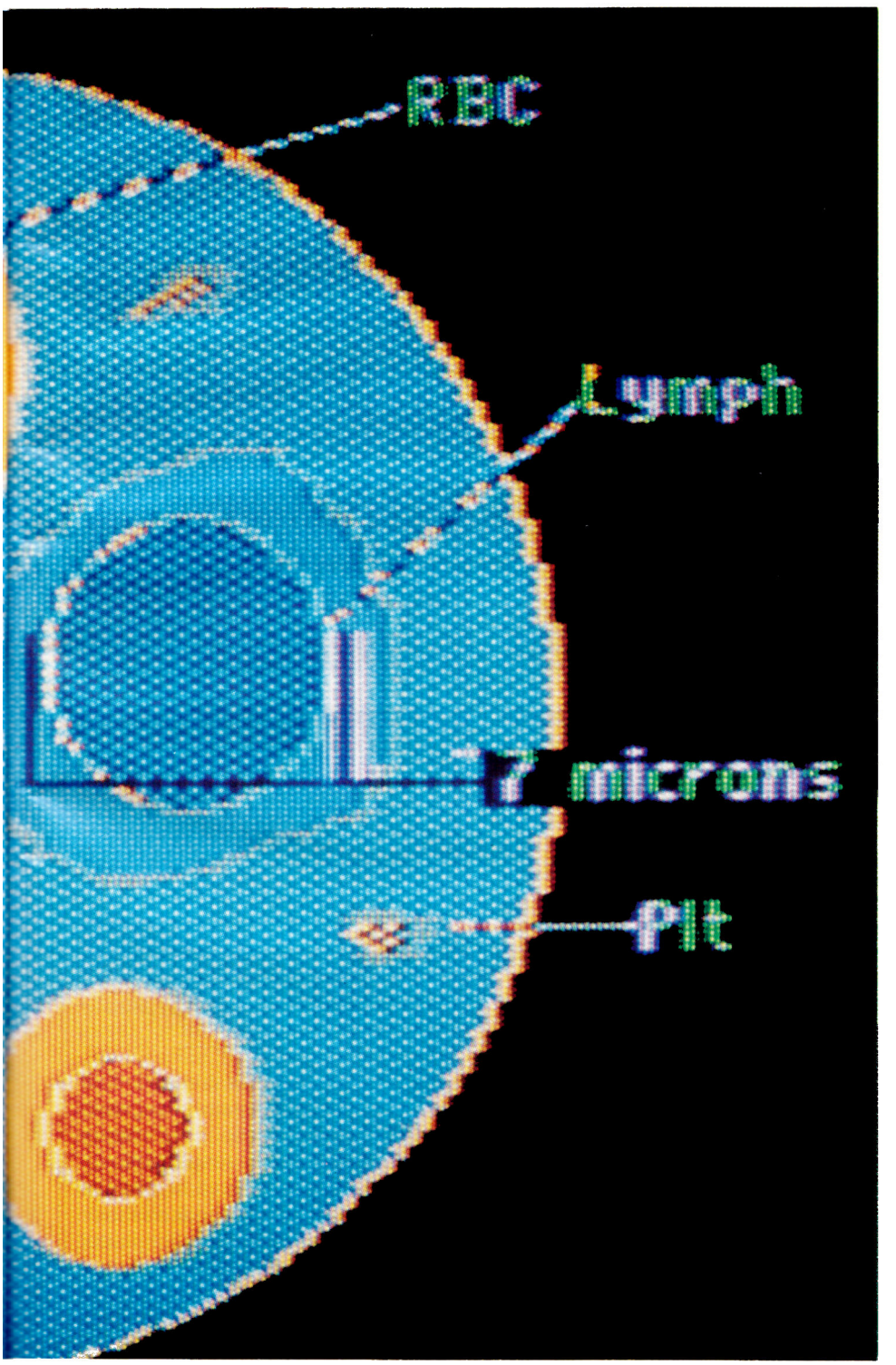

no software for microcomputers on the market, but early home computer owners soon found themselves probing the mysteries of programming. It was not long before Bash learned BASIC well enough to communicate with his SOL.

"The programs I use don't require any gigantic speed so I continue to write in BASIC. I have a fleeting acquaintance with Fortran, and an absolutely peripheral acquaintance with Pascal, which I just can't seem to get into, but BASIC remains my primary language," he said.

Bash practices internal medicine at Albert Einstein College of Medicine. Hematology and oncology are his subspecialties, so his first program was not *Wumpus* or *Tic-Tac-Toe*, but a more practical effort that diagnoses the symptoms of patients with anemia. It worked well on the SOL, but, ironically, it was on the "game with a keyboard" that it later became even better.

Bash likes to recall his near-accidental switch from the SOL to the Apple.

"Feeding one's computer new features is a never-ending task, and when I happened to be passing a computer store in Manhattan, I walked in with the intention of buying something for my SOL. That was when I saw the Apple and made a quick decision to buy it. I still thought of it as a toy, and I purchased it as such," he said.

After playing around with his Apple II for about a week, Bash decided to put it to a test and see if it was capable of real computing. There was no Applesoft BASIC yet, so he experimented with Integer and was so pleased with the result that his SOL soon started to gather dust. Not long after he transformed his Apple II into an Apple II$^+$ by replacing the Integer ROMs on the motherboard with Applesoft ROMs. Then Bash created an enhanced Applesoft version of his anemia diagnostics program, (see Figure

Figure 1: Digitized image of a blood smear taken through a microscope.

For recreation Bash also occasionally creates images of dinosaurs on his Apple.

2). Introduction of an Apple disk system made more improvements possible, and the process of upgrading continues.

"It is still a very simple diagnostic program, and its purpose is not so much to diagnose as it is to help the user develop a logical approach to diagnosis," he pointed out.

Medical Diagnostics

Since then, Bash, who recently traded in his Apple II+ for a IIe because, he says, it has a serious keyboard, has written more complicated programs to help in his work as a practitioner and teacher of medicine.

"I've written programs to use as teaching tools, but I am particularly interested in creating programs that allow me to do things that help my patients, tasks that I would not have done myself, only because it would have been very difficult. There is one particular program for patients with a particular type of malignancy called myeloma that I use occasionally. It allows me to quantitate the size of a tumor by inputing certain data from their blood tests, (see Figure 3). I could have done it another way, with a lot of time, patience, and a big calculator with all kinds of functions on it, but it would have taken very long, we would not have had hard copy, and we would not have been able to graph out a trend to see if my therapy is working. With the Apple, it's a question of just putting in the data—to a certain extent, it is really a simple-minded program that floats data into some regression equations, but it allows me to use another measurement to gauge my patient's response to chemotherapy."

While there are thousands of commercial programs that will run on an Apple, most medical programs are still written for larger computers. Bash is appalled by the high prices that such fundamental programs as Harvard's MEDUS/A command.

"*SuperCalc* or *Visicalc* they ain't," he says. "In terms of the expertise required to write them, these are incredibly trivial programs. One such program that I know of is designed for people in medical research. It stores and prints out data in a coherent form, and does very simple-minded statistical manipulations. The amazing thing about this is not the program itself, but the price they ask for it—thousands and thousands of dollars."



Figure 2

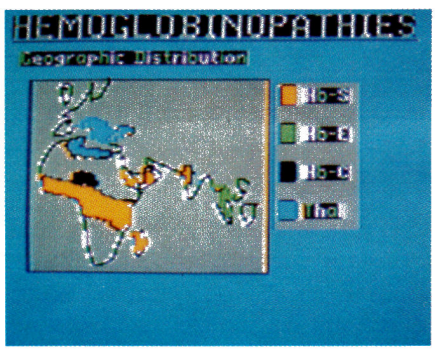

Figure 3

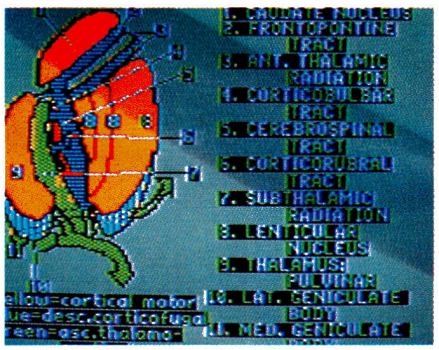

Figure 4

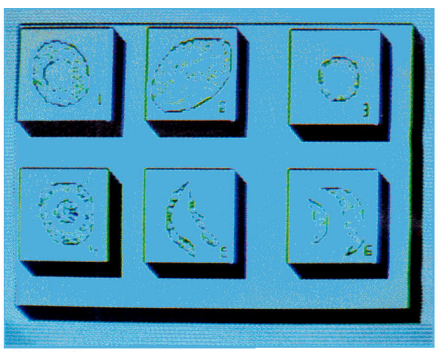

Figure 5

Figure 2: An anemia diagnostic program written by Dr. Bash.

Figure 3: Myeloma program written by Dr. Bash. The program quantitates the size of a patient's tumor.

Figure 4: An illustration taken from a medical textbook by use of a Dithertizer.

Figure 5: Conceptual drawings of formed elements in the blood drawn with a Gibson LPS II light pen and a Koala Pad.

Figure 6: Examples of dinosaur images produced on Bash's Apple.

Even more amazing, of course, is that such demands are met, and if it proves anything it is that some people still have a lot to learn when it comes to computers. Bash told how he was contacted recently by a clinical researcher of the Clinical Research Center at Albert Einstein.

"He had already budgeted $250,000 and wanted advice on what would be reasonable to buy, so I said 'Listen, why don't you just go out and buy an Apple II or an Apple III, or an IBM PC, and tell me what you want—I'll write the software.' People have no conception of these things at all. They really get suckered into buying these extraordinary machines for relatively simple tasks.

"Though it's considered heretical to admit, there is some cookbook medicine in oncology, to the extent that if a patient comes in with a malignancy, you have a bunch of recipes you can choose from. With the Apple, I have been able to call up a menu and decide on the recipe I

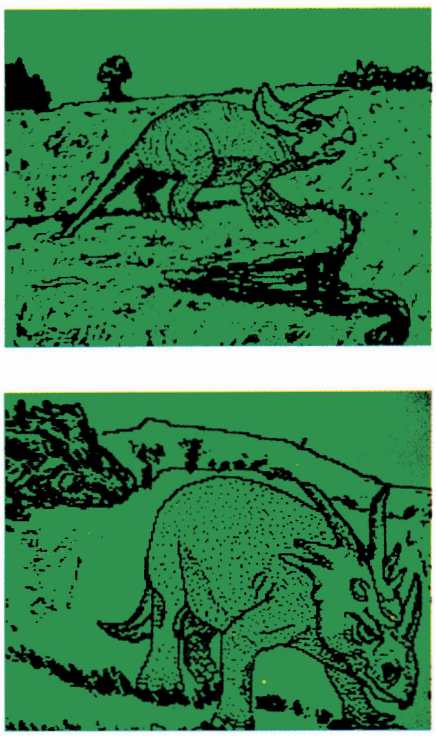

Figure 6

want to apply to the patient. After I input my data, the Apple calculates the dosages of medication required by the patient, the frequency with which that medication is to be given, and what modifications in dosage are necessary when the inevitable toxic reactions to chemotherapy occur. That is not a gigantically sophisticated or helpful thing in the vast scheme of things, but I think it may be useful for training students so that they can compare their clinical judgement with what is reasonable and accepted as correct—as much as anything is ever correct, as much as there is ever one answer to any medical question. Thus, it may ultimately be a learning tool, but the other nice thing about a program like that is that it allows you to generate and print out a complete therapeutic plan for a patient.''

Medical Education

It is not surprising to find that Bash has a special interest in the Apple as an educational tool. He spends some of his time teaching at Albert Einstein and at the New York State University at Stonybrook.

''I am working on an educational program that prompts you but, as yet, doesn't test you. I've actually been working on it on and off for several years and, again, the program is very trivial, but something like this is useful as a teaching tool, though I am not suggesting that we replace medical educators. This is where the Apple's graphics capability becomes particularly useful. Right now this is a bare bones program, but when it becomes more elaborate, it will elicit data, ask questions and make inferences based on the student's answers. Then it will tell why it made that inference, what it means, and how it relates to the medical problem that is being worked through. Ultimately, when I have the time, I am going to integrate this kind of thing with graphics. Hematology, the study of blood, is a visually-oriented science. Essentially, it's a lot of microscope work, and at one point I thought about simply attaching something to a microscope, focusing on a patient's blood, and digitizing the image (see Figure 1). I tried it, but the images weren't very good, because the Apple's resolution just isn't good enough to give you an accurate idea of what the microscope sees.''

For his experiment Bash used the Dithertizer II (it cannot be employed with the IIe, ''but they're working on it''), a peripheral he otherwise praises. He said the peripheral is great for snapping very elaborate illustrations from medical textbooks because the image can be stored or modified, (see Figure 4).

Living Color

Bash gets most excited about two new graphics tools that will yield color illustrations, the Gibson LPS II light pen and the Koala Pad, (see Figure 5). ''The Apple is well-suited for creating educational materials requiring illustrations. I'm pleased and taken by these two devices because they really work and with a little bit of patience you can create very acceptable conceptual drawings of what formed elements in the blood are supposed to look like. Until recently it was very difficult for someone like me to do this sort of thing. A small guy not working for an outfit with a zillion Apples and all kinds of expensive peripherals had a hard time creating graphics acceptable for education but that is no longer true. Now I can sit down and grind out quality graphics.''

Good pictures, even on a computer, require artistic talent, and Bash has his share of that. He is an amateur potter who has a wheel and kiln in a workshop at home. He refers to ceramics as his abiding passion. For recreation Bash also occasionally creates images of dinosaurs on his Apple, (see Figure 6). But mostly the new graphics devices will be used to create visual aids.

Package Polishing

Has he thought of marketing any of his programs?

''Yes, that is something I would consider seriously, but they are not as polished as I would wish them to be before inflicting them on the world,'' he said.

He can recall hearing about but not seeing an oncology package written for the TRS-80 Model III.

''Other than that, there is, to my knowledge, no microcomputer program commercially available that would help people in an oncology or hematology practice. I suppose there must be other doctors out there writing programs. I know that there are probably hundreds of doctors with Apples, and I often recommend them to my colleagues. One recently responded 'No, what do I need a computer for?' He just bought one a month-and-a-half ago and now he is also totally hooked. It's difficult not to become hard-core about your computer—there are people who can, but I've never met one.'' ✚

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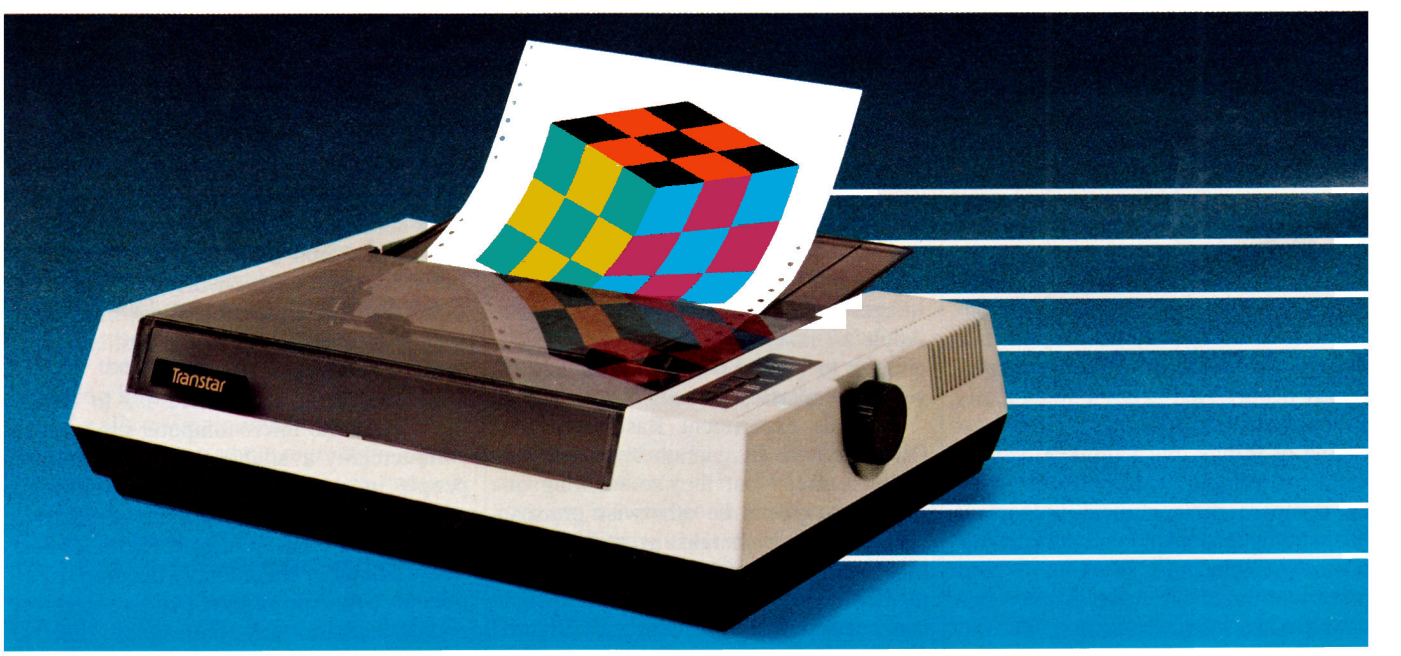

*PICS cards are currently available for Apples and Franklins. PICS cards for other computers will be available in the future.

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CIRCLE 143 ON READER SERVICE CARD

MIXING WORDS AND NUMBERS

The Apple III Sophisticated Operating System (SOS) allows you to load VisiCalc files into Apple Writer reports—and more.

You bought your Apple III to save time and effort, but are you taking full advantage of its capabilities? If you are entering information into three different programs to have it output in three different forms, you are wasting the resources the computer is designed to help save.

Many Apple III programs are equipped to work together to prevent needless repetition. This article will show you how to bring financial data from *VisiCalc* into a report created with *Apple Writer*, and how to use *Quick File* information along with an *Apple Writer* form letter to produce completely personalized direct-mail letters. Pay attention to the phrase "completely personalized": it means that the body of the letter can make reference to the person's name, company, title, department, favorite ice cream and whatever else you want to highlight. It's up to you.

This time-saving wizardry is brought to you courtesy of the Apple III Sophisticated Operating System (SOS). SOS can convert a data file from one program into a format compatible with another. In our examples, SOS converts the *VisiCalc* and *Quick File* files into standard *Apple Writer* text files.

To do these experiments, you'll need six different diskettes. (Assuming that you're already comfortable with the operation of these three individual programs, here are the diskettes.

- *Apple Writer III* Program Diskette
- *VisiCalc III* Program Diskette
- *VisiCalc Sampler* (included with *VisiCalc III)*
- *Quick File III* Boot and Program Diskettes
- *Quick File III* Sample Files Diskette (included with Quick File III)
- A blank SOS-formatted diskette.

To keep the instructions simpler, assume that you have an external disk drive with your Apple III system. If you don't you'll have to pay close attention as to which disk is in the drive.

VisiCalc into Apple Writer

This demonstration shows how to move a very short *VisiCalc* file into a brief *Apple Writer* letter. The letter could just as easily be a complex report; and the *VisiCalc* file could be much longer.

- Boot the *VisiCalc* Program Diskette on your Apple III's built-in disk drive.
- Insert the *VisiCalc* Sampler into Drive 2.
- If the *VisiCalc* screen has any data on it, clear it.
- Load the file "Sample.Budget" from the Sampler Diskette.
- When the file is loaded, clean up some unnecessary information on the sample by erasing the following cells: A4, B4, K5, E6, F6, G6, B10, and C10.
- Move the cursor to cells F6 and G6 and enter the date JULY 1, 1981.
- Enter some reasonable numbers into cells E14-J14, E15-J15, and E16-J16. You don't need to fill in every one. The totals will automatically recalculate as you progress.
- Remove the Sampler Diskette, and insert the blank formatted diskette.
- Place the cursor in cell A1. This will be the upper left corner of your printout.
- Give *VisiCalc* the "Print" command. In response to the prompt "Printer, File", type "F". When prompted for a file name, type ".D2/VCTEST". This is a totally arbitrary name which will be used for consistency's sake throughout this demonstration.
- Set cell K20 as the lower right hand corner of the printout.
- Since you commanded ".D2" as the print destination, the *VisiCalc* file will now be printed to the blank diskette.
- Leave *VisiCalc*, and boot *Apple Writer*, using the built-in drive. Leave the work diskette in Drive 2.
- Write a short letter or report segment that might logically include the *VisiCalc* file you have just transferred.
- Move the *Apple Writer* cursor to the location within the report/letter where you want the *VisiCalc* information to appear. Then, simply give *Apple Writer* the "Load" command, and load the file ".D2/VCTEST". The *VisiCalc* test file will be inserted into your letter or report.
- Congratulations! You now have a completed *VisiCalc/Apple Writer* document! You may save it on your work disk if you wish. Remember to assign it a new file name. If you want to print it out, be sure to set the page width to 80 columns so that the *VisiCalc* portion will print properly without wrapping around.

▶ The Maillist program requires that both your form letter and your information file be on the same diskette.

A note on large *VisiCalc* files: It's the width of a *VisiCalc* file that's apt

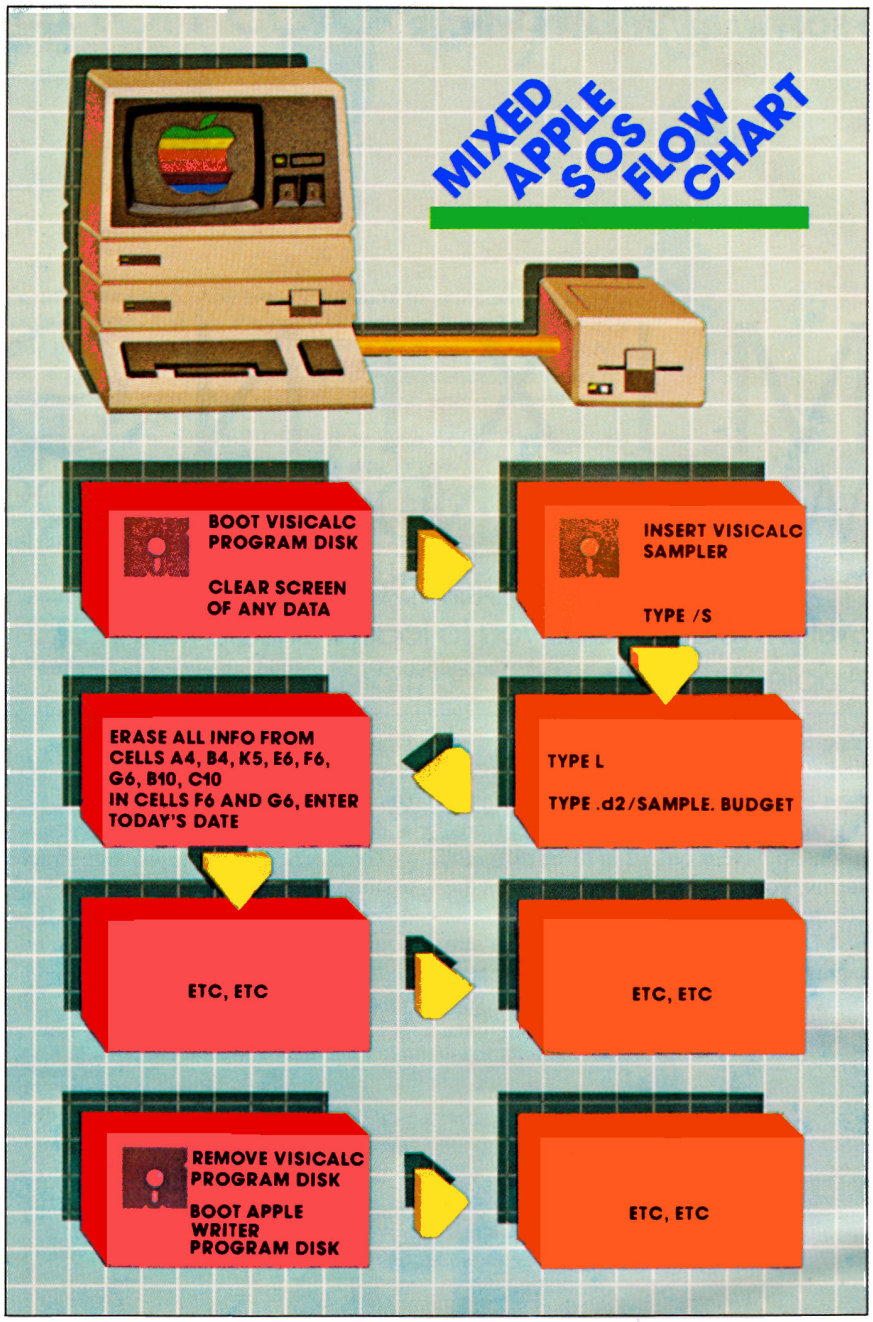
to cause more problems rather than its length. Be aware of how many columns your printer can handle, and never set the right hand limit of the *VisiCalc* file to more than this number of columns.

Quick File into Apple Writer

One of the exciting possibilities of *Quick File* is its ability to create truly personalized form letters. Even small businesses can create efficient, effective direct-mail marketing programs. Since each *Quick File* entry can contain up to 15 different information categories, you can personalize the letters with much more than just a name and address.

Even small businesses can create efficient, effective direct-mail marketing programs.

- Place the *Quick File* Boot Diskette in the built-in disk drive of your Apple III, and the Sample Data Files Diskette in Drive 2. Boot the program, inserting the Program Diskette when prompted.
- Load the file called "PRESS LIST" from the Sample Files Diskette.
- Go into the Report feature of *Quick File,* and select the "Create a New Labels Format" option. Do not use the existing Mailing Labels format. Enter any name you like when prompted for the report name.
- Delete the categories "Phone", "Specialty", and "Media Type". We'll be using all the others in the finished letter to demonstrate *Quick File's* flexibility. When you create your own form letters, you may want to transfer all 15 categories, just so you'll have them available if you need them. Don't change the order of the categories.
- Remove the Sample Files Diskette from Drive 2, and insert your working diskette. The one that has "VCTEST" if you did the preceding experiment, or is still blank if you didn't.
- Print the report, using print option 4 "Print to a special *Apple Writer* file on disk." When prompted, assign the name ".D2/QFTEST" to the file. Note that the message "Writing .D2/QFTEST.ASCI" will appear on the screen. Quick File adds the suffix ".ASCI" to these special files, so you must use it in all future use of the file.
- Leave *Quick File,* and boot *Apple Writer,* using Drive 1. Type in the form letter and save it to your working disk in Drive 2 under the name, ".D2/MYLETTER".
- On your *Apple Writer* Program Diskette is a WPL Word Processing Language, program called *MAILLIST*. Use this program to merge the *Quick File* information with the form letter. But first, a couple of changes must be made. So load it into the computer's memory (".D1/MAILLIST") and look at it.
- About 15 lines from the top of MAILLIST, you will see the program line "L $D/MLMLETTER". Change this to "L $D/MYLETTER". This tells the program to use your form letter instead of a sample Mail List Manager letter.
- A few lines further down is the line "L $D/MLMDATA!<(X)>!<!". Change this to "L $D/QFTEST.ASCI!<(X)>!<!". Now the program will use your *Quick File* information list instead of the Mail List Manager address list it was originally written for.
- You have now made the changes necessary to have the MAILLIST program merge MYLETTER with QFTEST.ASCI. Save this revised program to your working diskette, using the file name "NEW.MAIL" so you'll know it's not the original MAILLIST. Incidentally, the



MAILLIST program requires that both your form letter and your information file be on the same diskette.

- Almost there! Enter the "Print/Program" mode of *Apple Writer*, (CTRL-P), and check the print constants, (particularly the Print Destination. If you don't your form letters will print into the ether). Then type "DO .D2/NEW.MAIL". "DO" is the command which initiates running of a WPL program, which NEW.MAIL is.
- When prompted for the name of your Apple III volume, enter ".D2". Since your data diskette is already in the proper drive, you can ignore the next statement on the screen.
- Sit back and watch your printer. Your Apple III will create 10 copies of MYLETTER, personalizing each one for someone on the PRESS LIST. When NEW.MAIL runs out of names, it will stop.

You probably wouldn't want a form letter to read, "How are things in good old Dogwood, CA 94930?"

A Few Hints

Since this has only been a demonstration, the computer was set up to print the letters continuously. To change NEW.MAIL so it stops between letters and allows you to change paper, two program lines must be added. Near the very end of NEW.MAIL is a section starting with "L8 PNP". The next line reads "PSX +1". After that, add the line "PIN Insert new sheet of paper and press RETURN." This causes the program to stop until you press the return key. Then add the line "PPR (CTRL-V) (CTRL-backslash) (CTRL-V)". Control-V is an *Apple Writer* command that allows the entry of control characters; in this case, the control-backslash. This line will clear the screen each time, so you can see the "new sheet' prompt when it appears. Don't forget to save this new version of NEW.MAIL.

"PRESS LIST" has the city, state, and zip code together in one category. This makes it very difficult to separate the information when using it in a form letter. If you think you may need to separate pieces of information, set up your initial *Quick File* file to do so. (For instance, you probably wouldn't want a form letter to read, "How are things in good old Dogwood, CA 94930?"

As the old computer adage goes, "Garbage In/Garbage Out." Beware of poorly worded information in a *Quick File* category — such as seen in the sample "PRESS LIST" letter in which Eleanor Porter is addressed as the "Asst." Editor. Also, watch out for missing information. In the Steven McMurray letter, where no column or program title was entered in his *Quick File* listing, the result was a few blank spaces and an odd sounding sentence. Remember, they don't call them form letters for nothing — you do have to follow the form exactly and give it the information it wants.

```
⟨1⟩
@1@Johnson
@2@Milton
@3@Producer
@4@Moments in Business
@5@WBXZ
@6@223 73rd Ave.
@7@Chicago IL 99987
[1]⟨2⟩
@1@Callahan
@2@Sarah
@3@Assignment editor
@4@Book Corner
@5@KPYA
@6@2354 Golden Ave.
@7@Fast River OR 66544
[2]⟨3⟩
@1@Underwood
@2@Thomas
@3@Editor
@4@Business Pages
@5@Kansas Clarion
@6@556 Swan Way
@7@Topeka KA 22254
[3]⟨4⟩
@1@Theill
@2@Helen
@3@Editor
@4@Telling Time
@5@The Antique Journal
@6@568 Roseberg Ave.
@7@Willville MD 22147
[4]⟨5⟩
@1@McMurray
@2@Steven
@3@Features Editor
@4@
@5@The Weekly Palm
@6@2036 Sand St.
@7@Orlando FL 88542
[5]⟨6⟩
@1@Porter
@2@Eleanor
@3@Asst. Editor
@4@Ask Eleanor
@5@Watsonville Daily News
@6@5698 Lark Ave.
@7@Watsonville TX 55412
[6]⟨7⟩
@1@Perota
```

Program listing printout

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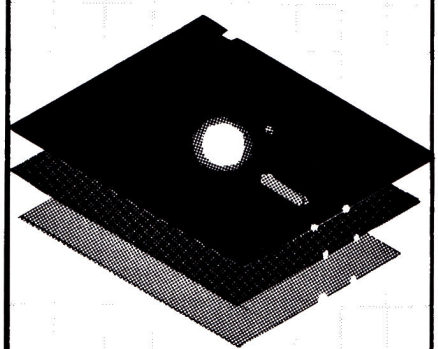

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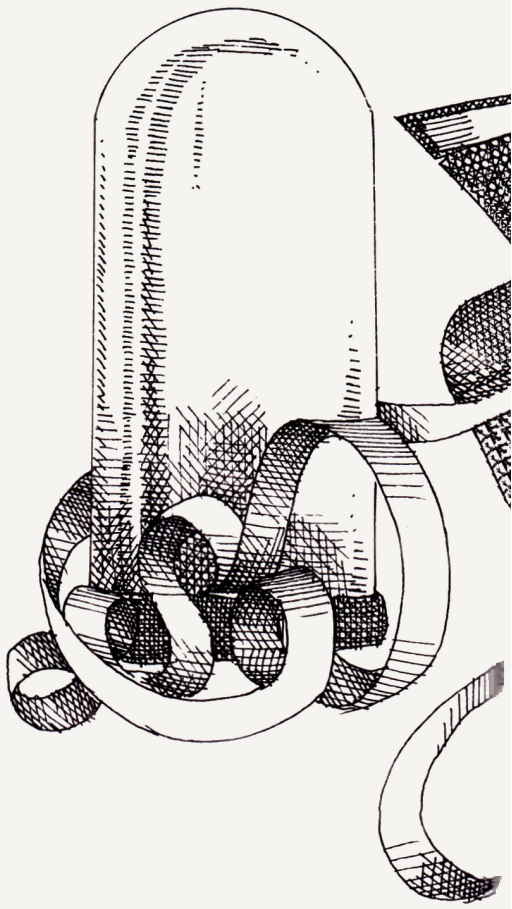
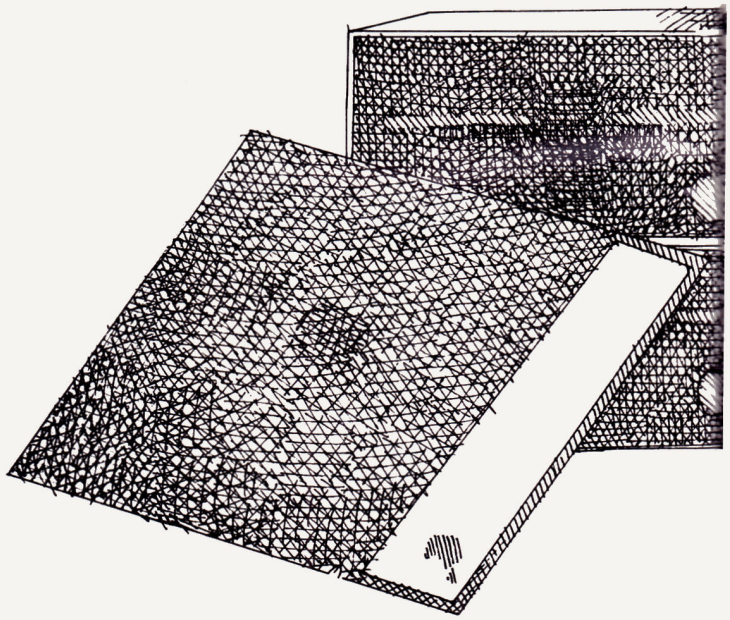
REVIEW

DOW JONES MARKET ANALYZER

Stock analysis packages from the company that brought us *The Wall Street Journal* and the Dow Jones News/Retrieval service are a great idea. The execution is something else.





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Requirements: Two Drives, Serial Card and Modem
List Price: $699

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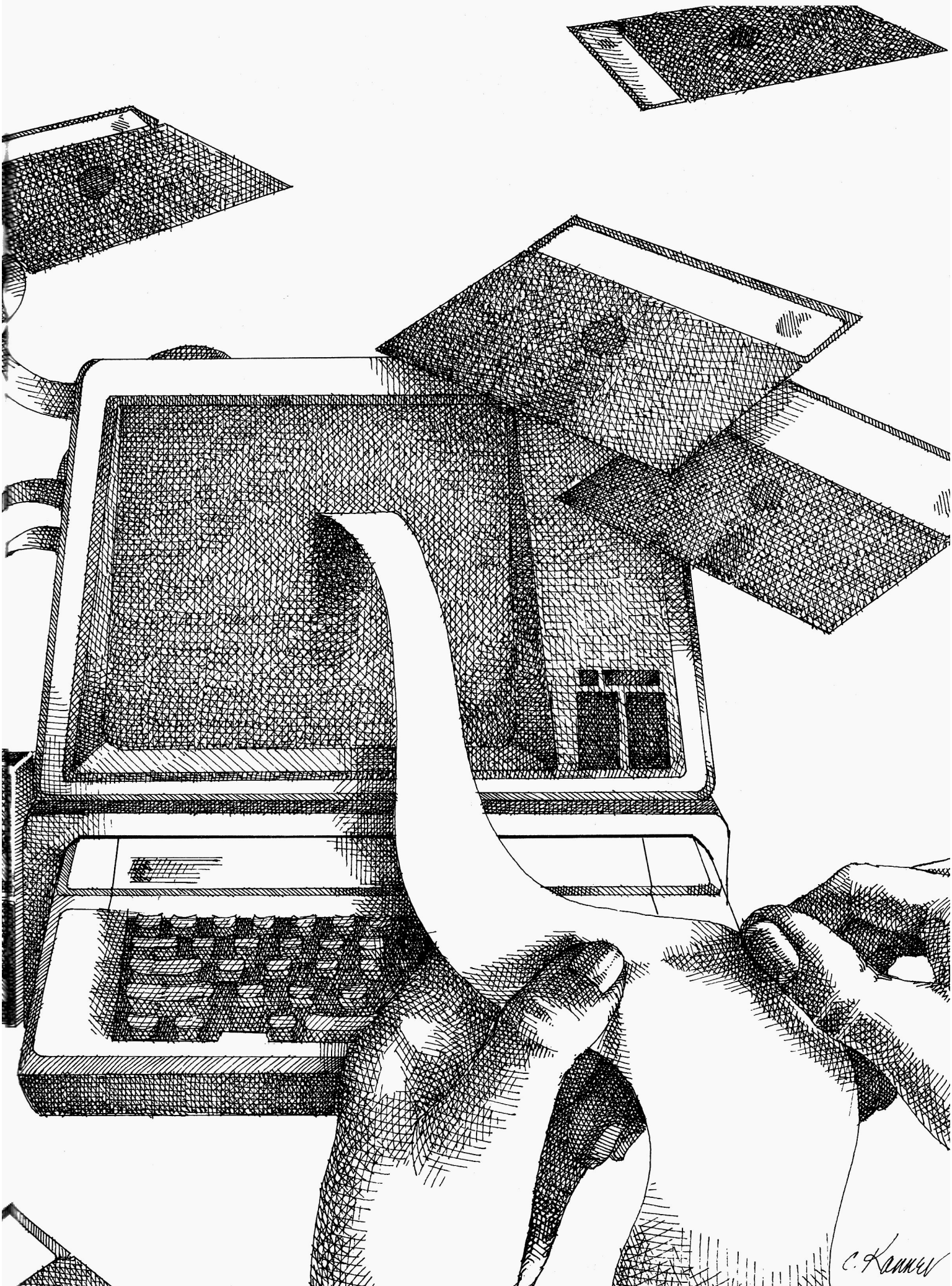
List Price: $299

All three programs are distributed by Dow Jones. Call (800) 257-5114 for further information.

Dow Jones, the company that brings you the stock market trading indexes and the *Wall Street Journal,* has entered into the software business. It has recently released three separate stock analysis packages for the Apple: two that track stocks and give trading advice, and one that keeps detailed records of transactions. All three are designed to tap into the Dow Jones


C. Kanner

News/Retrieval (DJN/R) network.

These programs were not written for penny-ante speculators. They are aimed at brokers, professional money managers, and sophisticated private investors—and are priced accordingly. But even if you are only a small trader, it's interesting to take a look at the kinds of tools Dow Jones now offers the big boys.

You would expect only slick, top quality programming to get the Dow Jones imprint. Surprise: These packages are quite uneven and some are littered with clumsy features that have no place in good business software. For the most part, these flaws don't prevent the programs from doing their jobs; they just make it needlessly difficult for the user to do his.

Despite their identical gray packaging, the programs were not all written by the same people. Dow Jones farmed out each one to a different software house. The overall menu-oriented design philosophy is thus the same, but the details of implementation are annoyingly inconsistent. In some cases, not even the hardware requirements are the same.

Of the three packages, *Market Microscope* and *Market Analyzer* are the most interesting because they are supposed to help you make better trades and, consequently, make more money. *Market Manager* is no doubt useful for anyone who has to keep track of large holdings in numerous portfolios, but it is really nothing more than a specialized filing system with a direct line into Dow Jones News/Retrieval.

Microscope and *Analyzer* use two entirely different approaches to help you make buy/sell decisions. *Analyzer* (which I would have called "*Microscope*") takes the infinite minutiae of price/trading volume, exponential moving averages, regression analysis and a host of other mathematical relationships to produce strictly technical analyses of securities. *Microscope* (which I would have called "Analyst") analyzes what are called "fundamentals": such things as corporate earnings, return on assets, and price/earnings ratios.

Close Look at Microscope

Microscope, the newest and best-designed of the three, comes on one disk, which contains all program modules. Lists of stocks and associated information are kept on separate data disks, of which there may be any number. For initial setup, the program asks for some information about your computer (which interface cards are in which slots), lets you initialize a data disk or two, and

```
                    ALPHABETICAL LISTING                    08/24/83

SYMBOL  STOCK OR INDUSTRY NAME          LIST   PRICE    TRADING RANGE
------------------------------------------------------------------------
HIT     HITACHI LTD                     S10    36.00    35.50  -  50.00
OMC     MATSUSHITA ELECTRIC INDL        S10      ND
PIO     PIONEER ELECTRONIC ADR          S10    22.38    19.00  -  20.00
SNE     SONY CORPORATION                S10    13.63    14.00  -  17.00
TDK     TDK CORP                        S10    45.63    30.00  -  46.00

5 ITEMS ON DISK
```

Figure 1: Abbreviated alphabetical list of stock data as printed out from Microscope.

```
?================================ BUY SCREEN ======================:

   JAP ELECT                          (S10)  -  08/19/83

A. %PRICE CHANGE LAST 52WKS.............HIGH TO LOW   LIMIT: 50

   PIONEER ELECTRONIC ADR              PIO          89.7
   MATSUSHITA ELECTRIC INDL            OMC          66.7
   HITACHI LTD                         HIT          56.8
   >
   TDK CORP                            TDK          49.2
   SONY CORPORATION                    SNE          10.2

B. CURRENT P/E RATIO.....................LOW TO HIGH   LIMIT: 20

   MATSUSHITA ELECTRIC INDL            OMC          16.9
   HITACHI LTD                         HIT          17.5
   >
   TDK CORP                            TDK          21.3
   SONY CORPORATION                    SNE          32.1
   PIONEER ELECTRONIC ADR              PIO      [NO DATA]

C. %CHANGE IN REVENUE YR TO DATE.........HIGH TO LOW   LIMIT: 5

   HITACHI LTD                         HIT           9.3
   MATSUSHITA ELECTRIC INDL            OMC           5.5
   >
   PIONEER ELECTRONIC ADR              PIO          -0.2
   SONY CORPORATION                    SNE          -1.9
   TDK CORP                            TDK          -3.5

D. %PROFIT MARGIN.......................HIGH TO LOW   LIMIT: 2.5

   TDK CORP                            TDK           9.6
   MATSUSHITA ELECTRIC INDL            OMC           4.3
   HITACHI LTD                         HIT           3.7
   >
   SONY CORPORATION                    SNE           2.0
   PIONEER ELECTRONIC ADR              PIO          -1.6

E. EST EPS %GROWTH PRESENT FY...........HIGH TO LOW   LIMIT: 10

   HITACHI LTD                         HIT         26.50
   TDK CORP                            TDK         10.14
   >
   SONY CORPORATION                    SNE        -18.52
   MATSUSHITA ELECTRIC INDL            OMC      [NO DATA]
   PIONEER ELECTRONIC ADR              PIO      [NO DATA]


   RANK MATRIX

   SYMBOL  A  B  C  D  E  ABCDE
   HIT     3  2  1  3  1  !!!!!
   OMC     2  1  2  2  *  !!!!.
   PIO     1  *  3  5  *  !....
   SNE     5  4  4  4  3  .....
   TDK     4  3  5  1  2  ...!!

   #>LIM   3  2  2  3  2
   #COMP   5  4  5  5  3
```

Figure 2: Ranking of Japanese electronic company stocks according to limits set by the author.

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```
= ================================ BUY SCREEN ======================
   FOOD CHAIN STORES                  (400)  -  08/19/83

A. %CHANGE VS S&P 500 LAST 52WKS.....HIGH TO LOW    LIMIT: ICF
                                                    ICF: 114
   STOP & SHOP COMPANIES              SHP              287
   SHOPWELL INCORPORATED              SH               201
   >
   GREAT ATLANTIC & PAC TEA           GAP              113
   WINN-DIXIE STORES                  WIN              106
   SAFEWAY STORES  INC                SA                99
   KROGER COMPANY                     KR                76

B. CURRENT P/E RATIO.....................LOW TO HIGH   LIMIT: ICF
                                                    ICF: 10.7
   SAFEWAY STORES  INC                SA               4.3
   KROGER COMPANY                     KR              10.0
   SHOPWELL INCORPORATED              SH              10.3
   >
   WINN-DIXIE STORES                  WIN             12.5
   STOP & SHOP COMPANIES              SHP             16.2
   GREAT ATLANTIC & PAC TEA           GAP             20.6

C. %CHANGE IN REVENUE YR TO DATE.....HIGH TO LOW    LIMIT: ICF
                                                    ICF: 6.3
   STOP & SHOP COMPANIES              SHP             14.9
   GREAT ATLANTIC & PAC TEA           GAP             10.9
   SHOPWELL INCORPORATED              SH               8.2
   WINN-DIXIE STORES                  WIN              6.6
   >
   SAFEWAY STORES  INC                SA               5.9
   KROGER COMPANY                     KR               0.6

D. DEBT TO EQUITY RATIO %.....................LOW TO HIGH   LIMIT: ICF
                                                    ICF: 77
   WINN-DIXIE STORES                  WIN              20
   >
   GREAT ATLANTIC & PAC TEA           GAP              79
   KROGER COMPANY                     KR               83
   SAFEWAY STORES  INC                SA              110
   STOP & SHOP COMPANIES              SHP             118
   SHOPWELL INCORPORATED              SH              129

E. %CHANGE IN EPS LAST QTR.....................HIGH TO LOW   LIMIT: ICF
                                                    ICF: -0.3
   STOP & SHOP COMPANIES              SHP             90.9
   GREAT ATLANTIC & PAC TEA           GAP             50.0
   WINN-DIXIE STORES                  WIN             14.7
   >
   SHOPWELL INCORPORATED              SH              -4.7
   SAFEWAY STORES  INC                SA             -15.0
   KROGER COMPANY                     KR             -29.0

   RANK MATRIX

   SYMBOL   A  B  C  D  E  ABCDE
   GAP      3  6  2  2  2  ..!.!
   KR       6  2  6  3  6  .!...
   SA       5  1  5  4  5  .!...
   SH       2  3  3  6  4  !!!..
   SHP      1  5  1  5  1  !.!.!
   WIN      4  4  4  1  3  ..!!!

   #>LIM    2  3  4  1  3
   #COMP    6  6  6  6  6
```

Figure 3: Buy screen for six supermarket stocks.

```
                        PRICE ALERT REPORT                    08/24/83

REC  STOCK NAME                  SYMBOL   PRICE   CP   %>CP  VOL(100)  %PF
-------------------------------------------------------------------------

S10 JAP ELECT                    08/23/83
 B   HITACHI LTD                 HIT       36.00   S     1.4       316    34
 B   PIONEER ELECTRONIC ADR      PIO       22.38   R    11.9        28     5
 S   TDK CORP                    TDK       45.63   R    -0.8         9    42
```

Figure 4: Price alert for Japanese stocks.

you're ready to go.

The next step is to assemble lists of the stocks you want to track and put them on your data disk. Each list is given a three-character name, usually the number of the industry group to which the stocks on a list belong. Computer software companies, for example, are industry group 505. Waste management and janitorial services are group 508. If you want to track a special group of stocks that do not fall handily into an industry group, you must give it a two-digit number preceded by the letter *S* for "special." Stocks are entered onto a list by their trading symbol—Apple Computer is AAPL, Control Data is CDM. Each list can contain up to 50 stocks and you can store 20 separate lists on each disk.

From the same list-making menu you can now pick another item and enter the trading range for your stocks. Some of the program features will run without this data, but the full benefit of the *Microscope* depends on it. A stock's general trading range is defined by its support and resistance prices, on the theory that market forces will keep most stocks from varying too wildly in price. The upper limit of the range, the resistance price, is the value at which there should be more sellers than buyers. When the stock reaches that level, it should go down. The support price is the lower limit of the trading range; when a stock reaches this level, it should begin heading back up. Trading range is, of course, only a best guess, based on a stock's behavior in the past.

When your stock lists and trading ranges are ready, you can select the fundamental indicators that you wish to track for the stocks on that disk. You can choose up to 20 from a list of 68 different indicators that include just about any information about a company that could be useful to investors. These indicators include such conventional data as debt/equity ratio, dividend rate, short interest ratio, and betas up or down, to more exotic fare such as insider net trading, volume/liquidity ratio, and volume-on-balance index. You choose your preferred indicators from a menu and write them to your data disk.

Now you are ready to dial up DJN/R and get the latest values for the indicators you plan to track. Depending on how many stocks you are following and how many indicators you need, this can be a lengthy process. It takes 10 minutes to track nine values for 5 stocks at 300 baud. This is because *Microscope* must fetch each of the 68 indicators stored by

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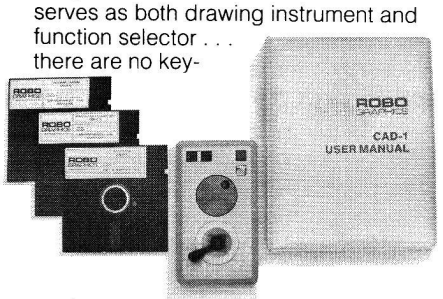

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Dow Jones and then pick out only the ones you want to track, a clumsy, time-consuming procedure.

When the program finally finishes talking to DJN/R, you can call up the information retrieved for each stock, or send it to the printer. Stock data on disk can also be printed out in a more abbreviated form (see Figure 1). This is a simple alphabetical list of every stock on the disk. In this case, we have only five stocks, all of them members of a special list (any group that doesn't fall into one of Dow Jones' categories) named S10, which consists of Japanese electronics companies. The ND in the line for Matsushita means that "no data" was available.

Beyond Retrieval

So far, all we have done is retrieve selected information from DJN/R. In order to put that information to work, we switch to a menu called "Customize the Software." One of the useful things this menu allows us to do is to set cut-off values for the indicators we are tracking, and to rank each stock in the list according to that value. We can rank stocks in a "Buy Screen" if we think they are going up, or we can rank them in a "Sell Screen" if they look like they might drop.

Creating a Buy Screen for our list of Japanese electronics stocks requires entering of a cut-off value for each of the fundamental indicators we wish to include as buy or sell indicators, and then specifying whether they are to be ranked in high-to-low or low-to-high order.

In Figure 2, all the Japanese stocks are ranked according to the limits I specified. For the first indicator, I assumed that stocks that have risen quickly in the past will keep on rising, so I set that indicator to a high-to-low ranking. I also set an arbitrary limit of a 50 percent stock price increase over the last year, which tells the program to separate my list at the specified break-point with a "greater than" (>) sign. All my indicators are ranked high-to-low except the P/E ratio; I would rather buy low P/E than high P/E stocks.

The rank matrix at the bottom of the figure is a quick reference to compare stocks in a list. It indicates that Hitachi (symbol HIT) ranked third according to indicator A, second according to indicator B, first according to C, etc. The column of periods and exclamation marks reveals whether a stock was above or below the > sign.

According to this matrix, Hitachi gets an exclamation mark on every count,

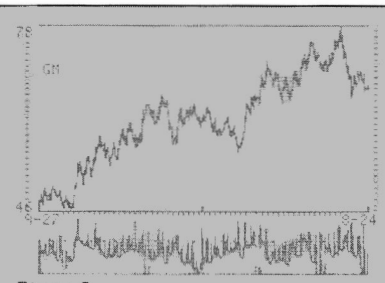

Figure 5.

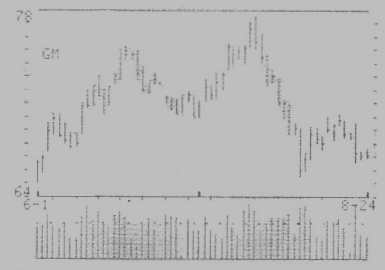

Figure 6.

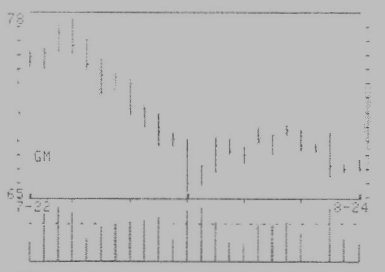

Figure 7.

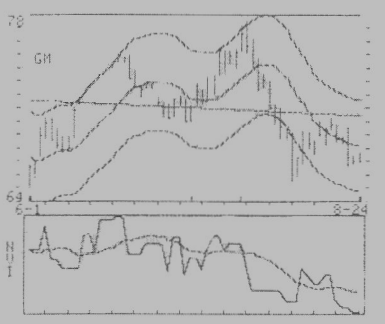

Figure 8.

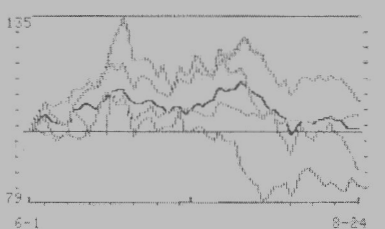

Figure 9.

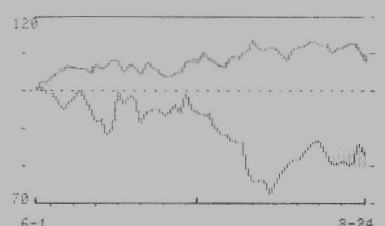

Figure 10.

and Sony (SNE) gets a solid string of raspberries. The last two lines of the matrix tell how many stocks were above the cut-off value, and how many were included in the comparison. (When there is no data for a stock, it drops to the bottom of the heap and is not counted in the number compared.) If you are in a hurry to size up the performance of your stocks, you can print out only the rank matrix.

Figure 3 is another buy screen, this time for a list of six supermarket stocks. In this case, I specified the industry composite figure (ICF) as the cut-off value. This way, the stocks that appear above the > sign are doing better than the industry average and those below the > sign are doing worse. ICFs are the lazy man's way to rank a list of stocks because he doesn't have to enter them; the program fetches ICFs from DJN/R. They are the default value for the cut-off figure when you are "customizing the software." Sell screens can be set up in exactly the same way. The only difference is that you rank the stocks you are tracking according to whether they seemed more likely to go down rather than up.

Tracking fundamentals and specifying buy and sell screens is very useful business, but *Microscope* goes about it in a slightly rigid way. When you choose the indicators to be tracked, or set the cut-off values for a buy or sell screen, these parameters are written onto the data disk and apply to every stock list on the disk. Parameters cannot be customized to each list. Thus, our lists of supermarket and electronics stocks had to be on separate disks because the cut-off values are different for the two lists.

This problem could be solved by specifying only ICFs as cut-off ranking values for every stock list on a disk. This would work fine because when you log on to DJN/R, the program is smart enough to fetch a different ICF for each list. Unlike customized cut-off values, ICFs are regularly computed by Dow Jones and are fetched from DJN/R just like any other value. However, ICFs may not always be what you want to use as cut-off values and are not available for special lists anyway.

Alert! Alert! Alert!

The "customization" section of the program includes a buy/sell alert routine that is implemented more smoothly. This feature also applies to an entire diskful of stocks, but it is not a handicap because the data that trigger a price alert are keyed to the individual trading range of each stock.

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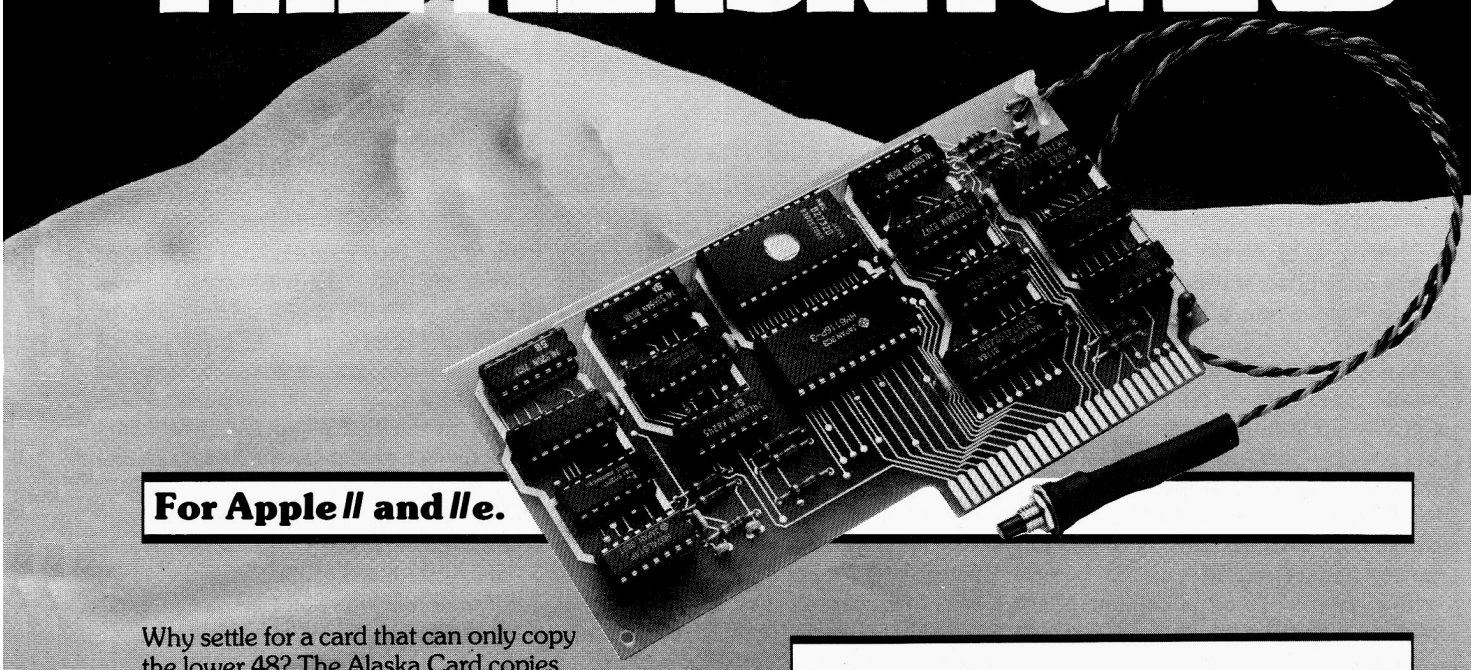

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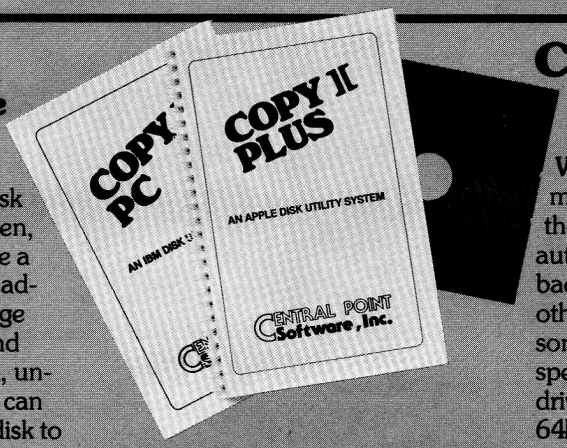

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Alerts are set up by specifying relationships between the current stock price, the support price, and the resistance price. For example, if the stock has a broad but consistent trading range, but has drifted toward one of the extremes, *Microscope* can be customized to alert you to the possibility of an imminent correction. Again, the theory is that if a stock moves too high, sellers will outnumber buyers and the price will drop. If the stock moves too low, the reverse should happen.

A support level buy recommendation might be made by the program when a stock price drifts within a small percentage of the bottom of its trading range. However, the normal range should be wide enough so that a routine correction would give the stock price enough room to move up into for an investor to come out with a worthwhile profit. You might therefore specify that the current price would have to come within 5 percent of the support price (bottom of the trading range) and yet be at least 35 percent below the resistance price (top of the trading range) before a buy alert was triggered.

By playing with these percentages and adjusting the trading range, you can configure the program to flash a price alert whenever current prices meet certain conditions you set. *Microscope* lets you set conditions for two different buy and two different sell conditions. It will also notify you, if you wish, when prices have broken so far out of normal patterns that the trading range should be updated. When you run the price alert routine, the program will scan an entire disk of stocks to see if any meet your pricing criteria.

Microscope can be customized to alert you to the possibility of an imminent correction.

A price alert for our list of Japanese electronics stocks is shown in Figure 4. The trading ranges and percentage parameters for price alerts were tinkered with to give results that are not realistic, but the program followed our instructions and duly recommended that we buy Hitachi and Pioneer, and sell TDK. The column in the printout labeled CP stands for "Critical Price" and indicates whether the alert was triggered by a critical relationship with the support (S) or resistance (R) price. %>CP indicates the percentage (positive or negative) by which the current price exceeds the critical price. %PF stands for "Percent Price Fluctuation" and indicates the relative breadth of the trading range.

We have now seen everything *Microscope* can do. A trader or broker who was following hundreds of stocks would probably use the program to update the fundamentals indicators every week or so, and to update current price/volume every day. He might also run a price alert every day to see if any stocks had moved into a critical range. Alerts are, of course, only as good as the trading range and alert parameters that he enters into the program, and Dow Jones takes pains to point out that it "make(s) no claim that the use of this software package will increase profits or reduce losses." Still, if you are a smart trader, it could make you even smarter.

Analyzing Market Analyzer

For investors who don't believe in tracking fundamentals, or who want to supplement that information with a lot of graphs and charts, Dow Jones offers *Market Analyzer*. This program is easily the most awkward to use and the most

WHEN YOU'RE BAN



poorly documented but is perhaps the most powerful.

Basically, *Analyzer* takes nothing but historical trading data—high, low, close and volume—and runs it through a mathematical meat grinder. The idea is to look for consistent relationships between numerical variables and price changes. There may be no clear cause-and-effect relationship between any of this data and changes in stock price, but, as the manual points out, "the fact that a particular method works need not be explainable, however strong the urge to do so."

The first step, after an installation procedure very similar to that for *Microscope,* is to establish a list of securities to track—stocks, bonds, options, mutual funds, or treasuries—and get the necessary historical data for them. To do that, you need to initialize a data disk, specifying whether you want to be able to store information for a maximum of 128 or 256 periods. The manual tells you that periods can be days, weeks, or months, but as we will soon see, this is only technically correct. These periods are going to be days.

After you have decided which securities to analyze, you tell the program you want to enter them. Immediately you're hassled: *Analyzer* wants to know exactly how many securities you want to put on the disk. It needs to know this because it will not leave the input mode until it has received exactly as many stocks as you told it you would supply, and as soon as it gets them it whizzes off on other business. You had better be sure about what you enter, too, because there is no backing up for corrections. To fix things you have to finish the entry procedure, go to a different menu, and go into correction mode. A polite program would let you fix things as you go along and would let you stop entering stocks whenever you liked.

You can configure the program to flash a price alert whenever current prices meet certain conditions.

Analyzer allows you to enter historical data on your securities in two different ways: electronically with DJN/R, or manually. The manual option means that you can analyze obscure Tasmanian debentures or anything else Dow Jones doesn't bother to track. Also, it is the only way to enter weekly or monthly data; consequently, those 252 periods are very likely to be days. That *Analyzer* offers a manual option means that it could conceivably be used without a subscription to DJN/R, but it's hard to imagine anyone wanting to enter all those data points by hand.

I took the easy route. I dialed DJN/R for my historical data and immediately ran into trouble: I was prompted to enter how many "pages" of information I want for my list of securities. Nowhere does the documentation tell me what "pages" are, but it turns out that one page represents 12 days of data. This is *Analyzer*'s clumsy way of asking how much data I want to collect.

Once you're on the phone with DJN/R, get ready for a long wait while the program reads in your data. If you ask for high, low, close, and volume for the maximum number of periods (252), it will take you 7 minutes at 1200 baud to get the facts on one security. If you've got more than one, walk the dog or make yourself a ham sandwich.

When this marathon procedure is over, you discover that in order to add the latest day's trading information to

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your historical data, you must go through yet another cumbersome procedure. This is apparently because DJN/R stores historical and current information in different databases, but *Analyzer* goes out of its way to make things difficult. The most recent day's quotes have to be collected on yet another "temporary work diskette" and then—oh my God!—transferred to the original data disk. You are compelled to shuffle disks and twiddle your thumbs until that's finally done.

Charts 'n' Things

At this point, you have up-to-date historical info on your stocks. You can either print this out in long, boring lists of numbers or in any number of exciting graphs. You hit the menu selection, "Individual Charts," and wait for 35 seconds while the graphing module loads: time enough to scratch every itchy spot on your whole body. Finally, the program decides to roll up its sleeves and do some real work. It prompts you for the security you want to chart and for the number of periods.

Since you just spent 7 minutes collecting historical information on General Motors, let's see how it did over the last 252 trading days (see Figure 5). The graph is designed to give you high, low, and close for each trading day, but there are so many data points breakdowns run together. The vertical bars below the graph are relative trading volume; they represent the natural logarithm of each day's volume figure minus the natural log of the smallest volume figure. Thus, the smallest volume day is shown as zero. The tick marks along the vertical axis are discrete dollar amounts. If GM stock had split at some point during the charting period, *Analyzer* has a routine that would let you correct for the change in price.

You can display the GM data in smaller chunks, say, 60 days (see Figure 6) or 24 days (Figure 7). These charts look very good indeed. If you like, you can chart the natural logarithm of the price on a semi-log chart so as to get a better illustration of percentage price variation at different stock prices. Also, *Analyzer* will let you stretch out or reduce either vertical or horizontal axes so you can zero in on any part of the data you like.

Most impressive, however, is *Analyzer*'s ability to draw curves through the data on your charts. To do this, you key in a few commands, and the new lines appear on the screen. In Figure 8, the plain, 60-day historical data shown in Figure 6 has been reconstituted using the program's special graph curve feature. The three parallel, curving lines in the upper chart are 12-day moving averages of closing prices. The middle curve is the moving average for the actual data points, and the curves above and below it are plotted at plus and minus 5 percent of the actual moving average. If you prefer, you could choose any number of days for your moving average, an exponential rather than simple moving average, and high or low prices for your data points rather than the close. The gently downward-sloping straight line through the middle of the chart is a linear least-squares fit of closing prices that gives the directional trend of the stock price throughout the period.

The lower chart in Figure 8 (where daily trading volume was first displayed) plots GM's negative volume indicator (NVI) over the 60-day period and then smooths that curve with a 12-day moving average. The NVI relates a drop in a stock's daily trading volume to a change in closing price. Whenever volume decreases from one day to the next, the NVI is adjusted by the percent change in the close. When volume increases, NVI remains the same. In this lower graphing space, you could choose to plot the stock's positive volume indicator, cumulative volume indicator, volume line chart, price volume trend, or daily volume indicator.

In the upper graph, there are yet more varieties of curves you may plot. You can draw straight lines between any two points, plot 1/3-2/3 spreed-resistance lines, or design oscillator bar or line charts. You may even stretch out the horizontal axes any distance into the future to project a continuation of any of the curves. Once again, the use to which you put this information is entirely up to you. If you find a relationship that seems to translate into trading profits, *Analyzer*

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TODAYS DATE 08/29/83

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5/06/83	X	BUY	200 C	@	28.50	5700
6/13/83	X	SELL	150 GM	@	70.75	10612
6/23/83	X	SHORT SELL	100 GM	@	74.88	7488
8/24/83	X	SELL	100 C	@	23.00	2300
8/24/83	X	SHORT SELL	200 C	@	23.00	4600
8/29/83	X	DELETE	200 C	@	23.00	4600
7/27/83	X	SHORT SELL	200 F	@	62.88	12576
6/23/83	X	BUY/COVER	100 GM	@	68.25	6825

Figure 11: Record for hypothetical portfolio (Portfolio X) as generated by Market Manager.

REALIZED GAINS/LOSSES

C O D E	SYMBOL	QTY	PURCHASE DATE	PRICE	$COST	SALE DATE	PRICE	PROCEEDS	GAIN/LOSS	L / S
X	GM	150	3/07/83	60.88	9132	6/13/83	70.75	10612	1480	S
X	C	100	5/06/83	28.50	2850	8/24/83	23.00	2300	-550	S
X	GM	100	8/29/83	68.25	6825	6/23/83	74.88	7488	663	S
TOTALS:		350			18807			20400	1593	

Figure 12: A second report for Portfolio X showing the results of all sales and purchases.

HOLDINGS BY PORTFOLIO

TODAY'S DATE 08/29/83

C O D E	SYMBOL	T Y P E	B SS	TRANSACTION DATE	QUANT	$COST	PRICE	08/29/83 $VALUE	PRICE	UNREALIZD GAIN/LOSS	L / S
X	C	S	B	5/06/83	100	2,850	28.50	2,538	25 3/8	-312	S
X	F	S	SS	7/27/83	200	12,576	62.88	10,825	54 1/8	1,751	S
X	GM	S	B	3/07/83	50	3,044	60.88	3,413	68 1/4	369	S
VALUED SECURITIES LONG					150	5,894		5,951		57	
VALUED SECURITIES SHORT					200	12,576		10,825		1,751	

CASH BALANCE = 20451

Figure 13: Current holdings report for Market Manager.

will chart it for any stock you like.

In its second graphing mode, *Analyzer* creates comparative charts for up to five stocks at a time. Figure 9, for example, shows the relative performance of five different automotive stocks during the 60-day trading period. The information along the bottom of the chart (which appears on the computer screen but was inexplicably dropped from the printout) indicates which stocks are being compared, and what a $100 investment in each stock, made on June 1, 1983 would be worth on August 24. If, on the last trading day, the stock's curve is above the base-line, there has been an overall profit; if the curve ends up below the line there has been a loss.

On a color screen these lines would all be easily distinguishable, but in monochrome it's hard to tell them apart. The end point of each line can be determined from how much the $100 investment was worth at the end of the period, but in the middle of the chart it's easy to get lost. Only the plot for the first stock, which happens to be GM, is printed out in boldface and can be distinguished throughout.

If, on the last trading day, the stock's curve is above the baseline, there has been an overall profit.

Figure 10 is a slightly different kind of comparative chart. Here, the baseline is not $100 but the GM stock price, with those of Ford and American Motors plotted against it. Since I have chosen only two stocks to compare with GM and the two diverge immediately, there is no confusion, even in monochrome, over which curve is which. This kind of chart could be printed out using an industrial composite as the baseline, to show which stocks were performing better or worse than the industry as a whole. Unfortunately, *Analyzer* can't fetch composite figures from DJN/R, so those data points would have to be entered by hand.

Analyzer is, all told, quite a razzle-dazzle charting machine. It makes good use of Apple's high-resolution graphics and sends complex graphs to both screen

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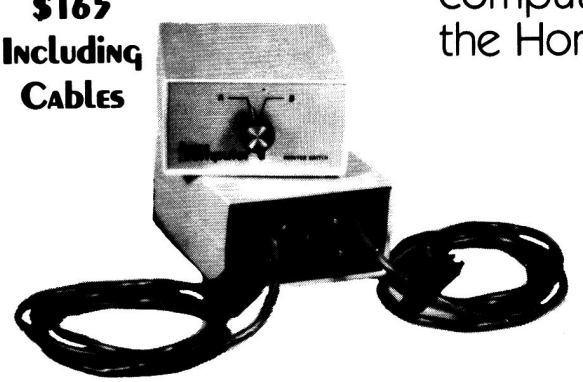

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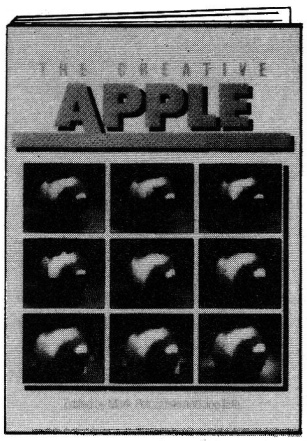

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and printer with only moderate delays. For technical stock analysts it will save an enormous amount of time that might otherwise have gone to doing the same work by hand.

Sadly, access to this powerful graphics package is gained only through an aggressively unfriendly front end. It's not all that difficult to learn how to enter a list of securities, but while you're learning, *Analyzer* is not patient with mistakes. The program assumes you are going to do everything right the first time. If you must make a correction and enter the module that allows you to change a list of securities, you could still be in for surprises. It's tempting to think that by blanking out the symbol for a security, you have removed it from your list. Wrong. The program thinks the security is still on your list and stupidly rings up DJN/R for a symbol composed of a string of blanks. Of course there is no such security, so *Analyzer* bleeps out a cryptic error message that is not explained in the error message appendix. To actually delete a security from your list, you have to go through an entirely separate "deletion" module. This sort of thing is thoroughly bush-league; one wonders how such a slick graphics routine got mixed up with such a clumsy user interface.

Sadly, access to this powerful graphics package is gained only through an aggressively unfriendly front end.

Myopic Market Manager

Market Manager, Dow Jones' portfolio maintenance program, is not a model of elegant programming either. It does a reasonable job of keeping track of trades in up to 26 different portfolios, but suffers from several eccentricities that limit its flexibility.

After a simple setup routine, *Manager* lets you initialize a data disk. Then you are ready to start entering the data for transactions in stocks, bonds, options, mutual funds, or treasuries. The program lets you enter buy, sell, short-sell and buy-to-cover orders, and also keeps track of cash. Aside from dialing up DJN/R for current quotes, such cash or securities entries are the only data the program needs. *Manager* will thus track holdings by portfolio, record gains and losses, and keep a cumulative record of all trades.

Entering transactions is a straightforward procedure. A data-entry screen prompts you for the name of the portfolio (identified by a single letter), the date of the transaction, its nature (buy, sell short, etc.), the Dow Jones symbol, the type of security, and the transaction dollar amount. On successive entries, all but the quantity and amount will default to the values of the previous entry at the touch of the Return key. This makes it easier to enter a series of similar trades.

Unfortunately, the entry screen does little error-checking. It will allow you to enter a strictly numerical security symbol (there can be no such thing) and will record a zero for the transaction amount if you hit the Enter key by mistake. *Manager* thus lets you buy or sell stocks at a price of zero. However, so long as you catch your error before you move on to the next transaction, the program will let you return to any line in the screen and make corrections. The same module of the program allows you to delete earlier transactions or make changes in the cash account.

One clever feature of the program allows you to match closing transactions with any appropriate open position. For example, you may have bought the same stock on different occasions at different prices. When you decide to sell, the program will cycle through the portfolio and show you the various long position you could close against. Your profits (or losses) will vary acccording to which position you choose to close out, and *Manager* records the appropriate results. Whenever you buy or sell, *Manager* also reduces or increases your cash account by the appropriate amount.

Market Manager can generate three kinds of report on the portfolios it is maintaining. Figure 11 is a record of all the transactions entered for a hypothetical portfolio I have identified as X I started on March 7, 1983 with a cash injection of $12,176 to buy 200 shares of GM, and then went on to play with several other automotive stocks.

Note that a deletion from this report does not result in a true deletion; both the original error and the correction are listed. Note also that this report does not sort transactions by date; it prints each one out precisely in the order in which it was entered, no matter what date was

specified for that transaction. For example, the short sell order for Ford (next-to-last transaction) is not listed in chronological order because the entry was not made until after the fact. Also, the buy-to-cover order is listed as occurring on the date of the original short sell order, not the date on which it was actually put through.

This sort of thing would not be too great a problem if the program were being used every day for real transactions; it would be unlikely that buy/sell orders be entered in anything but chronological order. Still, any entry that was made to patch up a past error or omission would appear in the wrong order and buy-to-cover transactions would be easier to understand if the program provided both short-sell and buy dates.

A second report records realized gains and losses by portfolio. Figure 11 gives the results for Portfolio X. The last report (see Figure 12) lists the current holdings in the portfolio, showing the results of all sales and purchases. It is the only report that requires latest securities prices, which can be entered either manually or via Dow Jones. Unless *Manager* were running very large portfolios, manual updating might be a realistic option; thus this program could conceivably be used without a DJN/R subscription. The current holdings report (see Figure 13) carefully nets out sales against long positions and distinguishes nicely between long and short securities.

Unfortunately, *Manager* suffers from omissions that prevent it from being the true broker's tool it was meant to be. The

The lack of a date sorting means that the program cannot tell when one year ends and the next begins.

lack of a date-sorting routine means that the program cannot tell when one year ends and the next begins. This means you must close out the files on each portfolio at the end of the year and start over. It also means that the program doesn't recognize a long-term gain or loss when it sees one. It would be a great help if *Manager* could flag long-term transactions. Alas, it can't.

It would also be useful if *Manager* were able to factor a commission into every transaction price automatically. As the program is now designed, it is possible to adjust each transaction manually to account for commissions, but why not let the user specify commission rates and let the program do the math?

Another shortcoming is *Manager*'s inability to handle margin transactions. It would be enormously useful to a broker to be alerted by his software whenever he needed to make a margin call. Also, if the program allowed him to input periodic changes in the loan rate, it could figure margin interest charges for him. Changes such as these need not be difficult to implement and would greatly improve the program.

Finally, *Manager* has some awkward features that could surely have been avoided. It is, for example, the only package of the three that makes you shuffle between two different program disks depending on what procedure you need to perform. *Manager* is the least complex of the three programs; it's got no business coming on two disks. At the same time, it is the only program that requires you to put DJN/R log-on information on each data disk rather than putting it once and for all on the program disk: more senseless bother.

An additional annoyance, *Market Manager* can't tell the difference between single- and multiple-key input. The other two programs respond immediately when they prompt you for a single-digit or single-letter response; *Manager* loafs around until you hit Return—even after a Y/N prompt.

Perhaps it's significant that, according to the manual, parts of the program were copyrighted by the University of California back in 1979. One wonders which parts. Programming for micros has traveled light years since then.

What, then, are we to make of this trio of offerings from the mighty Dow Jones organization? Frankly, not all that much. In effect, each is nothing more than a specialized database with stock market information for input. Databases now come in all degrees of elegance and sophistication; these, unfortunately, weigh in pretty low on the list. Each program manages to get the job done but none is likely to win a user-friendliness contest.

Microscope is the most straightforward of the three. Its menus load a little too slowly, but the program does its job without too many surprises. *Analyzer*, it must be admitted, creates very fancy graphs, but only after it has snarled at you for not inputting a list of stocks perfectly the first time around. *Manager*, in spite of its clumsiness, does nothing more spectacular than match transactions, make tables, and do four-function arithmetic.

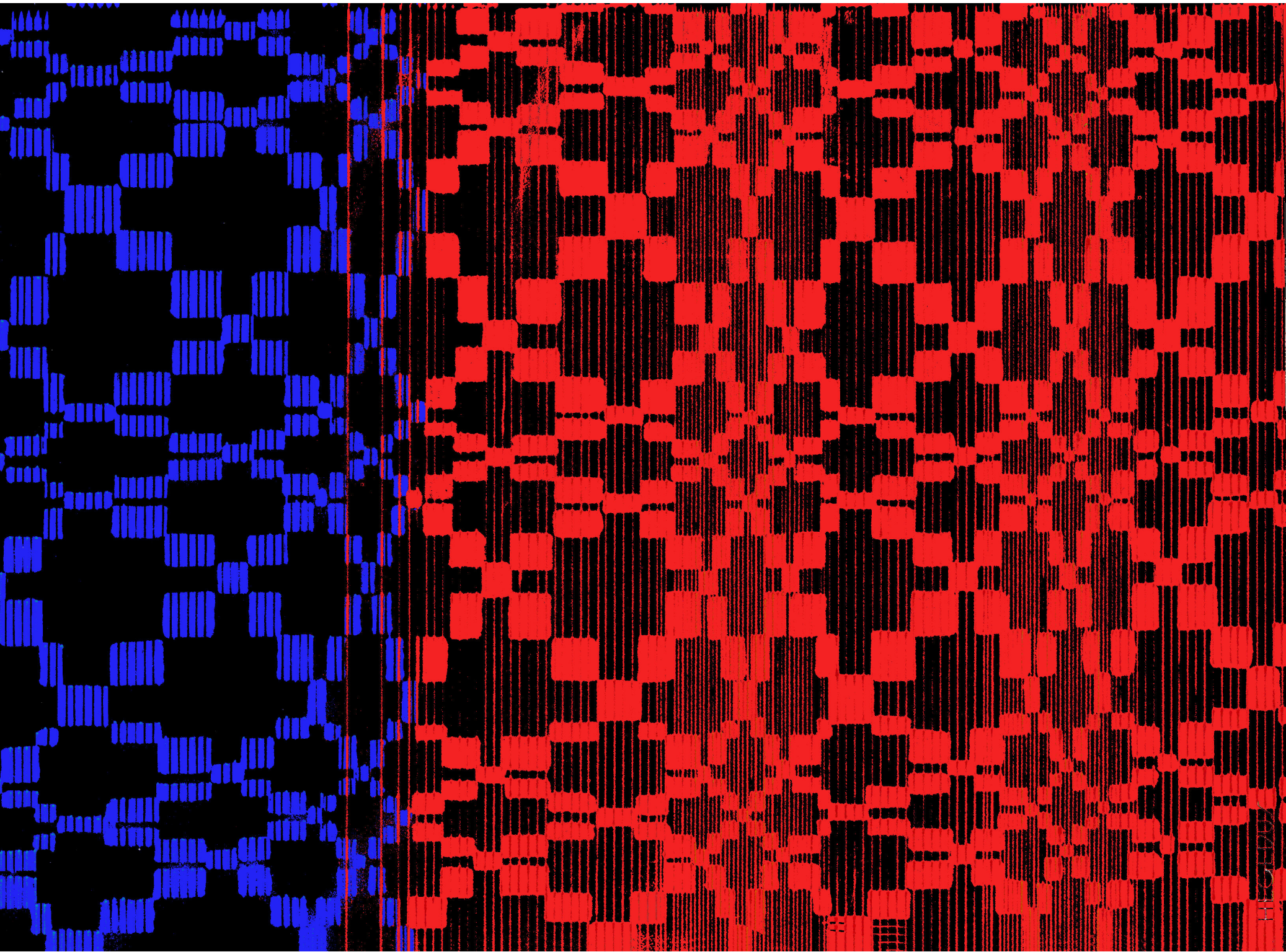
It is just as disappointing to find that these programs are not even consistent among themselves. When you store telephone numbers for automatic dialing,

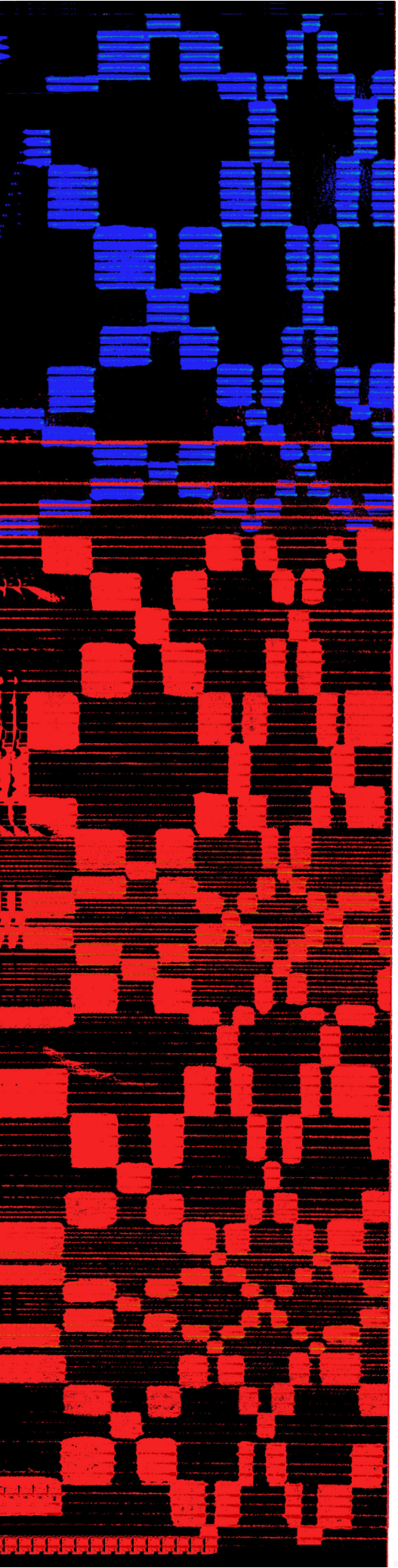
In effect, each is nothing more than a specialized database with stock market information for input.

each has a different system for specifying a pause when dialing 9 to get out of a PBX system. The hardware requirements for the three programs are not even the same. *Manager* will not work with anything but the 300-baud Hayes Micromodem II. The other two programs can be tinkered with so as to let you use a 1200-baud modem, but then you lose the auto-dial, auto-log-on features of the Micromodem. As an added eccentricity, *Microscope* will allow you to access DJN/R at 1200 baud to retrieve the specific indicators you wish to track, but will not let you leaf through the other Dow Jones databases at that speed. You need to drop down to 300 baud to use E-Z terminal mode. Only *Analyzer* will consistently let you operate at 1200 baud.

One respect in which these programs are consistent is their strict copy protection. Not only are the programs supposed to be impossible to copy, but anyone who tries will disable the original. At least that's what the manuals say, but sadly, they are at about the same level as the programs. Only the *Analyzer* manual entirely ignores a significant feature of the program (the "pages" feature) but none of the manuals is a model of clarity. All suffer from minor omissions and typographical errors.

Some day Dow Jones will no doubt smooth out the kinks in these three programs; for now, it looks as though the company was in one tearing hurry to get into the software market. ✚





APPLEWEAVE

The industrial revolution revisited: weaving applications for the Apple

Computing and weaving have a natural and historical affinity. Weaving, like computing, is dependent on precise mathematical relationships; threads are woven repetitively onto the vertical matrix of the warp, much as a program runs through a series of loops. Exactness of design and execution is required; a tiny variation in either will affect the outcome of the entire piece.

Apple owner and part-time weaver Arnold Edelstein recognized this connection and created a simple program called AppleWeave to aid home weavers in the design and production of their art. By removing the hard work and leaving only the joy of creation, the program gives artisans the flexibility and economies of scale usually available only to large-scale manufacturers.

Besides being chairman of the English Department at the University of Hawaii, Edelstein is also an accomplished home weaver whose work has been shown at the annual Art Academy Exhibits in Honolulu. His work is sold through various local stores.

Charles Babbage: Programming Pioneer

Through his work, Edelstein without realizing it pays homage to Charles Babbage, the nineteenth-century designer of the first computer. Curiously, Babbage was inspired by the then newly mechanized British textile industry. He was especially impressed with the automated Jacquard loom, which debuted at the Paris exhibition of 1801. Its creator, Joseph Maria Jacquard, had improved on the earlier attempts of the Frenchmen Bouchon and Vaucansons to increase the efficiency and decrease the human drudgery involved in weaving silk—a delicate, skilled, but repetitive task.

The Jacquard breakthrough was brought about by the use of stiff cards with holes punched through them. These cards controlled the weaving pattern, making the Jacquard loom the first programmable machine. It was immensely successful, and within 11 years of its introduction, over 11,000 were in use in France.

Babbage was also impressed with the mathematical predictability and precision of the new cotton spinning factories springing up all over England. He envisioned a world where the tremendous efficiency of the power loom enabled weavers to have greater autonomy and creativity in the production of their work.

Factory production, the keystone of the Industrial Revolution, led to the development of larger businesses than had previously existed. Keeping track of the sheer volume of information involved in the operation of these new large businesses meant that some people would be required to spend their entire lives dealing with the drudgery of routine, repetitive calculations. Improvements in manufacturing were intimately linked with the evolution of calculating machines.

By 1833, Babbage began applying

the punched card concept of the Jacquard loom to an invention he called the "Analytical Engine." This machine would perform any mathematical operation. It would have memory that could store numbers, and it would be able to make comparisons with the results of various operations. In short, Babbage envisioned the modern computer.

The poet Byron's daughter, Lady Ada Lovelace, was an accomplished mathematician and a contemporary of Babbage's. She followed the progress of Babbage's machine and was also aware of its textile heritage. She wrote: "We may say most aptly, that the Analytical Engine weaves algebraical patterns just as the Jacquard loom weaves flowers and leaves."

Babbage spent 4 decades working on his idea, but the Analytical Engine was never built. It was impossible to manufacture the parts for the machine precisely enough. What Babbage lacked was electronics. He was ahead of his time.

Edelstein without realizing it pays homage to Charles Babbage, the nineteenth century designer of the first computer.

Bigger and Better

About 150 years later, Arnold Edelstein returned the computer to its origins in weaving and textiles. Edelstein took up weaving after finishing the writing of a book during his sabbatical. His work followed the weaving tradition brought to Hawaii by New England missionaries in the nineteenth century. Starting with their traditional blue-and-white star patterns, he moved into his own style of earth-toned, free-flowing abstract designs. He progressed from a simple two-harness tapestry loom, similar to the ones the Navajo use for weaving rugs, to an eight-harness floor loom.

He worked out his designs for rugs and wall hangings on a grid formed by the intersection of two dimensions. The boxes so created represented design blocks. By varying the order of anywhere from two to eight design blocks, different patterns could be created. The pattern was then translated into a threading diagram and a treadling diagram, controlling the order in which threads were entered onto the loom and raised

```
                1     ********************************
                2     *          WEAVE PROGRAM       *
                3     *       by Arnold Edelstein    *
                4     *                              *
                5     *   NOTE: The PLOT routine was *
                6     *    bagged from the very old  *
                7     *    INTEGER HIRES routines.   *
                8     *                              *
                9     *                              *
                10    *                              *
                11    ********************************
                12
                13
                14    HBASL   =   $26
                15    HBASH   =   $27
                16    X0L     =   $0328
                17    X0H     =   $0329
                18    Y0      =   $032A
                19    HCOLR   =   $032C
                20    HNDX    =   $032D
                21    HPAG    =   $032E
                22    XLBUFF  =   $4000
                23    XHBUFF  =   $4100
                24    YBUFF   =   $4200
                25    TXTCLR  =   $C050
                26    MIXCLR  =   $C052
                27    MIXSET  =   $C053
                28    HIRES   =   $C057
                29
                30            ORG $6000
                31
                32    * The somewhat bizarre manipulations here all
                33    * accomplish one purpose: to keep track of
                34    * two arrays, one of which is longer than a
                35    * a single page. I should probably rewrite
                36    * it now that I know more about assembly-language
                37    * programming, but it works and I'm lazy.
                38
6000: 00 00 00
6003: 00 00 00  39    DATA      HEX   000000000000
6006: 20 90 60  40              JSR   GRAPHIC
6009: AD 52 C0  41              LDA   MIXCLR
600C: A9 FF     42    INIT      LDA   #$FF
600E: 8D 2C 03  43              STA   HCOLR
6011: A9 00     44              LDA   #$00
6013: 8D 00 60  45              STA   DATA
6016: 8D 02 60  46              STA   DATA+2
6019: 8D 03 60  47              STA   DATA+3
601C: 8D 04 60  48              STA   DATA+4
601F: A9 C1     49              LDA   #$C1
6021: 8D 01 60  50              STA   DATA+1
6024: A9 01     51              LDA   #$01
6026: 8D 05 60  52              STA   DATA+5
6029: 4C 5E 60  53              JMP   COMPARE
602C: A9 00     54    NEXT      LDA   #$00
602E: 8D 00 60  55              STA   DATA
6031: EE 02 60  56              INC   DATA+2
6034: AD 03 60  57              LDA   DATA+3
6037: CD 02 60  58              CMP   DATA+2
603A: D0 17     59              BNE   BEGIN
603C: A9 01     60              LDA   #$01
603E: CD 05 60  61              CMP   DATA+5
6041: F0 01     62              BEQ   NEXT1
6043: 60        63              RTS
6044: A9 00     64    NEXT1     LDA   #$00
6046: 8D 05 60  65              STA   DATA+5
6049: A9 18     66              LDA   #$18
604B: 8D 03 60  67              STA   DATA+3
604E: A9 01     68              LDA   #$01
6050: 8D 04 60  69              STA   DATA+4
6053: EE 00 60  70    BEGIN     INC   DATA
6056: AD 01 60  71              LDA   DATA+1
6059: CD 00 60  72              CMP   DATA
605C: F0 CE     73              BEQ   NEXT
605E: AE 00 60  74    COMPARE   LXD   DATA
6061: A9 01     75              LDA   #$01
6063: CD 05 60  76              CMP   DATA+5
6066: D0 0E     77              BNE   COMP1
6068: AC 02 60  78              LDY   DATA+2
606B: BD 00 42  79              LDA   YBUFF,X
606E: D9 00 40  80              CMP   XLBUFF,Y
6071: D0 E0     81              BNE   BEGIN
6073: 4C 81 60  82              JMP   MATCH
6076: AC 02 60  83    COMP1     LDY   DATA+2
6079: BD 00 42  84              LDA   YBUFF,X
607C: D9 00 41  85              CMP   XHBUFF,Y
607F: D0 D2     86              BNE   BEGIN
6081: AD 00 60  87    MATCH     LDA   DATA
6084: AE 02 60  88              LDX   DATA+2
6087: AC 04 60  89              LDY   DATA+4
608A: 20 0C 61  90              JSR   HPLOT
608D: 4C 53 60  91              JMP   BEGIN
6090: A9 20     92    GRAPHIC   LDA   #$20
6092: 8D 2E 03  93              STA   HPAG
6095: AD 57 C0  94              LDA   HIRES
6098: AD 53 C0  95              LDA   MIXSET
609B: AD 50 C0  96              LDA   TXTCLR
609E: AD 2E 03  97              LDA   HPAG
60A1: 85 1B     98              STA   $1B
60A3: A0 00     99              LDY   #$00
60A5: 84 1A     100             STY   $1A
60A7: 98        101   GRAPH1    TYA
60A8: 91 1A     102   GRAPH2    STA   ($1A),Y
60AA: CB        103             INY
60AB: D0 FB     104             BNE   GRAPH2
60AD: E6 1B     105             INC   $1B
60AF: A5 1B     106             LDA   $1B
60B1: 29 1F     107             AND   #$1F
60B3: D0 F2     108             BNE   GRAPH1
60B5: 60        109             RTS
60B6: 8D 2A 03  110   HPOSN     STA   Y0
60B9: 8E 28 03  111             STX   X0L
60BC: 8C 29 03  112             STY   X0H
60BF: 48        113             PHA
60C0: 29 C0     114             AND   #$C0
60C2: 85 26     115             STA   HBASL
60C4: 4A        116             LSR
60C5: 4A        117             LSR
60C6: 05 26     118             ORA   HBASL
60C8: 85 26     119             STA   HBASL
```

```
60CA:  68          120           PLA
60CB:  85  27      121           STA  HBASH
60CD:  0A          122           ASL
60CE:  0A          123           ASL
60CF:  0A          124           ASL
60D0:  26  27      125           ROL  HBASH
60D2:  0A          126           ASL
60D3:  26  27      127           ROL  HBASH
60D5:  0A          128           ASL
60D6:  66  26      129  ROR           HBASL
60D8   A5  27      130           LDA  HBASH
60DA:  29  1F      131           AND  #$1F
60BC:  0D  2E  03  132           ORA  HPAG
60DF:  85  27      133           STA  HBASH
60E1:  8A          134           TXA
60E2:  C0  00      135           CPY  #$00
60E4:  F0  05      136           BEQ  HPOSN2
60E6:  A0  23      137           LDY  #$23
60E8:  69  04      138           ADC  #$04
60EA:  C8          139  HPOSN1   INY
60EB:  E9  07      140  HPOSN2   SBC  #$07
60ED:  B0  FB      141           BCS  HPOSN1
60EF:  8C  2D  03  142           STY  HNDX
60F2:  AA          143           TAX
60F3:  BD  0C  60  144           LDA  INIT,X     ; Offset to MASK
60F6:  85  30      145           STA  $30
60F8:  98          146           TYA
60F9:  4A          147           LSR
60FA:  AD  2C  03  148           LDA  HCOLR
60FD:  90  03      149           BCC  HPOSN3
60FF:  0A          150           ASL
6100:  69  00      151           ADC  #$00
6102:  85  1C      152  HPOSN3   STA  $1C
6104:  60          153           RTS
6105:  01  02  04
6108:  08  10  20
610B:  40          154           HEX  01020408102040 ; This is the MASK
610C:  20  B6  60  155  HPLOT    JSR  HPOSN
610F:  51  26      156           EOR  (HBASL),Y
6111:  25  30      157           AND  $30
6113:  51  26      158           EOR  (HBASL),Y
6115:  91  26      159           STA  (HBASL),Y
6117:  60          160           RTS

-END ASSEMBLY-

ERRORS: 0

280 BYTES


SYMBOL TABLE - ALPHABETICAL ORDER:

BEGIN   =$6053   COMP1   =$6076   COMPARE =$605E   DATA    =$6000
GRAPH1  =$60A7   GRAPH2  =$60A8   GRAPHIC =$6090   HBASH   =$27
HBASL   =$26     HCOLR   =$032C   HIRES   =$C057   HNDX    =$032D
HPAG    =$032E   HPLOT   =$610C   HPOSN   =$60B6   HPOSN1  =$60EA
HPOSN2  =$60EB   HPOSN3  =$6102   INIT    =$600C   MATCH   =$6081
MIXCLR  =$C052   MIXSET  =$C053   NEXT    =$602C   NEXT1   =$6044
TXTCLR  =$C050   XOH     =$0329   XOL     =$0328   XHBUFF  =$4100
XLBUFF  =$4000   YO      =$032A   YBUFF   =$4200


SYMBOL TABLE - NUMERICAL ORDER:

HBASL    =$26     HBASH   =$27     XOL    =$0328   XOH     =$0329
YO       =$032A   HCOLR   =$032C   HNDX   =$032D   HPAG    =$032E
XLBUFF   =$4000   XHBUFF  =$4100   YBUFF  =$4200   DATA    =$6000
INIT     =$600C   NEXT    =$602C   NEXT   =$6044   BEGIN   =$6053
COMPARE  =$605E   COMP1   =$6076   MATCH  =$6081   GRAPHIC =$6090
GRAPH1   =$60A7   GRAPH2  =$60A8   HPOSN  =$60B6   HPOSN1  =$60EA
HPOSN2   =$60EB   HPOSN3  =$6102   HPLOT  =$610C   TXTCLR  =$C050
MIXCLR   =$C052   MIXSET  =$C053   HIRES  =$C057


Applesoft Driver

1  ONERR GOTO 10000
2  DIM A(279)
5  FOR I = 0 TO 279
10  READ A(I): NEXT
12  FOR I = 0 TO 191
15  POKE 16384 + I,A(I): REM "X" buffer
20  POKE 16896 + I,A(I): REM "Y" buffer
30  NEXT I
40  FOR I = 192 TO 279
45  POKE 16384 + I,A(I): REM "X" buffer
50  NEXT I
70  IF PEEK (24582) + PEEK (24583) + PEEK (24584) < > 272 THEN PRINT
      CHR$ (4)"BLOAD WEAVE"
80  CALL 24582
90  REM

The numbers refer to pattern blocks

100  DATA 4,3,2,1,1,1,8,7,6,5,6,7,8,1,1,1,2,2,3,3,3,4,3,3,4,3,3,4,3,4,3,3,
     4,3,3,4,3,3,3,2,2,1,1,8,7,6,5,6,7,8
110  DATA 1,1,1,2,3,4,3,2,1,2,3,4,4,4,3,2,1,2,3,4,3,2
120  DATA 1,1,1,2,3,4,3,2,1,2,3,4,4,4,3,2,1,2,3,4,3,2
130  DATA 1,1,1,2,3,4,3,2,1,2,3,4,4,4,3,2,1,2,3
9000  END
9999  REM

The error routine makes sure the "X" array will cover the screen by repeating
the pattern.
10000  IF PEEK (222) < > 42 THEN PRINT "ERROR #"; PEEK (222):" IN LINE";
       PEEK (218) + PEEK (219) * 256: END
10010 N = I
10020  FOR I = N TO 279
10030 A(I) = A(I - N)
10040  NEXT I
10050  GOTO 12
```

and lowered during the weaving process.

His works grew in size and complexity; he began to make 9-foot-long linen and silk weavings. Working with costly materials on such a grand scale required careful calculations.

Edelstein also liked working on the concrete problems of developing good design and technique and of combining color and texture to achieve the effects he desired. It was a welcome change from grappling with the vagaries of teaching the American novel. Each work represented a tangible aesthetic problem. According to Edelstein: "When the piece is finished, so is the problem.

Before and After

This same interest in practical problem solving led him to computers. He became interested when his wife took a statistics class involving computers. Intrigued, Edelstein began using her access number to experiment with the University's Hewlett Packard and became hooked. He purchased an Apple, particularly because of its high-resolution graphics.

Before getting the Apple each design took about 45 minutes. With the Apple, he could write a simple program to speed up the process.

Before getting the Apple, he designed weaving patterns with graph paper and felt-tip pens. Each design took about 45 minutes. With the Apple, he could write a simple program to speed up the process.

Using the Applesoft handbook as his guide, he wrote a simple program representing the vertical and horizontal dimensions of his loom. He would enter the pattern in data statements, read it into an array representing the x-dimension, restore and then read it into a second array representing the y-dimension. A double loop would compare the two arrays and plot a point where the values were equal. If they were not equal, a blank was left. The program generated 28-inch × 19-inch pattern drafts on cross-section paper set at 10 units per inch.

This was a tremendous improvement over the old method. Each design now

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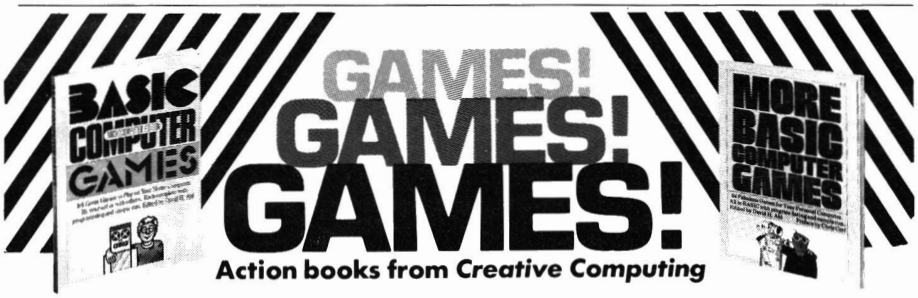

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took about only 7 or 8 minutes. But the process still seemed inefficient to Edelstein because it took too long to generate each design possibility. As he said, "I could still go out and have a beer" in the time it took for each pattern to appear on the screen. It occurred to him that he might get faster results if he rewrote his BASIC program in assembly language.

On to BASICs

Assembly language is one step closer than BASIC to the actual operation of the computer. It is one step above machine language because it is the language the computer "thinks" in. BASIC actually is a program driven by assembly language.

Rewriting the program in assembly language would increase processing efficiency. To do this, he had to manipulate how the computer went about executing the tasks he assigned it. He would be able to dictate at a more fundamental level how he wanted the machine to perform the programmed task.

A mini-assembler would have enabled him to write instructions in assembly language and would, in turn, have translated his instructions into machine language. However, Edelstein didn't own the only mini-assembler on the market at that time. He found it primitive and was not tempted to buy it. He would have to use other means to attack the problem.

In short, Babbage envisioned the modern computer . . . What Babbage lacked was electronics. He was ahead of his time.

As he soon discovered, there were few available books or manuals on the use of assembly language with the Apple. Edelstein checked with the store where he bought his Apple, to no avail. He and his local user group struggled to teach themselves assembly language. "It was awful," he said. "It took us about 4 hours to learn how to add."

Finally, he was able to get some information from *CALL-A.P.P.L.E.*, the publication of the Puget Sound Users' Group. He came across a book on the PET 6502, the Apple's microprocessor. These guides enabled him to translate his BASIC program into assembly language.

The program began as before, with two arrays and Applesoft data statements. Instead of comparing the arrays in BASIC, they were poked into two buffers. Assembly language then ran the

He could now look at an entire series of design variations in the time previously required to map out a single design.

loops, indexing one array with the x-register and the other with the y-register. When a match was made, the program did a subroutine to a plot routine that Edelstein copied from the graphics package accompanying the Apple. The results were satisfying; it now took 7 seconds to fill the screen with a pattern of his design.

He could now look at an entire series of design variations in the time previously required to map out a single design by hand. Studying the images, he could quickly pick designs for production or save each one for future reference as it came up. The EXEC command allowed him to switch back and forth between two or three variations. He could develop a central pattern that he liked and put three alternative borders on a loop. He could then decide which of the three combinations represented the best design solution.

After settling on a pattern, he used another program he developed to convert the pattern draft into a threading list. The list could either be copied from the terminal screen or printed out on hard copy that could be taken directly to the loom. After creating a threading list, he could use still another program to determine the amount of yarn needed for both warp and weft (fixed threads and cross threads). The width or number of thread, the kind of yarn, and the yarn size would be entered, and the amount of yarn he needed would be computed in both ounces and grams.

Because he also exhibited and sold many of his pieces, he used his Apple for the business management of his craft. He created a small general ledger program for Edelstein Eccentricities, the name he gave to his business. He wrote a yarn inventory prgram that calculated the amount and cost of yarn by type and by piece of completed work, and a finished work program that kept track of each

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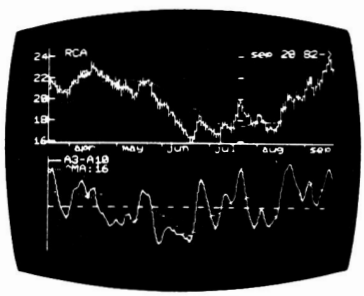

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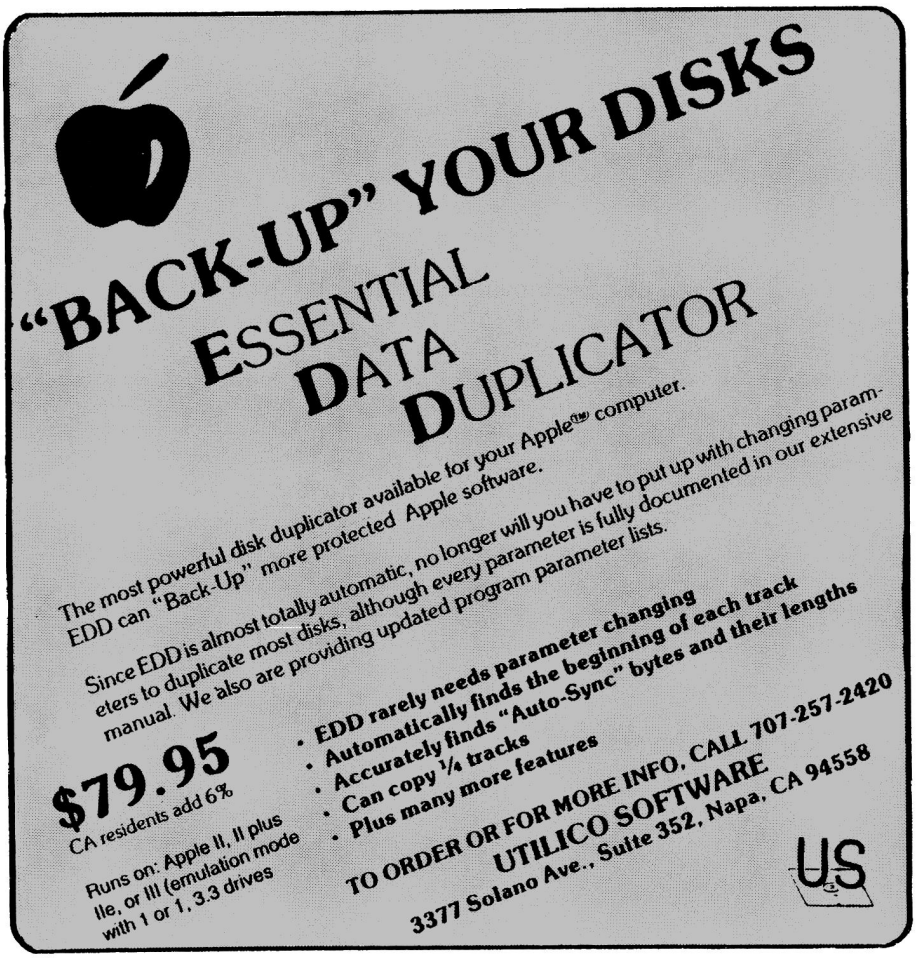

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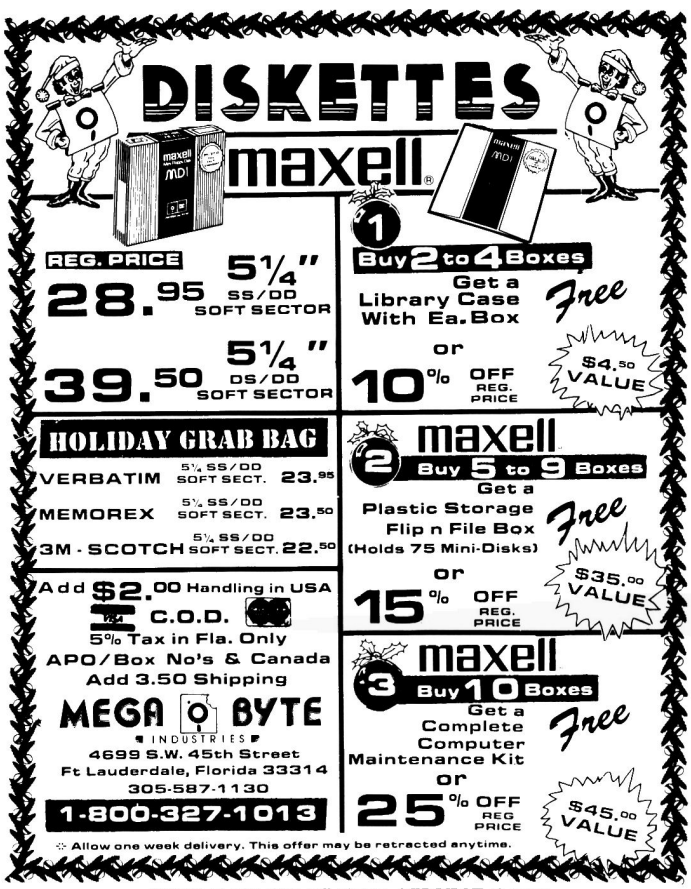

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piece by status, title, and description.

Eventually, he acquired a black-and-white monitor, which gave him better resolution than his terminal screen. He became aware that the colors available on the Apple were not true to the colors of his yarns, if only because spectroscopic light cannot have the same qualities as reflected light. He felt that the effects of color and texture created when yarns are twisted together and intermingled could not be simulated on the screen. Edelstein now relies on his native color sense to determine color choice, once he has chosen one of his computer-aided designs.

Babbage's Dream Come True

Recently, a commercial manufacturer of looms for craftspeople developed software for its semiautomatic loom. The Macomber Company has two programs for its Dobby loom; one is for design purposes, much like Arnold Edelstein's. The other actually runs the loom. It is reminiscent of Charles Babbage's dream of skilled home weavers empowered by automation.

"I could still go out and have a beer" in the time it took for each pattern to appear on the screen.

In spite of the efficiency gains that this package represents, Edelstein is not interested. He enjoys the entire process, from conceptual work to the actual weaving, and he has no interest in automating himself out of the picture. His goal has never been to fully automate his weaving, but to enhance the creative aspects and minimize the routine ones. The results of his decision to rely on his intuition instead of the Apple generated colors in designing tapestries, for example, greatly pleased him.

AppleWeave is merely a tool. It is different from computer-generated art in that it is not a demonstration of intellectual virtuosity or technical expertise. It is, instead, a vehicle that fosters the artist's creativity.

Edelstein's Eccentricities has suffered a bit during the last 2 years, due to Edelstein's decision to tour China. When the time came for his trip, he unplugged his Apple and took it with him. "But," he says, "that's another story." ✚

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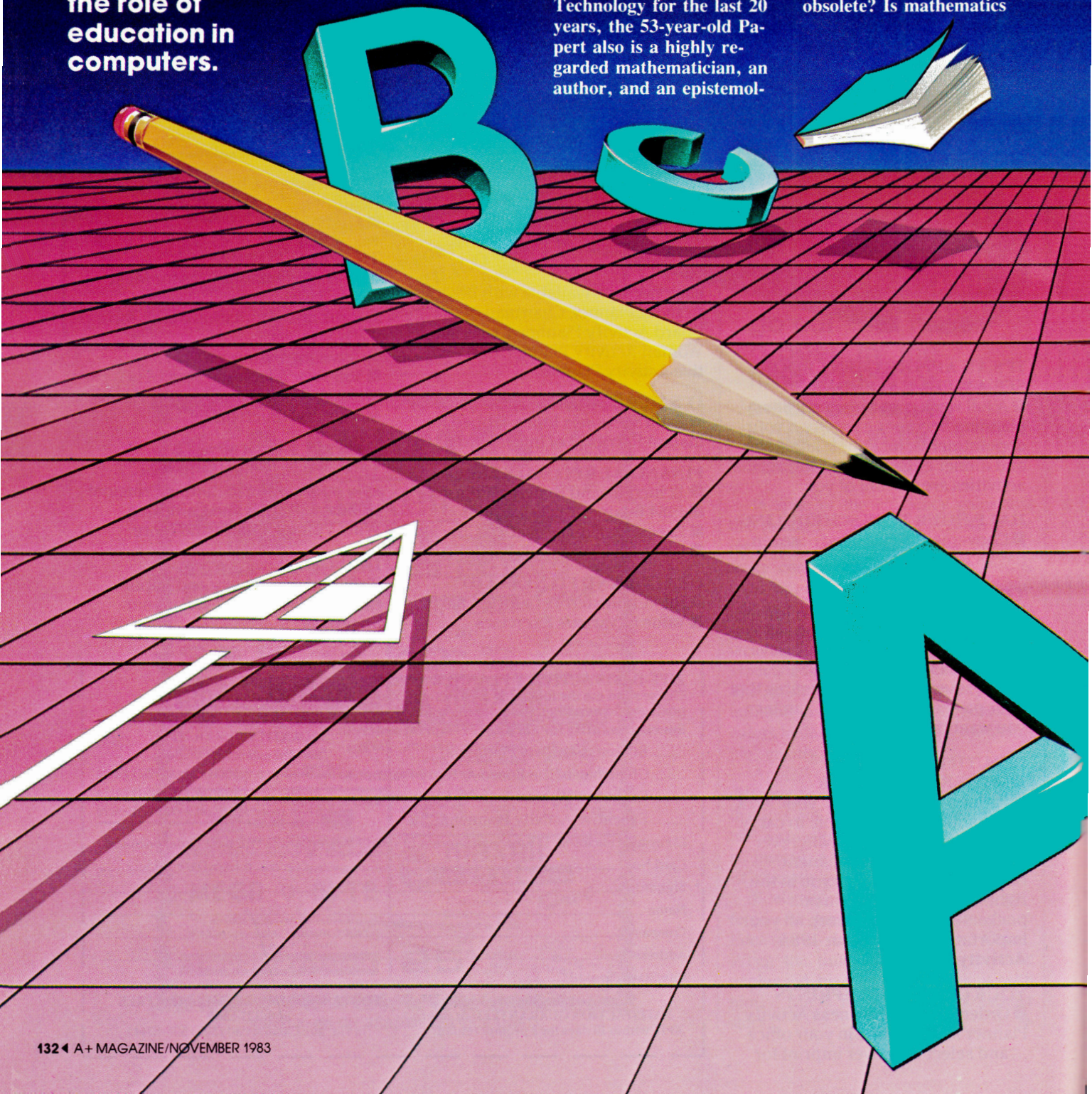
THE FATHE

Seymour Papert talks about the role of computers in education—and the role of education in computers.

As the debate over the true worth of microcomputers in the classroom brews, experts on both sides likely will find themselves faced with the controversial ideas of Seymour Papert, a computer scientist best known for his theories on the role of computers in education and society.

A professor at the Massachusetts Institute of Technology for the last 20 years, the 53-year-old Papert also is a highly regarded mathematician, an author, and an epistemologist.

In his career, Dr. Papert, who holds a Ph.D. in the mathematics field, has focused on such weighty issues as: Are schools as we know them obsolete? Is mathematics

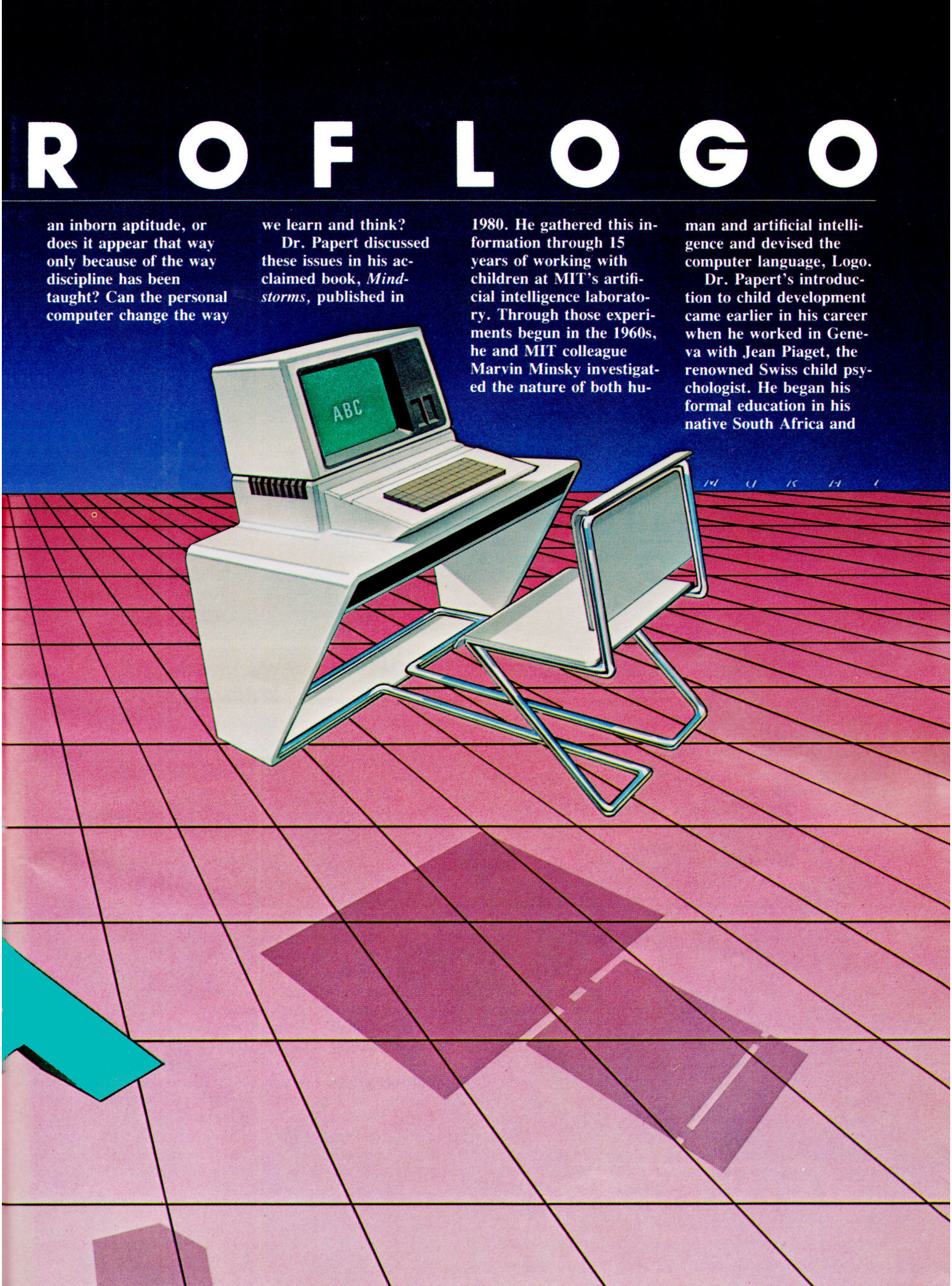


R OF LOGO

an inborn aptitude, or does it appear that way only because of the way discipline has been taught? Can the personal computer change the way we learn and think?

Dr. Papert discussed these issues in his acclaimed book, *Mindstorms,* published in 1980. He gathered this information through 15 years of working with children at MIT's artificial intelligence laboratory. Through those experiments begun in the 1960s, he and MIT colleague Marvin Minsky investigated the nature of both human and artificial intelligence and devised the computer language, Logo.

Dr. Papert's introduction to child development came earlier in his career when he worked in Geneva with Jean Piaget, the renowned Swiss child psychologist. He began his formal education in his native South Africa and



then went on to Cambridge and Paris.

Although Dr. Papert and his colleague developed Logo more than 15 years ago, it wasn't until the late 1970s that the language gained recognition. Texas Instruments Corp. (TI) first adapted Logo for use on personal computers. Later, TI financed an experimental program using Logo at the Lamplighter School in Dallas. Today, the language is found in many different versions, applicable to other personal computers, including several for the Apple II. Dr. Papert is a founding principal in Logo Computer Systems, Inc., a Canadian firm that develops the version of the language sold by Apple Computer, Inc.

I've criticized the educational world today not because it's got schools, but, because it's stuck in the rut.

Logo is interpreted through a turtle, a triangular-shaped cursor on the computer monitor which draws geometric shapes and complex designs on the screen in response to receiving simple commands. The language itself is based on the artificial intelligence language called LISP. Proponents contend that the Logo language is better than BASIC, for instance, because it is more like a natural language and therefore much easier to learn. Moreover, Logo is so simple to understand that kindergarten children can program the computer using it.

A constant student and ever the epistemologist, Dr. Papert continues to test through his own pursuits the study of what knowledge is and how people acquire it. In his spare time, Dr. Papert has taught himself to juggle, fly an airplane and read Chinese.

The following is taken from a two-hour interview with Dr. Papert:

A+: In a world of the future what sort of changes in our culture and in our educational system do you see, or hope to see, come from the widespread use of personal computers?

Papert: What I think is most critical is whether the computer and computer culture will be continuous with the kind of computers and computer culture we have now, or whether we will break out of that continuity and produce a totally different set of computer cultures. I think this is really the key issue. Computers have been made essentially by engineers who invented them, with some input from mathematicians. And I think that everything about them, the form that they have, and the way that you interact with them, the languages and metaphors and the way people think about them, represent a coherent projection of a certain subculture in our society. It's technically oriented and very male. In America, it's very white. On a world scale, it's very Euro-American, and it's very white, too.

People whose approach to reality is more oriented towards people, those who are more psychological, who are less analytic, are excluded from this computer culture. Now I don't think the role of the computer culture is to bring them into it. This is often said to be the importance of the computer, that it will teach the nonanalytic people to think analytically. Of course, it will do that, but that's not the important thing. What I would like to see in the world of the future is not the computer changing people into something that they aren't, making everybody like a computerist, rather I would like to see the computer being able to let everybody be more of what they are. In order for that to happen the computer has to be remade in many different images. I think that's really what I'm most hopeful of. I call that *appropriation* of the computer by individuals, by cultures.

A+: What do you mean by remaking the computer in different images?

Papert: Well, for example, I've seen how children use Logo computers. Some children use them in a way that you would expect from a computer science point of view. They like to be very analytic and they like thinking of linear programs and they like subdividing the problem, and so on. I've been calling that the "hard style" of computer programming. But I also noticed that if you create a situation where children can really get enough access to a computer to do what they want with it, children who don't like to think like that can use it in a very different way. They don't start off by analyzing the problem, they start off by doing something simple and modifying it interactively.

The Space Shuttle example (at the Lamplighter School in Dallas) is the most dramatic example I saw. Here was a whole community of kids that got involved in something that had a kind of sense of importance to them. *(Interviewer's note: the children had seen the first space shuttle go up on television and the next day they spontaneously started drawing space shuttles on their classroom computers.)*

There were the "hard" ones who did it in the way you would expect a traditional computer scientist to do it: you imagine what you'd like to have—that's your plan—and then you translate this plan into sub-plans and you write subprocedures and you hope it gets straight in your head and then you type it into the machine and it runs. That's the idea of it.

The other kid puts a blob on the screen and sort of likes it. Then he modifies it a little and gradually builds it up into something much more complicated. He's not doing a simpler job; he's not learning less. Much that he's learning is the same stuff. But he's interacting with reality in a profoundly different way, in a way that corresponds with *his* personality.

A+: Are these differences cultural or biological?

Papert: I think you've got to say nobody knows. But the presence of computers, which is going to allow many different approaches to thinking about the same problem to flourish, is going to allow us for the first time to really understand how many of these things are cultural and how many of these things have biological roots.

We hardly understand the deep psychology of what makes games so exciting it's clear that some very powerful things are at work.

Obviously, there's some sort of mixture of both and how much of each nobody can say. I'm inclined to think that people just are very different initially, but that these differences are much more fundamental things than whether you're good at math or not good at math; I don't think that's innate at all. I think what's innate is personality differences . . . very elemental kinds of differences which result because of a process of interaction with a particular society and a particular culture and the kind of way in which children have access to knowledge. These differences give rise to some kids taking to mathematics and some not.

A+: Isn't it true, though, that certain people seem to have natural aptitudes for doing certain things well, such as music

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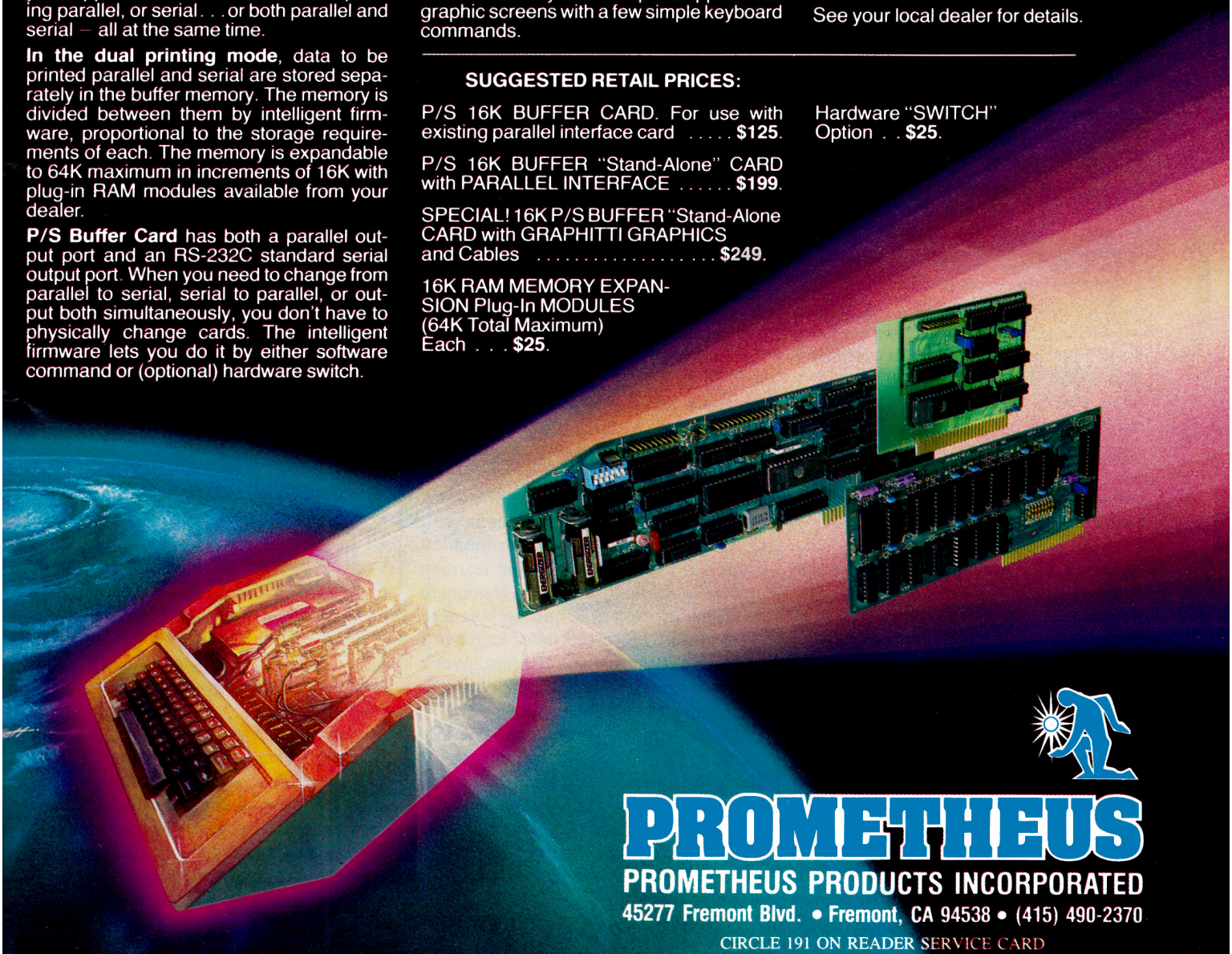

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or mechanics?

Papert: Well, I can mention my favorite example from *Mindstorms,* if you were to judge from looking at America, people who were born on this side of the Atlantic, unless they happen to be in Quebec, somehow systematically have a poor aptitude for French. Obviously people have aptitudes that are different, but before we can conclude that this is an aptitude for French, or for mathematics, we've got to understand a lot more about how that child or that person would have developed under different circumstances.

I think there's a very powerful personality difference that shows itself in the difference between obsessionality and hysteria in personality types. And, I'm prepared to believe that it's very deeply rooted in biological things. In any case, it gets established very early in life.

Will the major effect of the computer be a greater presence of mathematical and scientific and technological thinking?

What I'm sure of is that those who are on the obsessional side of life have an infinitely better chance of doing well in mathematics in our world in the culture we offer them. And I also know for a fact now from our experience in computers that many who are on the other side—who you'd think had no aptitude for mathematics and simply don't do it—pick it up very easily if you put them in the right sort of computer environment where they can pick up mathematics in a more hysterical style, a more active style.

A+: Would you elaborate a bit more on what you mean by obsessional and hysterical personalities?

Papert: The obsessional is the one who likes writing little details, is concerned with detail, who likes to see things in a fine sort of way, who likes to concentrate on detail. So a person who will sit down happily putting numbers on squared paper tends to be obsessional. Whereas the other one (hysterical) likes to see the results, is more attracted to the broad brush, to respond to the activity—to not defer the emotional response but to do things that have it mixed up in them a high degree of excitement.

A+: Is this "creativity" versus something else?

Papert: No. Obsessionals can be extremely creative.

A+: Are you talking about the notion of left brain-right brain influence on thinking and problem solving?

Papert: That's one division I think is more complicated. There are many more dimensions in which people differ than that. I think it's a fair rule that whenever anyone says there are two kinds of anything, it might be true in a sense but it must be oversimplified.

A+: Might one be more analytical and the other more intuitive?

Papert: I don't believe those categories are very good for (describing it). For that matter, when I say obsessional and hysteric I think that we're beginning to see a very systematic difference in people, but we're *just beginning* to see it. It's a very intuitive concept. I don't know yet how to spell it out in detail.

A+: In your book *Mindstorms,* you focus mainly on math and physics in your examples of how the computer can change attitudes. Do you feel these subject areas will be the most fruitful areas in which to use computers?

Papert: Will the major effect of the computer be to cause a greater presence of mathematical and scientific and technological thinking? It might very well be because in the nature of the world, in the nature of the fact that industry and production and getting things to happen depends on technology and harnessing the physial sciences, there's a great need for that and so it might be that's the way the computer is used.

A+: Those are applications. I was thinking more about math and the physical sciences being the undiscovered aptitudes that are most likely to come out through use of computers in education.

Papert: No, I don't think so. I think that the literary is just as likely to come out. In fact I think that the profoundest impact of the computer on the learning process in the next generation is going to be on the process of acquiring language and using it. The presence of keyboards in the lives of preschool children gives a new approach to the alphabetic language, the written language.

We're seeing preschool children learning the alphabetic language as a direct instrument of controlling their work. This is a profoundly different route into the written language than that which is practiced in our education system today. The written language is seen as a way of coding the spoken language and we are seeing three- and four-year-old children beginning to master the keyboard and beginning to master the alphabet through the keyboard.

A+: But does it really matter if they do it at an earlier age or later? If children are going to develop these skills anyway, does it really make any difference if this development is speeded up?

Papert: I think what matters is the tremendous psychological boost this gives a child. I emphasize this more with mathematics in *Mindstorms* but I'd say the same about writing. The major effect of bad mathematics education on society is not that there are fewer people who can do mathematics but that there is the psychologically destructive effect of when it (mathematics education) fails. The schools are just not very good for getting people into mathematical thinking. It might be okay for children who have acquired somehow an intuitive sense of mathematics for them to acquire more formal detail, but it's not for those who come in not being able to think mathematically. They very seldom acquire that in school.

So they're put in this frustrating "put-down" situation that's enormously destructive psychologically. Same thing about writing. So I think the major question is not the age at which it happens but protecting the children from the frustrating and psychologically damaging effects of society's clumsy attempts to force unnatural modes of learning and teaching on them.

A+: In your writings and speeches you've been quite critical of existing school structures saying that the schools of today are obsolete. You've described yourself as an educational utopian although I think you might even be said to be an educational anarchist. In any case, in what ways do you see the personal computer changing schools?

There's no question in my mind that the computer could enormously exacerbate inequality just as much as it could bridge it.

Papert: I have to make two corrections. First, there are many senses of the word "critical." In one sense being critical is somehow blaming it, "It did a bad

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thing.'' I'm not critical in that sense. I think that school as we know it didn't happen like that because people were bad or stupid, it happened like that because it had to. I don't think we had choices, ''we'' being society.

I think if you look back at the history of educational criticism it's been like criticizing the waves for beating on the shore and making a lot of noise. You can't stop it. You recognize a natural process.

I think what the computer opens up is the possibility of changing, of offering us a greater choice of how we can introduce children into our culture. So I'm critical in the sense that to continue the school after it's become anachronistic due to material conditions (i.e., computers) that make it possible to do something else, that's bad. I've criticized the educational world today not because it's got schools, but, because it's stuck in the rut and finds itself hard to break out of being able to think. You've got to have school as we've known it.

I don't know what you mean by anarchist, either. I'm not against a structured environment for children, but what I am against is the idea that thinking happens and can be imposed in a structured way. I think there probably isn't a single educational theorist in the world who really believes that—that you can impose structure on a growing mind—as opposed to creating the conditions where the structure will grow.

A+: Do you advocate doing away with classrooms and/or emphasizing education at home?

There will be new ways of thinking, new kinds of theoretical analysis in anthropology and logic and the relationship of people to knowledge and to culture.

Papert: I think it would be a social disaster if we moved into a situation where children spend most of their time in the home and in the family. If children did not come out and interract with other children in different environments, and with other adults, I think there is every reason to believe it would be something catastrophic.

People say I criticize classrooms and say we shouldn't have them, and that I forget about all the things that happen in the class besides learning arithmetic. There's spelling and all this social interaction and learning to deal with people. This I've found the most infuriating criticism because—I don't suppose it's really made in bad faith—but it just shows how deeply rooted people's minds are in the assumption that the way things have always been is the way they have to be.

Let's ask the question a little differently: Suppose you were to set out and say, ''I'd like to design the ideal kind of conditions for children to learn social skills, how they think of one another and how to interact with children and adults.'' When you think of socialization as the goal, I think the chance that you would decide to put them into groups of 30 where they're going to learn the multiplication tables—is very unlikely.

Obviously, you've got to think about how children should enter society in social ways, but in the school that goal is systematically deformed by being mixed up in the need to teach them the multiplication tables, for example, and a lot of other needs of this sort. I think what the computer presence is going to allow us to

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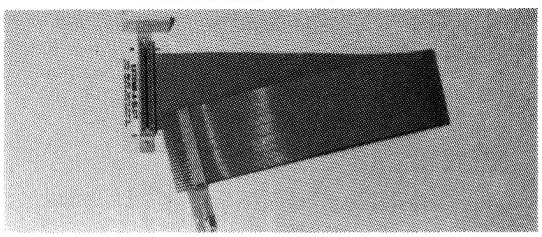

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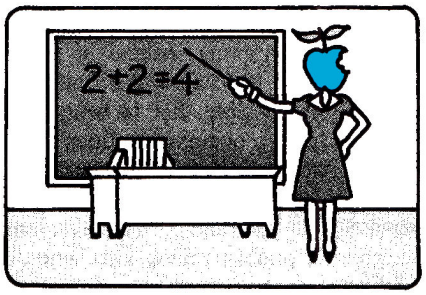

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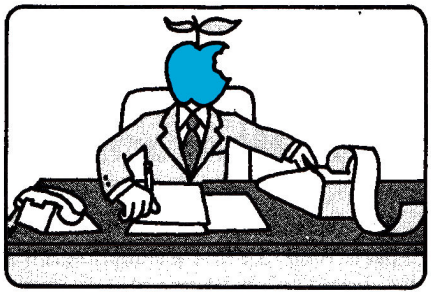

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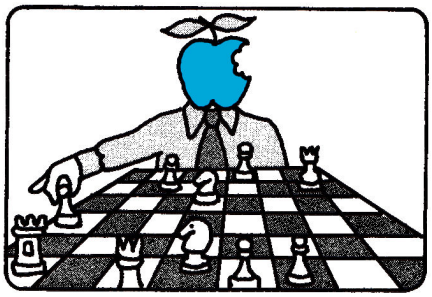

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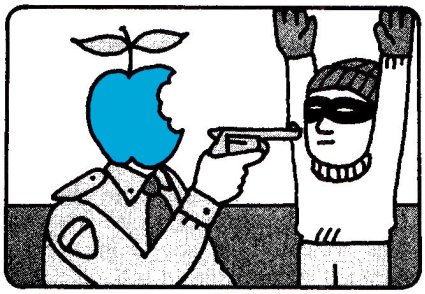

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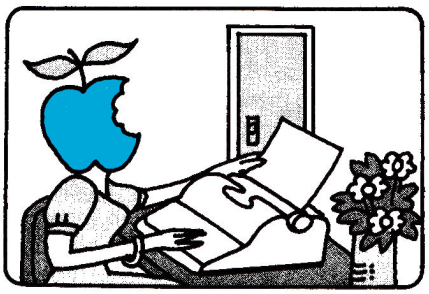

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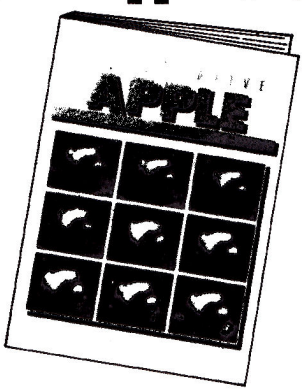

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do is to disassociate these so that society can think about, experiment with new forms of social environments for children without it being constantly weighed down and deformed by a particular set of rote learning that has to be imposed on the children.

A+: I don't suppose there's much indication that anyone is going to do this kind of experimentation?

Papert: Oh, there's absolutely every indication. This idea of the School of the Future, this idea of making experimental schools in which we go as far as we can towards simulating the future is catching on. It's hardly a mass movement, there hasn't been one created yet, but the number of people in a position to do it who have begun to manifest an interest is quite impressive.

I believe what is (happening) in New York City will be the beginning. I believe in three or four other cities in the U.S. and in some in other countries we will see at least a half a dozen such experiments in the next year or two. If there are 6 or 10, between the 6 or 10 there will be enough variation so that it'll become apparent at least some of the ways in which very dramatic, unexpected results can be obtained. As soon as that happens I think the people of the world will start demanding something better for their children. People accept school because they haven't seen an alternative.

The computer is going to allow us to experiment with new forms of social environments for children.

A+: Would you describe the New York school experiment?

Papert: Well, the first assumption is that all children will have free access to quite a lot of computer power. You could say it's like every child having a computer. This computer will be integrated into everything a child does, as a writing instrument, as a music-making instrument, and so forth. In writing, for example, it'll be used as a word processor, as a dictionary, as a way of keeping a filing system for doing a research project and as a communication system between kids and kids, and between kids and teachers.

There *is* a sense of anarchism in the concept that I don't think we should sit back and redesign the school curriculum first. We'll start off by introducing the computer in those ways that it can be picked up. For example, writing takes a large part of a child's time and is one of the big blocks in elementary schools, especially in the areas we're working, the disadvantaged areas of urban New York. That's a very big issue and just having a computer instead of a pencil immediately makes a big difference.

A+: Is it possible that in bringing out certain hidden positive qualities in some kids it may turn off others? That we might end up replacing a math elite with a computer elite and perhaps even create computer phobia among kids who can't relate to a computer?

Papert: Yes, all of these things can happen. I think that our job shouldn't be to predict whether it will happen or not but to be aware of all the positive things, and all the negative things, that could happen, and work as hard as we can to . . .

A+: But have you seen any *evidence* of this happening?

Papert: Oh, absolutely. It's very clear that typically the way computers are dumped on children in schools you see very clearly a polarization there. There's

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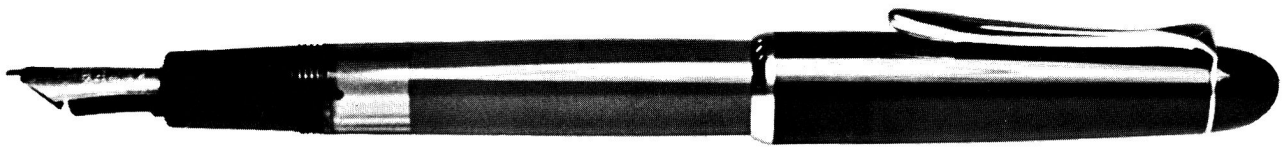

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a small group of usually boys, a certain aggressive personality type, somewhat mathematical already. The boys take over this computer and the girls get excluded and this undoubtedly colors their (the girls) perception of the computer; it's associated for them with a put-down and inferiority and they seem to find themselves saying 'That's not for me,' or 'I'm not for that.' There's no question you have that.

This goes back to the question of whether the computer will have the effect of reinforcing the structures already with us or changing them. For example, the split between those who can have access to knowledge and those who don't. There's no question in my mind that the computer could enormously exacerbate inequality just as much as it could bridge it and be the instrument for democratization. It could go either way.

A+: Most of the examples in your book *Mindstorms* come from your work at MIT where children have been able to use powerful computing equipment that's very different from what's commonly available. This would seem to limit the universality of your conclusions.

Papert: This is changing because the book (published in 1980) was written just about the time when the micro revolution started happening. So during most of that formative period of my thinking, with those experiments it was very hard to have a computer that was sufficiently flexible to be appropriated by the individual. So we only saw interesting phenomena where we especially set up situations where children had access to very expensive, very special purpose equipment.

We're now seeing all those things happening on quite a large scale because there are many thousands of computers out now where children can do all that stuff. We're also seeing phenomena that we never saw when it was more of an individual relationship between the child and the computer.

A+: Can you give an example of that?

Papert: I think the Lamplighter school experience for me was an eye-opener because the amount of computing that happened there got so far beyond what the adults could keep track of. That it really was a child takeover. So many different children had access to computers and there were enough computers so the usual people who capture them didn't exclude anyone else.

A+: What is the ratio of children to computers there?

Papert: There are 50 or 60 computers and some 300 children; 5 or 6 children to a computer. But it's not just the ratio. The school is fairly open, children can come in before school and stay after school, and they're not watched. They can get the computers without any adults around. I've come to learn that's very important. Children will do different things when there is no adult around.

A+: What kinds of things?

Papert: Well you see, for example, take that hard and soft style of programming. There's no question that adults systematically favor the hard and the children know it. This is partly because the adults who do become involved with the computers tend to be hard, because the computer culture is hard, and partly because they have to be an *official* model of what it is to program.

And so I think that the children, being aware of this when there's an adult who's likely to see what they're doing—even if the adult is careful not to give signals, and that's fairly impossible—if the child feels that that adult prefers certain directions, that changes the child's approach.

The major question is protecting the children from the frustrating and psychologically damaging effects of society's clumsy attempts to force unnatural modes of learning and teaching on them.

A+: How do you feel about video games, computer games, and children?

Papert: You mean games like Space Invaders?

A+: Yes.

Papert: I think we hardly understand the deep psychology of what makes games so exciting and what they're doing. It's clear that some very powerful things are at work and we don't know how to channel that, we don't know what conditions make it go one way or the other way.

I think it dramatizes the situation I touched on a few times in this conversation and in *Mindstorms*: That people are always concerned with trying to predict the computer future and the point isn't to *predict* it, it's to *make* it. It could be made in very different forms and how it gets made depends on the social process, the political process, how much energy and scientific research there is and which talented people become involved.

One could imagine a world in which children grow up hypnotized by highly interactive, highly structured kinds of game situations and we have a whole generation of psychotics on our hands. That's possible. Very possible. There's as much of a danger that the power of this thing gets out of hand as the danger that there's been more talk about, that genetic engineering gets out of hand, somebody makes a horrible new disease that ravages the world. I think that psychological diseases could also ravage the world.

On the other hand, one can also see enough continuity between these games and intellectual development so that it could go in that direction too. One could imagine all children being involved in kinds of game activities that will lead to enormous intellectual development.

If we look at children and the present games you see elements of both tendencies. You see, unquestionably, intellectual development, learning things. Take a little example. It used to be a little tricky when we did turtle geometry to explain to children when the turtle went off the screen how it came back again on the other side. That's a complicated little piece of topology you don't have to explain today anymore. Everybody knows. It's a piece of geometry that they've picked up from the games. That's a very simple example, but there are a lot of examples of this sort, examples of geometric and strategic knowledge.

I think there's also knowledge about the learning process, which fascinates me. I think that a lot of children seem to have become very aware of 'strategies for learning strategies' because whenever a new game comes out they have got to learn the new game very fast. We haven't often had a situation where there's been as much incentive, as much opportunity for quick learning of new things. Children have always known how to learn. That's their business. This gives them extra opportunity to learn new strategies. So there's that positive side.

On the other hand you could make a list of negative things, kids who get hypnotized by it, almost addicted. . . . and there are all sorts of things that we don't know about, like as much as you might be afraid of overanalytic thinking in having children program too much, with the

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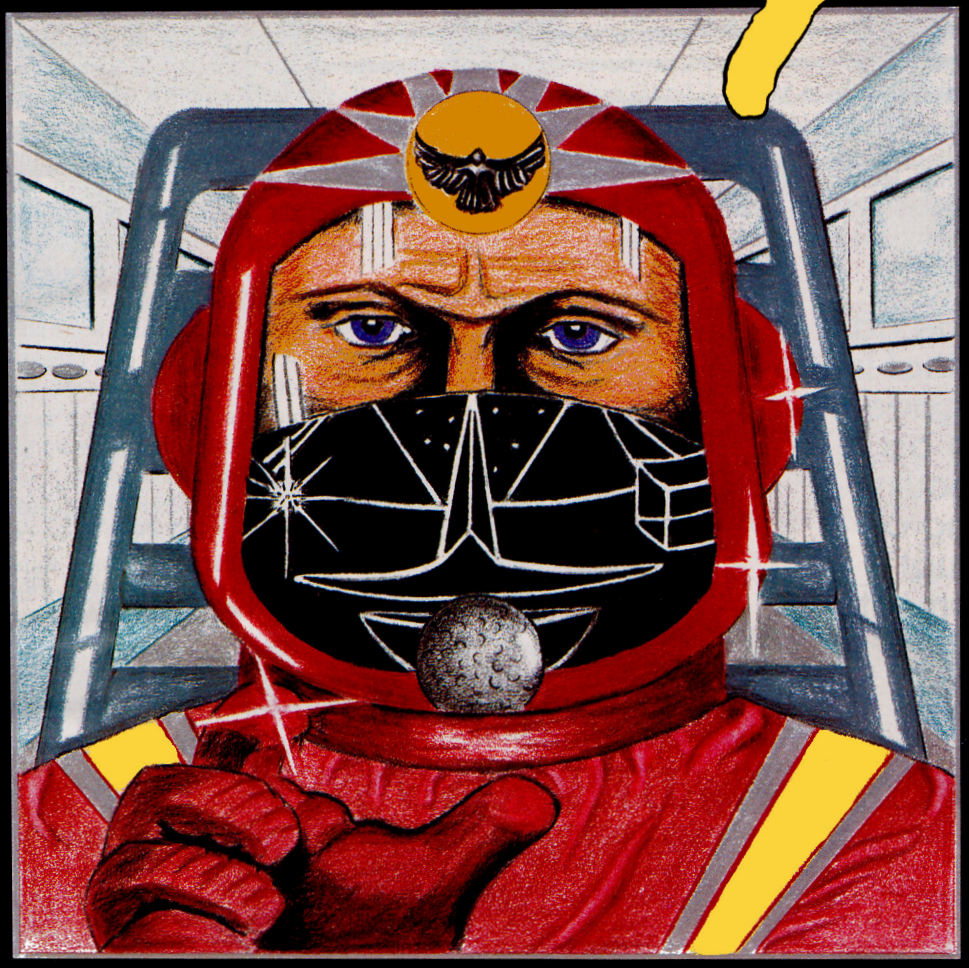

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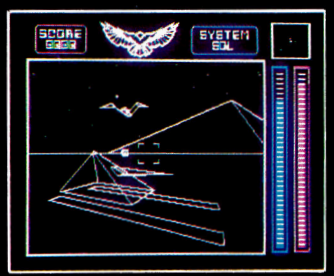

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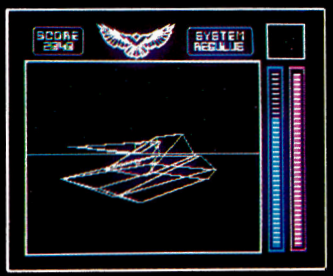

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games there's a kind of emphasis on a pre-analytic thinking, immediate response, immediate gratification. I mean, you have it *right now*. Looking at them you can see they're going in all sorts of directions.

If you look at the amount of attention and resources being devoted by humanity to really try to understand these things it's scandalous, it's nothing. Just drops in an enormous ocean.

A+: Do you play games?

Papert: I had a summer house in Maine (two years ago) and I often used to drive up from Boston, often very late at night, which was very tiring. Exactly halfway there's a Howard Johnson's with a lot of computer games. I always stopped there and played Asteroids. My score at Asteroids tells me more about if I'm in a fit state to be driving and at what speed I should let myself drive than my intuitive feelings. If my score is disastrously low, if I can't play Asteroids to my usual standards, I shouldn't be driving a car because my reaction times have slowed down.

I think one can predict that in the next decade there's going to be a tremendous flourishing of intellectual development.

A+: Getting back to computer languages, some computer scientists feel that the programming language of the future may be no language at all, that is, instead of being programmed, the computer will use an artificial intelligence routine that will respond to simple instructions from the person using the computer. What's the implication of that?

Papert: Indeed it might be that all the thinking we're doing now about how using the computer might be good for people's intellectual development would be out the window. In fact, intellectual development itself might be out of the window. This is really the scary thing around the corner. If you think about artificial intelligence seriously you should think in terms of what it might be like in a hard core vision, which is (the idea that) machines will do everything better than people. So then you might say what's the point of intellectual development under those conditions?

A+: But wouldn't you still have some sort of programmer "elite" who writes the artificial intelligence routines?

Papert: If you really believe the hard core vision of AI then the machines will do that too. I don't know how you start thinking about what you should do about that. Clearly the Joe Weizenbaum approach is absurd. *(Interviewer's note: Joseph Weizenbaum is an MIT computer scientist who has criticized the artificial intelligence movement for being anti-humanistic.)* By the Joe Weizenbaum approach I mean Joe Weizenbaum realizes one day what this hard core vision is saying and he's driven by this to say: "No, that's terrible. Let's tell everybody how terrible it is and stop it." Well, I don't think it's had any effect on stopping it. I don't think that predicting how many dangers there are going to be is an effective way of stopping it. I don't even think that we want to stop it . . . or that *I* want to stop it.

A+: You've written and spoken extensively about how computers can change the way people think. Would you give some examples of that?

Papert: This in the context of putting in question the established assumptions

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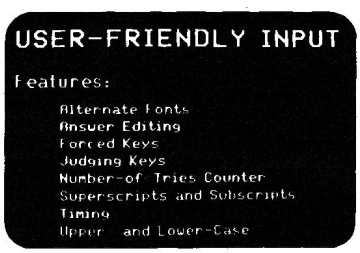

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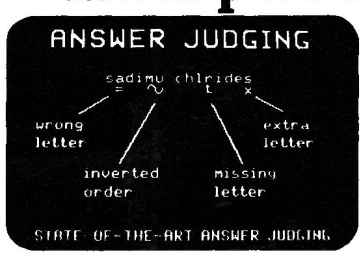

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about the order in which children learn and acquire knowledge and behavior—particularly, I think, Piaget's very insightful classification of what he calls *concrete* operations versus *formal* operations.

A+: What would be an example of concrete knowledge?

Papert: There is a certain slice of arithmetic knowledge. For example, knowing that if I've got a bunch of objects, that changing their arrangement doesn't change their number. This is what Piaget calls conservation of number. It's a fundamental piece of understanding without which you couldn't get very far using numbers. We see from Piaget's work that children are not taught this and they're not born knowing it, either. But they come to understand it spontaneously at about the age of five or six in the normal course of development.

A+: And formal knowledge?

Papert: A typical kind of *formal* knowledge is systematically manipulating the permutations and combinations of the (number) set, but this doesn't happen often until the age of 10 or 12.

Now the question is: Is this central to or accidentally dependent on cultural things? My thesis, which we're seeing already in this case, is that when you're used to using procedural programming, the systematic manipulation of combinations of things becomes quite as concrete as lining up objects. So something that could only be handled abstractly before can now be handled very concretely and can be acquired by children at a very early age.

So our concept of *what* gets learned *when* is totally reshuffled. We're seeing children of five or six beginning to learn things spontaneously that children wouldn't discover in their own development until twice that age, without the computer.

A+: What's the implication of this?

Papert: I think the implication is that one thing leads to another: The roots into adult knowledge available to children are now totally different so that our whole concept of who should learn what, when has to be thoroughly revised. Now that's, I suppose, the *practical* implication.

The implication for *theoretical* psychology is another story. There are extremely subtle and deep questions raised about whether we need a different kind of theory now for intellectual development.

Which relates to all these other questions about the effect of games, what kind of language is good for children, if there's early imprinting what is it's effect, are there really aptitudes. During this conversation there have been many obviously important questions about the psychology of thinking and learning and intellectual development that we've not been able to answer in the past. In order to answer them it's not enough to put

We're seeing children of five or six learning things spontaneously they wouldn't discover on their own, without computers, until twice that age.

computers out in the world, we also need theoretical constructs. So I think one can predict that in the next decade there's going to be a tremendous flourishing of intellectual development. There will be new ways of thinking, new kinds of theoretical analysis in anthropology and logic and the relationship of people to knowledge and to culture. ✚

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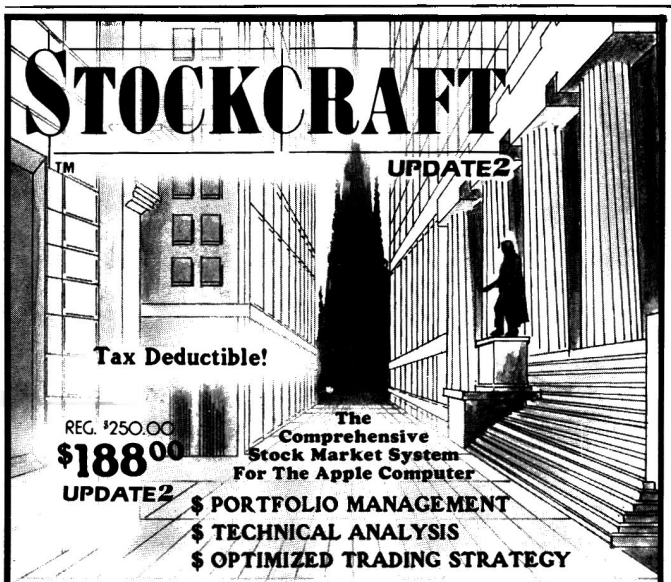

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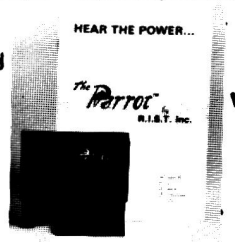

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Whether you are a "green" Apple user or an experienced programmer, your local user group can provide valuable advice on computer operations and new applications.

Dusk settles over a small city in northern California. At a local junior high school, members of the town's S.P.C.A. are arriving for their regular monthly meeting. Friendly chatter subsides as the meeting begins. The picnic chairman brings the crowd up to date on plans for the annual cookout. The treasurer says income is up. Another member stands to give an announcement of the "D.O.M."

D.O.M.? It doesn't stand for "Dog of the Month," as one might suspect, and this S.P.C.A. isn't the well-known animal rights group that its name suggests. This is a meeting of the Society for the Prevention of Cruelty to Apples, a computer user group. And its D.O.M.—Disk of the Month—is a floppy disk containing a variety of software programs made available to members at a low cost.

Apple user groups similar to this one are springing up all over the country. Organized by computer owners to discuss how to operate, modify, and upgrade their computers, the groups attract everyone from "green" Apple users to experienced programmers and engineers.

Wherever they meet—a member's living room, a local computer store, or a public auditorium—their purpose is to stimulate the education and enjoyment of their members.

Most groups run entirely on volunteer energy. In return for yearly dues ranging from $5 to $30, members have access to software libraries and receive newslet-


S.P.C.A.
POST
WELCOME
Stan Fenman

ters containing club news, programming tips, and product announcements. Monthly public meetings usually feature guest speakers.

Apple user groups are growing rapidly to accommodate the increasing number of computer owners. In the Midwest, a group that began with a gathering of 20 people in a Chicago-area founder's den in 1978 has mushroomed to 800 members. In New England, more than 2,000 members of the Boston Computer Society (BCS) have indicated an interest in one of the group's many offshoots, the Boston Apple User Group.

The World's Apple Core

The Santa Clara, CA-based International Apple Core (IAC), is an umbrella group for more than 450 user groups around the world, counting 75,000 Apple computer buffs among its far-flung affiliates. Apple computer owners are gathering to exchange tips on computer operation in Zagreb, Yugoslavia; Osaka, Japan; and Dublin, Ireland.

User groups are groups of people "who have pooled their ignorance for the purpose of gaining intelligence;" quips David M. Alpert, president of the IAC. Alpert, who donates his time to the IAC, said he joined his first group as a "dumb member," but now describes himself as a "commodity trader turned software vendor."

User groups have been successful because, according to members, they bring together a wide assortment of knowledge, experience, and resources that then become available to all members.

"People join user groups for the same reason people join antique auto clubs or model railroad clubs," Alpert said. "Computer owners can learn a lot from the manual or their dealer, but it's also nice to work with people who share the same interests."

Ken Silverman, executive director of the IAC and one of the group's nine paid staff members, oversees the day-to-day operations of the organization. For Silverman, the IAC's goal is simply stated: "We are here to support the machine we love."

In this case, "support" refers to the variety of services offered to member groups. Silverman estimated that last year the IAC delivered $482 worth of educational materials to each club, a sizable return on each group's $50 membership fee.

The IAC serves as a consultant to fledgling groups, giving advice on how to create a successful user group. It keeps sample constitutions on file, guides members through the legal requirements needed to gain nonprofit status, and suggests fund-raising ideas to struggling clubs.

In its software library, the IAC houses more than 1,000 disks containing public domain programs, software made available to the general public for copying without charge. Each month the IAC puts together a "Disk of the Month," which it distributes free to member groups. The disks usually contain a variety of programs, from games to business and educational programs and utilities. The IAC also makes the disks available to the public for an $8 cover charge.

Silverman stresses that the nonprofit IAC doesn't intend to compete with computer stores, however. "We don't want to sell products," he said. It's primarily a resource center, dedicated to filling the needs of computer owners.

"Computer stores are not educational centers," Silverman said. "They don't have the time or the staff to teach buyers how to learn to use their computers. But owners have to learn somewhere." The responsibility to educate computer owners shouldn't fall on the shoulders of computer companies, either, Silverman remarked. "Car dealers don't teach people how to drive when they sell a car, although they will repair them if something goes wrong. The same is true with Apple Computer."

Although the membership rolls are predominantly male, the number of women members is growing.

What is the IAC's relationship with the company? "Strictly at arm's length," Silverman stated. The IAC accepts Apple's help when it is offered, but it has also criticized company policies that hurt users, such as the firm's decision to stop mail-order sales.

The IAC also publishes a monthly magazine for Apple computer users, called *Apple Orchard*, featuring reviews, programs, product announcements, and club notes.

A Diverse Membership

User groups are a relatively new phenomenon, dating from the mid-1970s, when microcomputers first became commercially available. According to IAC's Alpert, early user groups were citadels of "hobbyists, tinkerers, and the like" who wanted to find out how the computer worked.

But the typical computer owner has changed since those days. "Five years ago, about 75 percent of the microcomputers sold were bought by hobbyists," he said. "Today, more than 80 percent are purchased by business people and educators."

User group members are now so diverse that many have organized special interest groups, or "sigs", which allow members of the group to focus on more narrowly defined interest areas or pursue specialized applications.

A member of the San Francisco Apple Core, for instance, can participate in a subgroup whose focus might be telecommunications, operating systems, programming, or machine languages. Like many groups, it also has incorporated a beginner's group, known as the Green Apples.

In fact, as user groups continue to grow, they must meet the challenge of welcoming new members, according to Jonathan Rotenberg, president of the Boston Computer Society.

The BCS, for instance, schedules time for beginners before each general meeting. It also takes steps to combat excessive use of technical jargon that could leave novices bewildered, Rotenberg said. The organization gives a handout to guest speakers on how to address the group, cautioning against too much computer lingo.

"We try to cut through the garbage people have to put up with in computer stores and manuals," Rotenberg said.

User groups try to fight the mystique that surrounds personal computers and try to make them technically accessible to the average person. User groups cater to people who "don't want to become computer nerds" in order to enjoy their machines, he said.

But many groups still rely on these hard-core hobbyists, people who know their computers inside and out, to help solve members' technical problems. Sometimes these computer "gurus" are still in high school; often they work in the computer industry itself. Most important, however, is their eagerness to share their expertise with novices.

Since a typical meeting brings together new users as well as experienced ones, the groups try to strike a balanced approach. "We target groups at a certain level," Rotenberg explained, "but it's not the absolute beginner's level."

Smaller user groups also focus on ways to weave new members into the fabric of the group. The S.P.C.A. in Fre-

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mont, California, for instance, appointed one of its members to be a "beginner's ombudsperson."

A typical user group meeting includes guest speakers and time for members and guests to ask questions. Discussions can cover a variety of issues, from where to get the best price on printer paper, to how to get the Apple to "talk" to a printer, to critiques on the latest developments in hardware and software.

These question-and-answer sessions are the heart of user groups and provide a public forum for members to ask questions and make contacts. A common refrain during these sessions is: "See me after the meeting." Following the general meeting, members mill around to exchange information in what many groups refer to as "random access" sessions.

The meetings often include demonstrations of new products. At a recent meeting of Apple P.I.E. (Programming and Interfacing Enthusiasts), a standing-room-only crowd filled the Saratoga, California community center library for a demonstration of Apple Computer's Lisa. Viewing a large screen in the center of the room, members watched with great interest as John Fenwick, the club vice-president demonstrated the system's office application programs, bit-mapped graphics, and mouse, a pointing and drawing device.

User Sisters and Swashbucklers

Although the membership rolls are predominantly male at present, the number of women members is growing. Three years ago, Carol O'Connell joined Apple P.I.E. because she wanted to find out how a computer could help her train her autistic child. "I've taken BASIC now and turned into a hardware freak," she admitted with a smile.

O'Connel, now a student at San Jose State University, says women teachers and computer-related business operators are now attending Apple P.I.E. meetings.

Other user groups have noticed increased interest from women. In the beginning, women members were almost exclusively engineers or programmers. "In the spring of 1980 when the Boston Apple User Group was formed, it was almost a rarity to have a woman involved in the group," said Allen Sneider, director. But as personal computers moved into classrooms and offices, students, teachers, secretaries, and professional women began tapping into user groups for advice and support. According to Sneider, women now make up about 25 percent of the Boston group.

As mentioned earlier, most Apple user groups offer members access to a library of public domain software. Many of these programs are contributed by members. One group holds a yearly software programming contest soliciting new library entries.

But software copying can present problems for many groups. In some cases, members have been accused of being software "pirates," who meet only to copy commerical software. Most groups take a public stand against piracy, however, and actively campaign against the practice. As a preventive measure, the librarians of many groups review the library and throw out any copyrighted software they find. "We don't condone piracy, we condemn it," said IAC's Alpert. "For one thing, the only computer allowed in the meeting room is the one to be used for that meeting's demonstration . . . If there is piracy, it is not going on with the knowledge or consent of the group's officers," he continued. "Almost every user group takes an editorial and political stand against piracy."

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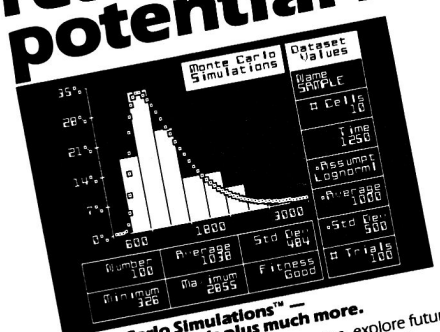

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rainy night in 1975, when the Homebrew Computer Club conducted its first meeting in a Menlo Park, California garage. A small group of hobbyists and engineers met to discuss the Altair computer, a personal computer built from a kit.

One of the people who crowded into that garage was Steve Wozniak, later a cofounder of Apple Computer with Steve Jobs. "I was there because I thought people interested in video terminals would meet," he said. "I didn't know anything about microprocessors then."

But he had always wanted a computer, and Homebrew's biweekly meetings led to the development of the first Apple computer. "It became a big thing for me," he remembers. "Every 2 weeks I had to worry about what I was going to show off at the next meeting." Wozniak said he never thought he would eventually have a job designing computers. He feels Homebrew's meetings provided a strong impetus to his computer design work.

Homebrew also attracted Chris Espinosa, now Apple's publications manager. Espinosa was a 14-year-old high school student when he began attending Homebrew meetings for fun. "It was not that much different than school," he said. "The fact that most of the people there were 10 to 40 years older than me didn't matter."

Espinosa frequented Byte Shop Computer Stores, the first computer store franchise, and for the price of a bus pass had managed to get "thousands of hours of programming time" writing demonstration programs for the busy owners.

User groups are a relatively new phenomenon, dating from the mid-1970's, when microcomputers first became available.

Since Espinosa was too young to drive, Wozniak drove him to the meetings. He remembers the night Wozniak arrived with the prototype Apple II in a cigar box.

During a break at another Homebrew meeting, Espinosa met Steve Jobs, who offered him a job. Espinosa spent an "entire Christmas vacation, from six in the morning until eight at night," putting Apples together in Jobs' garage.

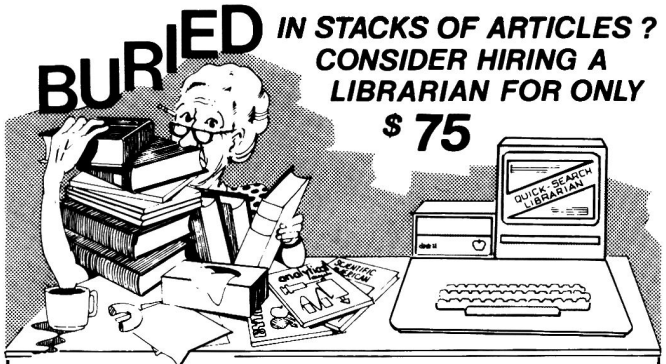
Espinosa built a computer for his high school out of spare parts from the job. When it broke down after 5 years, Apple offered to exchange it for a new one and discovered that Espinosa's model was the earliest existing prototype of the Apple II. The company then donated it to the Smithsonian Institution in Washington, D.C.

User groups have come a long way from the Homebrew days. The first Applefest—a computer show devoted entirely to the hardware and software accessories available for the Apple computer—was organized by BSC's Rotenberg and its Apple User Group. New Apple products sometimes make their first public appearance at user group meetings.

Keeping Pace

The basic purpose of Apple user groups, large or small, hasn't changed. They try to keep pace with rapidly changing computer technology and give support and encouragement to both novice and expert computer owners.

To find the Apple user group in your area, check computer stores, look for magazine or newspaper announcements of meetings, or call the International Apple Core, at (408) 727-7652. ✚



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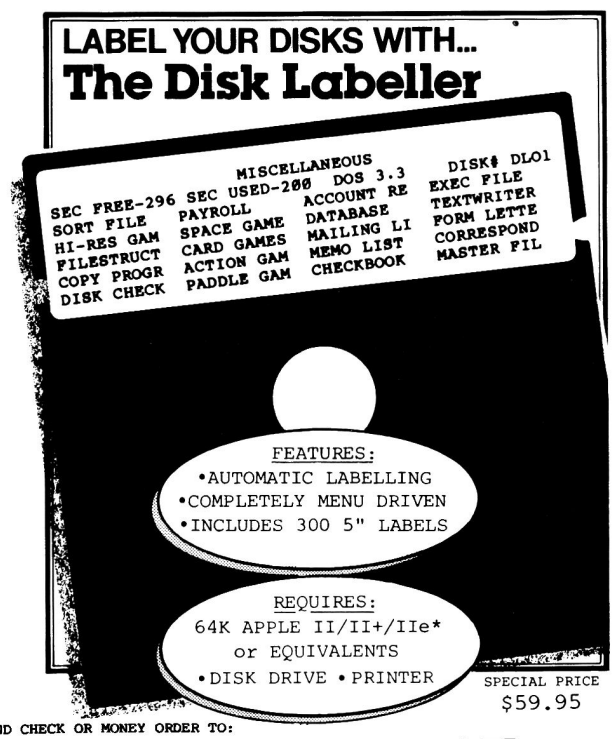

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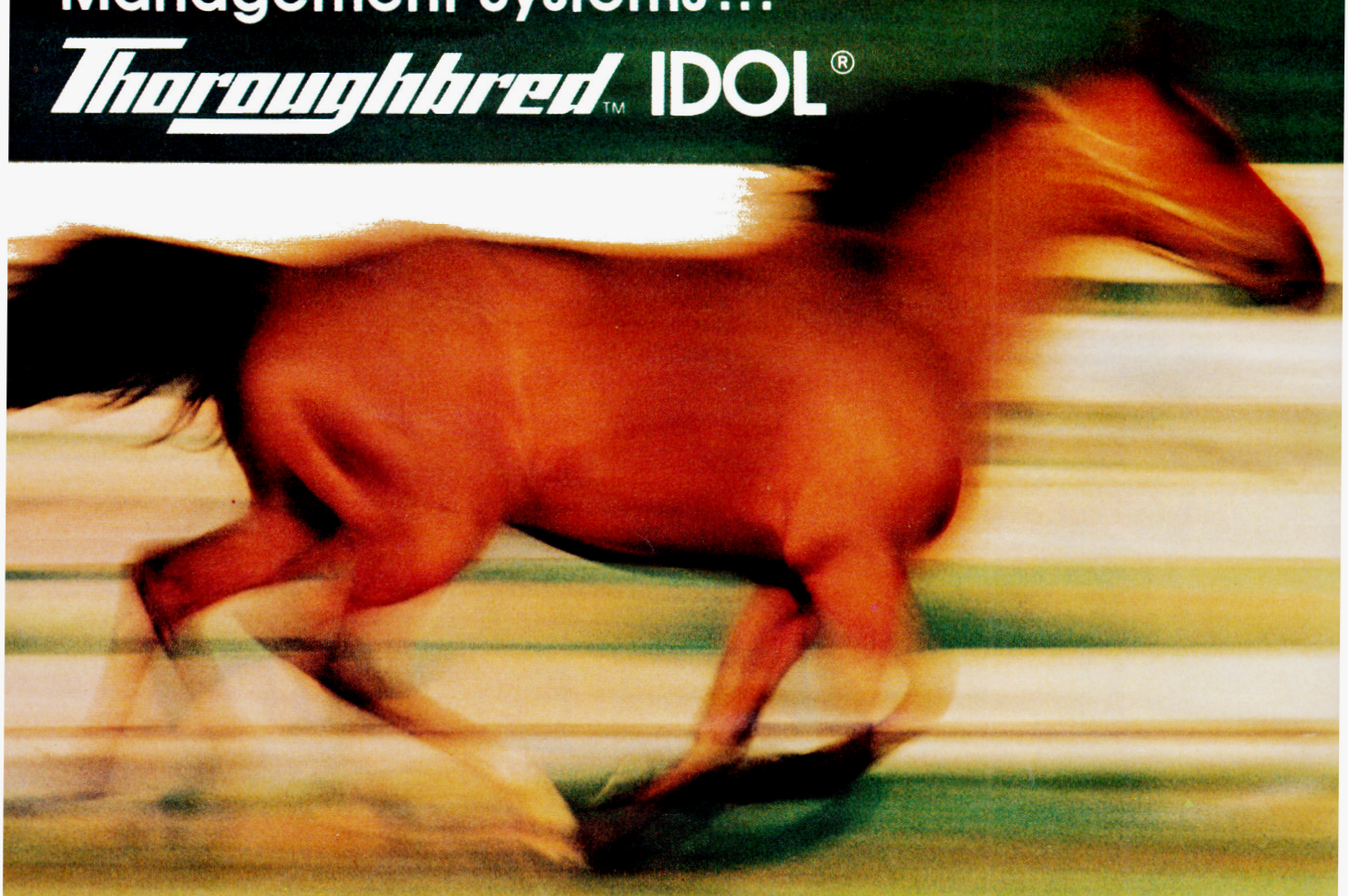

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With a list price of $700, *dBASE II* is not inexpensive, but its usefulness in a wide range of applications could easily justify its cost. And if sheer numbers hold any meaning, the public seems to agree.

Marketed by Ashton-Tate, *dBASE II* has already sold over 120,000 copies. If you consider that there are over 700,000 CP/M systems in the field and that, as with audio and video recordings, copyright infringements do occur, then no doubt there are a few more than 120,000 copies in actual use.

dBASE (as it is often referred to by enthusiasts) has attained such popularity in the 3 years of its existence that many users believe *dBASE* has established a de facto standard for CP/M database management, joining the ranks with the likes of *WordStar*. The widespread acceptance of *dBASE II* has spawned an enormous following of aftermarket products and services, not to mention imitations. *dBASE II* utility programs, books, tutorials, user groups, training classes, consultants, and programmers are springing up all over the country, inspiring many microcomputer users to purchase a copy of *dBASE II*. Unfortunately, after the initial excitement of the new purchase wears off, the task of learning an extensive new program with scores of unfamiliar commands can seem overwhelming. New *dBASE II* users typically find themselves confused and floundering, pondering such points as: "What *is* a database?" "Where should I start?" or "What is the most efficient design for my database?"

In order to tackle the details of *dBASE II* with greater ease, consider the following concepts first.

What Is a Database, Anyway?

Databases are nothing new, but as often occurs in the computer world, a cryptic pseudonym has replaced the common term. Actually, most of us use at least one database every day, but we just don't call it by that name. Encyclopedias, dictionaries, phone books, and shopping catalogs are examples of common household databases. These are nothing more than lists of information, some more detailed (encyclopedias) than others (phone books). But what qualifies these lists as databases? Isn't a book or a magazine a database, too? No. A database provides a way of finding information quickly and easily based on one reference point. However, an unorganized collection of information, like a novel, does not.

Another way to think of a database is like this: The most common databases are really nothing but a series of "rows" and "columns" filled in with informa-

The widespread acceptance of dBASE II has spawned an enormous following of aftermarket products and services, not to mention imitations.

tion. But they must be laid out in such a way that any specific piece of information is easily available. Typically, each column is headed by a title describing the type of information in it, and each row contains the information itself. In database lingo, the columns are called "fields" and the rows are called "records."

For example, consider your checkbook register, another household database. The categories ("check number," "description," "charges," "credits," "balance") comprise the fields of the database. Each check entered is a record (see Figure 1).

	Record				
Field	check	description	charges	credits	balance
	#1				
	#2				
	#3				

Figure 1: Example of checkbook register fields.

	Record			
Field	name	address	city	phone
	Marengo, Lily	8065 Toyler Dale	Hill Town	555-1212

Figure 2: Example of telephone directory fields.

	Record		
Field	item	subheading	page
	Pets	aardvark	3
		chuckwallah	25
		ibexe	27
		lemur	483
		platypus	19

Figure 3: Example of catalog fields.

Another example: Suppose you want to look up the phone number of your friend, Lily Marengo, in the telephone book? Your reference point (sometimes called a "key") is her name. From this one piece of information you should be able to find Lily's phone number, and possibly even her address (if it is listed) (see Figure 2).

A telephone book is useful only because it allows rapid access to desired information. The same is true of a catalog, assuming it includes an alphabetical index of its contents. The key in the case of the catalog is the item name, which leads you to the correct catalog page number (see Figure 3).

In contrast, a magazine or a novel may contain lots of information, but it is not usually stored in a manner designed for instant random access. No novel contains a "plot" or "quotation" index. Who would want one?

The next question is: "So who needs a computer? I can make lists like this easier and cheaper on paper!"

A good point. In some cases, it would be foolish to use a computer to create and maintain a database. Consider the telephone book example. As long as you want to look up Lily Marengo's phone number based on her name, you are better off with a book rather than a computer. However, what if you already knew Lily's phone number but had forgotten her last name? Or you needed a list of everyone whose phone number started with "527"? With its inexhaustible capacity for drudgery, a computer is the perfect tool for this type of work.

Not only could it allow you to find the desired information easily, it would allow you to add more people to the phone book, and keep it up to date as phone numbers and addresses changed.

Of course, all this could be (and sometimes still is) done by hand, but human-being hours are better spent in creative and intuitive pursuits than in memorizing or searching through lists.

Besides, another advantage of computerization is speed. A good computerized database system can extract information much faster and more cheaply than humans can.

What Is dBASE II?

Sophisticated database management systems have been available on large computers for at least a decade now. But until recently, squeezing much capacity or flexibility out of a microcomputer has proved difficult due to the limitations of the computers and the primitive state of microcomputer database software. This is precisely where *dBASE II* comes in.

dBASE II is a CP/M-based relational database management system. With *dBASE II* you can:

- Create a wide variety of small- to medium-sized databases using English-like commands.
- Update and edit databases using a format on your screen that lets you see exactly what data is being added. You just fill in the blanks.
- Display information in an almost endless variety of ways, either on screen or on paper.
- Generate printed reports, mailing labels, form letters, and so on in any visual arrangement, with *dBASE II* automatically doing mathematical calculations for you.
- Do all of the above either manually or under program control, using the complete database-oriented programming language included with the system.

Many of these capabilities result from the relational design of *dBASE II*. *Relational* refers to flexibility in database design. For instance, say you decided to create a telephone directory database. To start, you want to search for phone numbers based only on names. Later, if you want to use another key for the search (perhaps the company names of people listed in the phone book), you can. In some other types of databases, all this must be prearranged.

However, although flexible, *dBASE II* is not particularly easy to learn, especially if you want to take full advantage of its capabilities. To complicate matters more, *dBASE II* is actually two programs in one: a database *filing system* and a *programming language*.

The tasks of creating and gaining access to *dBASE II* databases are relatively simple, and this simplicity, to a large degree, accounts for the program's success. Simple English words like *create, append, list,* and *edit* can be entered from the keyboard for immediate results. However, mastering the subtler points of command syntax and developing automated programs definitely require more time and diligence. The advantages you gain from *dBASE II* are proportional to the time you spend learning its quirks.

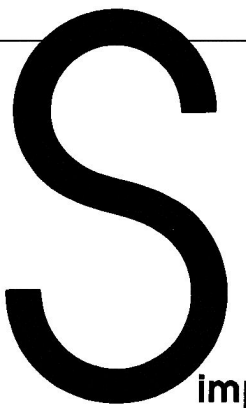
The following pages contain the first part of a series of tutorials that will walk you through the basics as well as some of the nuances of *dBASE II*. The series requires an experimental inclination on the part of the reader, an Apple running CP/M, and *dBASE II*. Before starting, however, look over the following notes and suggestions.

All Apple IIs require 56K RAM, CP/M, and a Z-80 card in order to run *dBASE II*.

The current version of *dBASE II* is 2.4. Operating systems earlier than CP/M 2.0 will not run *dBASE II* revision 2.4 properly. If you do not have these revisions, contact the appropriate sources to obtain the updated versions before continuing. Incidentally, the new features in version 2.4 are well worth your while.

Make sure you run the "install" program on your *dBASE II* disk before starting. And when prompted to indicate if you want "full-screen" editing, say YES. This way, the examples in the tutorial will make sense, and you will be able to enter and edit data more easily.

You may find that a 40-column display is a bit of a nuisance for data display of complex files. If you do have an Apple II with a 40-column display, you



Simple English words like create, append, list, and edit can be entered from the keyboard for immediate results.

might consider obtaining an 80-column upgrade. This accessory is available through most Apple dealers. If you do have an 80-column display, run the install program twice. The first time, choose "Apple II 40 column." The second time you run the install program, select Y for modification of existing installation. Indicate D for decimal input; then choose parameter 9 (screen size). Change the 40 to 80. Leave the 24 as is by hitting the Return key, and save the changes. Now you will be running an 80-column *dBASE II*.

In the following interaction, the words in lowercase are the ones you type. *dBASE II* always (except in the case of the North Star version) responds in uppercase. The <CR> sign after a command indicates that you should press the Return key.

Creating Your First Database

Assuming your system is up and running, and you have DBASE.COM, DBASEOVR.COM, DBASEMSG.COM, AND DBASEMSG.TXT and some spare room on drive A:, follow along.

Since the telephone book example is something everyone can relate to (and use), it's a good place to start. An electronic phone book is easy to keep up to date, and for those with a printer, you can produce a hard copy in alphabetical order, too. Since the database will include addresses, you will be able to generate mailing labels and form letters. Once you have the A> prompt, type:

```
A>dbase <CR>
```

When *dBASE II* asks for the date, you can either type it in or just hit Return. In either case, your date is:

- Temporarily stored in a **memory variable** (more about these in a future installment) in your computer, so that you can use it later.
- Permanently stored on any database you happen to update during this session, so that you can find out when the last update occurred.

Just pressing Return fills in the date as 00/00/00. For purposes of illustration later, type in today's date this time.

Now you should have the *dBASE II* prompt, which is a DOT. This means *dBASE II* is waiting for a command from you. Next, type in:

```
create <CR>
```

This tells *dBASE II* that you want to build a new database. In response, the program prompts you for more information:

```
ENTER FILENAME: phonebk
<CR>
```

It's a good idea to use a name that will remind you of the file's contents. *dBASE II* will now create a CP/M file on your disk called PHONEBK.DBF. (You don't have to specify the extension "DBF" unless you want to.) Now *dBASE II* responds with:

```
ENTER RECORD STRUCTURE AS
FOLLOWS: FIELD
NAME,TYPE,WIDTH,DECIMAL
PLACES001
```

Creating the Structure

If the last message seems a little confusing, the following explanation should help clear things up.

The first thing that *dBASE II* asks you to do is to indicate the *structure* of your database. In other words, the program wants to know the names, types, and sizes of the columns (or fields) in your database. The term *structure* should not be confused with the term *data*. Structure refers to the framework, data to the actual content. Thus, the next few steps are very important, as they will determine the way your database stores information. The following explanation of the screen message will help you understand the next steps in creating your database.

- **NAME** What is the name you want to give to the first field (column)? A name can be up to 10 letters wide (either upper or lowercase), and may contain only colons (:) for punctuation.
- **TYPE** What kind of information is going to be stored in this field? There are three choices (C, N, or L):

C refers to *characters* (including all printable letters as well as any numbers that are not going to be mathematically manipulated).

N refers to those *numbers* that will later require mathematical manipulation.

L refers to *logical* (true/false or yes/no).

- **WIDTH** How many letters, numbers, etc. do you plan to put into this field? That is, how wide should it be? If you choose L for the TYPE category, the width will be 1.
- **DECIMAL PLACES** If you enter N (meaning "numerical") for the TYPE category, you must indicate the number of decimal places in the field (e.g., for monetary figures, type 2 to indicate that there are 2 decimal places.)

If you enter C or L for the TYPE category, simply ignore the DECIMAL heading by leaving it blank.

Careful thinking at this stage will pay off in the long run. Revert to a little low technology for a minute by pulling out a piece of paper and a pencil. Ignore your computer. Now, make a list of what you want your database to do for you. Then consider how many columns you need, what they should be named, what type (C, N, or L) they will be, and how wide each column should be. Imagining what it would look like on paper is the best approach. See Figure 4 for a structure model. For the time being, use this structure. We'll change it later on as part of the tutorial. That way you can practice adding your own finishing touches to meet any specific needs you have.

Since you will not be doing mathematical calculations on any of these fields (such as asking *dBASE II* to find the sum of all your friends' ZIP Codes), you can categorize all the fields as C (character). (Both you and *dBASE II* will find it easiest to use character fields whenever possible.)

Now, how long should each field be? Do a little research. Pull out a phone book and get an idea of how long people's last names are. How long is the average street address? Count the letters in a few city names.

The advantages you gain from dBASE II are proportional to the time you spend learning its quirks.

Imagining what it would look like on paper is the best approach.

field #	1	2	3	4	5	6	7
	FIRST:NAME	LAST:NAME	PHONE:NO	STREET	CITY	STATE	ZIP

Figure 4: Working model structure for dBASE II telephone directory database.



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Keep in mind that blank spaces take up room on your disk just as letters do. You want your fields to be long enough for all relevant data, such as phone numbers and zip codes. But don't make your fields so long that the shorter ones end up getting half filled with blank spaces. You know your field length is correct when only an occasional name or address won't fit in the field. You can usually abbreviate part of the entry in these cases.

From experience I suggest that the lengths indicated in Figure 5 work best. The PHONE:NO field is 12 spaces long to allow room for an area code and the hyphens between the numerals. Since none of your fields are going to be numerical, the reference to DECIMAL PLACES can be ignored this time. Now, proceed to enter the structure as follows. But beware. If you get a BAD NAME FIELD or other error message, check to see that you put the commas in the right place and that you separated multiword field names with colons only. And remember, the <CR> sign means Return.

field #	1	2	3	4	5	6	7
FIRST:NAME	LAST:NAME	PHONE:NO	STREET	CITY	STATE	ZIP	
type-C	C	C	C	C	C	C	
size-10	15	12	22	13	2	5	

Figure 5: Recommended maximum number of characters (width) for each field in the telephone directory database.

dBASE II is not particularly easy to learn.

```
ENTER RECORD STRUCTURE AS
FOLLOWS:
FIELD NAME,TYPE,WIDTH
DECIMAL PLACES
001    first:name,c,10  <CR>
002    last:name,c,15  <CR>
003    street,c,22  <CR>
004    city,c,13  <CR>
005    state,c,2  <CR>
006    zip,c,5  <CR>
007    h:phone,c,12  <CR>
008    <CR>

INPUT DATA NOW (Y/N)? n <CR>
```

Assuming everything went smoothly, you have successfully created your database structure.

Verifying the Structure

Just to be safe, it is a good idea to verify that *dBASE* recorded the structure properly by typing a few commands:

```
use phonebk <CR>
```

This command "opens" the database file that you just created. You must always open a file with the Use command before *dBASE II* will allow you to do anything with it.

Type the following (for DATE OF LAST UPDATE, enter the date you typed in earlier):

```
display structure <CR>

STRUCTURE
FOR FILE:        A:PHONEBK.DBF
NUMBER OF RECORDS:        00000
DATE OF LAST UPDATE: 00/00/00
PRIMARY USE DATABASE

FLD  NAME        TYPE WIDTH DEC
001  first:name   c    010
002  last:name    c    015
003  street       c    022
004  city         c    013
005  state        c    002
006  zip          c    005
007  phone        c    012
** TOTAL **            00079
```

Notice that aside from the structure, you will also see some other information, like the date that your database was last updated and the number of records or entries you have added thus far. Since you have not yet added data, this field should read 00000.

In order to "close" your file and exit from *dBASE II*, use the following command:

```
quit <CR>
```

You should now see the message:

```
***END RUN DBASE II***
```

This means that the *dBASE II* program has relinquished control back to CP/M. You should now see the familiar

```
A>
```

prompt once again.

Coming Soon . . .

In the next issue of *A+* we will explore techniques for entering and storing data into your newly created *dBASE II* structure. ✚

Robert Cowart, a former Technical Support Specialist for North Star Computers, is a free-lance writer living in Berkeley, California.

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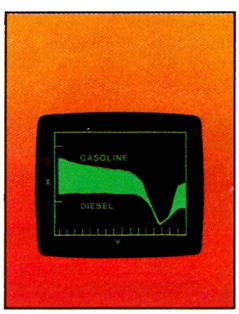

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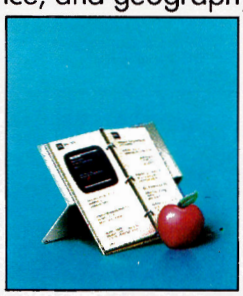

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Continued from page 48

matter what the computer said, printed lines were double-spaced. The solution to the problem was to remove the top cover (no problem for us since the unit came without screws) and flip an internal DIP switch by turning switch three to the OFF position. Although the manual says that the factory setting is to have all four of the internal DIP switches "off," both the machines we received had switch number three set to "on." The other switches control international character sets; besides the United States character set, you can choose British, German, or Swedish. And another switch puts the printer through a self-test. Although we would normally disparage a self-test buried inside the machine, it has two saving graces. It is primarily aimed at servicemen who use it for diagnosis, and it can be elicited by a control code.

The documentation (our copies were marked GX-100) is scanty and may be confusing if you have never confronted a printer before. On the other hand, the manual gives the dedicated hobbyist more information than he might ever need to handle its Centronics-compatible parallel input port. Then again, with the Banana not much of the manual is needed. Just plug one cord into the wall and another into your Apple, spin some paper in, and you're in business.

Although it may not inspire faith, the Banana does do what it was designed for: It prints. Output is actually legible. It may be the ultimate no-frills printer. And for some users the Banana will make some of those frills on other machines look more worthwhile than they did before.

While we were testing the Apple Dot Matrix Printer and the C. Itoh ProWriter II, we were struck by the similarity between the two machines.

People first laughed at the name *Apple,* but when the machine proved itself as a well-built, versatile, reliable machine, the laughter changed into respect. The Banana has a funny name, too. Although the Apple overcame it's handicap with excellence, there's no such quality to change your opinion about the Banana. You'll probably keep laughing about that ridiculous name all the way to the bank, as you deposit the money you saved by buying the least expensive printer.

C. Itoh ProWriter II

Put the ProWriter II and the Apple Dot-Matrix printers side by side and odds are that an illiterate, color-blind witness could not see the differences between them. Except for color and the names on the fronts, the machines look the same. Hopefully you are neither color-blind nor illiterate because there are important underlying differences between these machines which may make one more useful and valuable to you than the other. We won't go so far as to say that one printer may be better than the other, but only that the differences may make one of them personally preferable to you.

Like the Apple, on the ProWriter normal character sets are formed by a nine-wire printhead in a 7-by-9 dot matrix. Although only scanty information about dot-addressable graphics is given in the manual, apparently vertical dot spacing is 72 to the inch, and horizontal dot density can be varied (be selecting different character widths) at 80, 96, 136 or 160 per inch.

Operator controls on the ProWriter II

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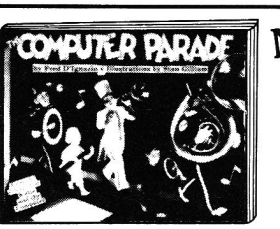

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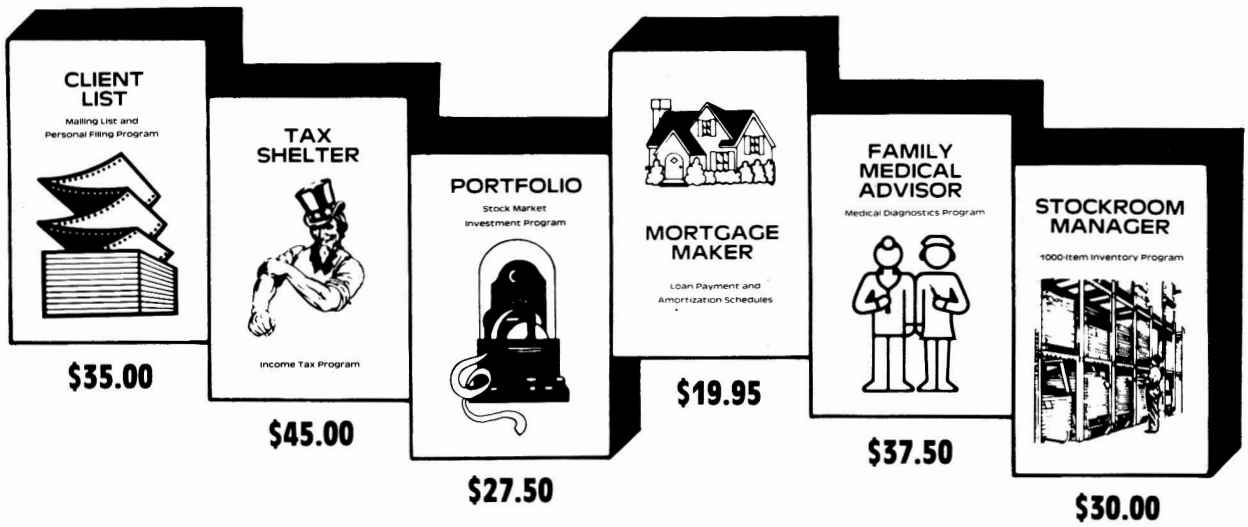

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are located in a recessed area on the front of the machine and allow all the normal paper handling functions—top-of-form, line feed, and selecting on-line or off-line. Two green LEDs indicate that the power is turned on (labeled POWER) and that the printer is on-line (labeled SEL). If a fault should occur, a red LED labeled P.E. lights up. Holding the line-feed button down speeds up the slow feeding.

The ProWriter II uses a snap-in fabric ribbon cartridge that mounts on the moving printhead assembly and is smaller than most matrix printer cartridges. (We found the cartridge to be interchangeable with that of the Apple Dot Matrix Printer.) More like a typewriter ribbon than that of a typical printer, it automatically reverses when it reaches its end instead of continuing in an endless loop.)

The ProWriter II can handle all kinds of paper, provided they are single sheets; roll paper; or fanfold, continuous-form paper from 4 to 10 inches wide. Single sheets and roll paper are friction-fed. Continuous-form paper is first fed from the rear of the printer through the tractor mechanism, then around a rubber platen, and past the printhead. The platen knob on the right side of the machine permits precision paper positioning, including some backward movement. The printhead to paper gap can be adjusted for dying ribbons or for multipart forms (up to 0.28 millimeters or 0.011 inch thick, an original and roughly three copies) by a plastic lever on the right side of the printhead chamber.

Learning to use the Apple printer with your Apple computer is easier than getting a handle on the ProWriter.

Basic mechanicals and physical appearances aside, there are significant differences between the ProWriter and Apple Dot Matrix printers. As mentioned before, we were most surprised that the ProWriter II is appreciably faster than the Apple. It is noisier as well; it sounds a bit like a dentist's drill. While the ProWriter II gives you block graphics, the Apple allocates its memory to downloadable characters, different character widths, and two proportionally spaced character widths (instead of ProWriter's one).

If you're a computing novice, the Apple printer will be quicker to get up and running. The ProWriter II gave us double line-feeds when connected to our Apple IIe and ran it through Applesoft BASIC. No big deal if you know what you're doing; just flip one DIP switch located conveniently on the bottom of the printhead chamber. Contrary to the illustration in the manual, the DIP switch should not be set to automatically give a line feed with every carriage return. (If you encounter this problem, ignore the drawing on page A1-4 of the manual and move switch 1-8 to its OPEN position.) Note, too, that if you have problems getting the ProWriter's standard parallel interface to work with your Apple, this manual will be no help. It states: "PARALLEL INTERFACE: Depends on printer interface used."

As you might expect, learning to use the Apple printer with your Apple computer is easier than getting a handle on the ProWriter. The Apple manual is excellent. The ProWriter manual is medi-



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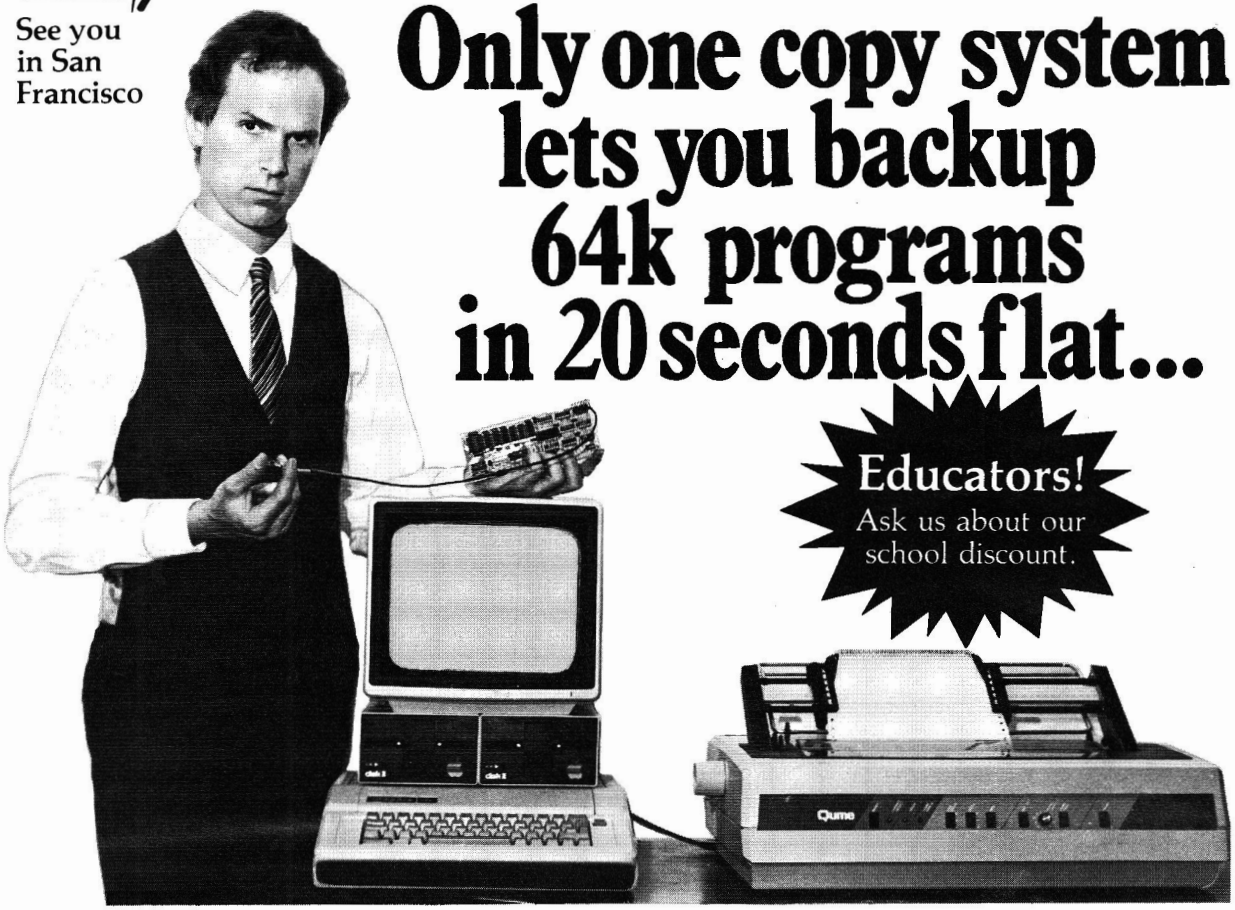

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ocre. Although clearly written, it's shipped without a binder, and its numerous programming examples are written in a language different from Applesoft BASIC.

Apparently no one has ever tried the tutorial in the ProWriter manual about special typeface features. The instructions help you turn on and off various "enhancements," alternate pitches and the like. Take a look through it, and you'll discover that no one ever tells you how to cancel the "proportional space" mode. Consistent with this omission, all the examples given for the proportional space mode are shown combined with the other feature. If you want to get rid of the proportional spacing, you'll either have to turn the printer off and reset it or go hunting for the proper escape code. Sure, it's a minor point, but someone should have noticed when the manual was being produced. It makes you wonder what else might have been missed.

Mannesmann-Tally Spirit-80

If you are familiar with Mannesmann-Tally's other printers, the sleek, wedge design of the Spirit-80 may seem foreign in comparison to its other no-nonsense, heavy-weight machines. Unlike Tally's more expensive, European-crafted printers, the Spirit-80 is manufactured in Japan. Of course, this country of origin is now the norm among inexpensive matrix printers.

The performance of the Spirit-80 is about what you would expect from a printer in its class. We measured a throughput of 59 characters per second virtually the same speed as that of the Epson RX-80, for instance. And as should be expected from Tally and Japan, it's both solidly and precisely built. Notably, a profusion of plastic gears hides inside the Spirit near its rubber platen roller, much like in Tally's more expensive printers. Other printers in the Spirit's class either lack such mechanical wonders, or keep them further from sight.

The sleek, wedge design of the Spirit-80 may seem foreign in comparison.

The Spirit-80 offers a variety of print modes and typefaces including normal, reduced, enlarged (double-width), emphasized, italic, reduced-size superscript and subscript print, all of which can be mixed and matched to your heart's content. Both block graphics and dot-addressable graphics (in two horizontal densities, 80 and 160 dots per inch) can be printed. All of these features can be selected through software command using escape sequences. Other escape codes allow setting line spacing, horizontal tabs, and skipping over perforations in continuous-form paper.

The carriage of the Spirit-80 is more than wide enough to handle 9½ inch, sprocket-fed paper and can print 80 characters across it in normal mode, 142 in the compressed mode. A lever on the printhead assembly allows adjustment of printhead force for multiple copies or fading ribbons. The Spirit-80 will handle an original and up to three copies (maximum 0.01 inches).

The Spirit-80 uses a nine-wire printhead and forms characters out of a 7-by-8 array of dots. Although it uses the same standard pitch and line spacing (in normal mode) as most printers in its class do, letters formed by the Spirit appear

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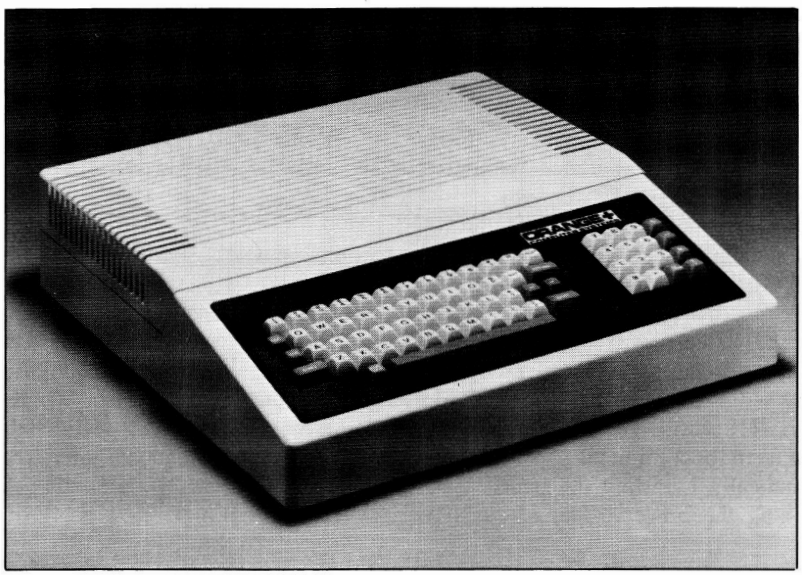

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noticeably smaller.

We received a film ribbon with the Spirit-80 instead of the fabric ribbon used on most matrix printers. According to Mannesman-Tally, the ribbon is a continuous loop and is good for 1,000,000 characters—a point we did not test. The difference in quality using the film ribbon was minor. The printout was a slightly darker black, and the individual dots of each character blended together better than with the other printers in this test.

The ribbon must be the easiest to install and remove of any that we have encountered. In fact, we were able to remove and install the ribbon cartridge while the Spirit-80 was printing! (We don't recommend you follow in our footsteps, however, as operating without a ribbon can damage any printer.)

Controls on the Spirit-80 fit the *de facto* standard for printers in this price range: four LED indicators, green for Power On, On-Line, and Ready, and a red one for Paper Out; three pushbutton switches for putting the Spirit-80 On-Line, Line-Feed, and Form-Feed. Again, like most printers in our test, the top of form for continuous paper is set by mechanically adjusting the paper, then switching the power off and back on. The power switch is located on the right side of the machine which is fairly convenient. The Spirit-80 assumes you will be using sheets 11 inches (66 lines) long. Setting other form lengths requires escape code programming.

Continuous-form paper is fed into the Spirit-80 from the rear, through a unidirectional tractor, then around a rubber platen. A knob on the left side of the printer allows fine adjustment of vertical paper position. With this paper-feeding arrangement, a limited amount of "backing-up" of continuous-form paper is possible. A wire paper-guide/separator keeps ingoing and outgoing sheets from interfering with one another. The Spirit-80 will also friction feed single sheets.

We were able to remove and install the ribbon cartridge while the Spirit-80 was printing!

Default settings of typefaces, character sets, and other functions (slashed zero, buzzer on, automatic line feed with carriage return) are controlled by two DIP switch banks. Adjusting them, however, requires delicate surgery. They are located on the main circuit board of the machine and getting to them requires unscrewing the top cover and balancing the pieces. A short wire ties the two pieces together—one false move and it's straight to the repair shop. You may never need to tangle with these switches—our Spirit-80 worked fine with our Apple IIe without having to dig out the screwdriver. Anyway, most of the DIP switch functions are duplicated by escape codes. However, if you do need to make a permanent change in a default setting, it may be best to have your dealer do it.

The *Operator's Manual,* which accompanies the Spirit-80 is a thin, but complete, pamphlet that provides setup, programming and parallel interfacing instruction, and reference material. The setup instructions assume you know how to read, but that's about all. The programming section assumes you know what to do with escape codes. The interfacing instructions assume that you are



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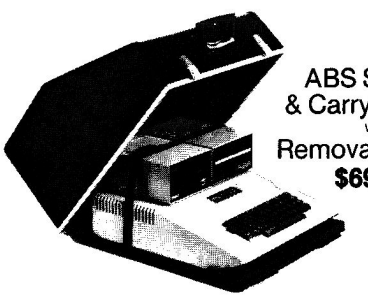

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Softerm file transfer utilizes an easy to use *command language* which may be executed interactively or from a *macro* command file which has been previously entered and saved on disk. Twenty-three high-level commands include *DIAL, CATALOG, SEND,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

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an electrical engineer, and you want to design your own system. But you need not worry about all this technicalese. The Spirit-80 came to life without a hitch immediately after we plugged in a standard Centronics interface cable into the connector in the back. (Serial interface is optional.)

Star Micronics Gemini-10X

Overall, it's difficult to fault the Gemini-10X when compared to the other machines in this group. It was a close second in print speed and tied for first in noisiness. It has one of the widest varieties of type widths in the group and worked flawlessly throughout our brief test period. When we start nitpicking, there's still something good to be said about even its worst features. They hardly interfered with performance.

For instance, the Gemini-10X was the only printer in this group that does not use ribbon cartridges. Consequently, we started our second day of testing with fingers that had turned purple from threading its inked fabric spools. No doubt that with practice the job can be mastered. And discolored fingertips every million or so characters deserves no major penalty. Proponents of noncartridge ribbons will be quick to point out that the old-fashioned way is more economical. A noncartridge ribbon can be turned over for extra printing life and is generally cheaper. Unless you're allergic to ink, the style of ribbon should not be a major factor in choosing a printer.

Similarly, the transparent plastic cover to the Gemini-10X can be spurned or praised. It is not hinged; both its front and rear edges snap into place. And if you're used to hinged covers, you'll probably end up snapping off the tabs that lock the back edge down. The first time we lifted the lid, we snapped off the left tab. Twenty minutes later, after having learned to be more careful with the left-hand side, we snapped off the right tab.

Similarly, the transparent plastic cover to the Gemini-10X can be spurned or praised.

On the positive side, however, the lid on the Gemini-10X completely covers the entire printhead chamber and prevents anything from paper clips to spilled coffee from dropping into and possibly damaging the mechanism.

The Gemini-10X uses a rubber platen roller with a paper-feed tractor on the input side. This arrangement permits the use of either friction-fed single sheets or roll paper (a roll holder is included with the printer) or sprocket-edged continuous fanfold paper. Paper can be rolled backward (carefully) when initially positioning the "top of form" with continuous paper—a small, but welcome convenience.

The cover must be removed to load paper, and the off-and-on-again routine may become cumbersome when friction feeding individual sheets. Of course, you can always leave the cover off for sheet feeding. For continuous fanfold paper, however, we found the Gemini-10X to be one of the quickest and easiest printers to load of all those reviewed here. On the other hand, the feed mechanism seemed a bit more sensitive than most to the condition of the feed paper. Although our observations were purely subjective, the Gemini-10X seemed

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more likely to have feed problems; a misplaced cord running across the paper path required more than normal force to pull the paper through the printer.

Front panel controls on the right side of the top of the Gemini-10X are typical of the printers in this group. It has three pushbuttons, one each for on-line/off line selection, form feed, and line feed. As you might expect, form feed and line feed function only when the printer is off-line. Four LED indicators complete the controls: POWER, READY, ON LINE, and PAPER OUT. A lever on the left side of the printhead chamber adjusts the printhead gap for multipart forms or failing ribbons.

Two DIP switches control printer set-up and defaults. One of them is buried inside and the other is accessible from the rear of the machine. Changing the defaults settings (international character sets, pitch line spacing, and type style at power-on) requires disassembly of the machine. The only redeeming aspects to this inconvenience are that all of these settings can be software controlled, and that the Gemini-10X defaults were already set to the most likely specifications (10 pitch, 6 line per inch spacing, U.S. character set, and standard typeface). The easily adjustable rear panel DIP switches control the functions that are most likely to need changing when the Gemini-10X is shuffled between computers and programs. These include selection of automatic line feed with carriage return (or not), data word length (7 or 8 bits), and so on. We pulled the Gemini-10X out of the box, plugged it into a standard parallel interface cable from our Apple IIe, and everything worked fine—no adjustments or switch flicks needed. (An optional serial interface version is available but was not tested.)

The Gemini-10X sports more special features than any of the other printers in this test group.

The Gemini-10X sports more special features than any of the other printers in this test group (though Apple allows more character widths), including an italic typeface, reduced-size superscripts and subscript characters, and the ability to download character sets. Both block graphic characters and dot-addressable graphic abilities are standard.

One final note: The Gemini-10X and its sibling, the STX-80, both arrived packed with a spare fuse. Far from hinting that the printers would somehow need the spare, the extra fuse gives you a second chance to get the machine running before you run up a repair bill. Alas, you must disassemble the printer to replace the fuse.

Star Micronics STX-80

The STX-80 was the only printer in the group we tested that drew a crowd to ooh and aah over it. All the other machines were impact printers that, at best, sounded like friendly dentists' drills. The STX-80 is a nonimpact thermal printer and was so quiet we couldn't measure its contribution to the general chaos of the room. The crowd gathered to watch its nearly silent, magic work as the print-head quickly scooted across the paper and words appeared magically.

Otherwise the STX-80 is not particularly amazing. It's quite slow, about 27 characters per second in our tests, notwithstanding its bidirectional and logic-seeking virtues, and has no exclusive features except its silence. On the posi-

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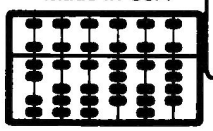

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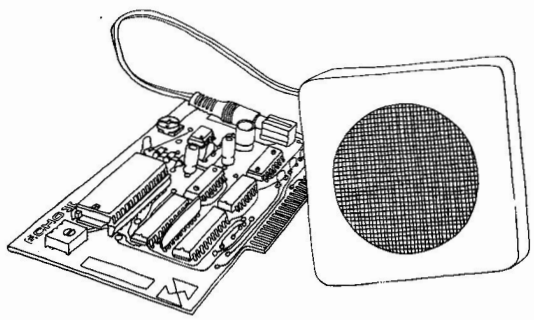

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tive side, however, it's quite compact—smaller than a breadbox and most loaves of bread—and feels quite solid.

Like any other thermal printer, the STX-80 requires a special diet of treated paper to print, and it is mandatory the paper be fed from a roll. Unlike most roll-fed printers, however, the paper roll used with the STX-80 is not mounted on a spindle but instead lies inside a special chamber at the rear of the printer. Unlike many thermal papers, the paper the STX-80 uses is white (instead of silvery) and only belies its temperature sensitivity with occasional blemishes and its too-slick feel.

With no spindle to contend with, loading a roll of this paper is simple. You slide the free end that trails off the roll under the friction-feed platen, spin the platen to move the paper up past the printhead, then drop the rest of the paper roll inside the paper chamber. The paper on the roll has no sprocket holes on its edges to guide it through the machine, and it is not perforated into separate sheets. Neither is apparently necessary. During our tests the paper never skewed, and the rear edge of the STX-80's top cover has molded plastic teeth that serve as a cutoff bar.

Printouts on slippery and glossy paper with rough edges and no fixed length are obviously from a cheap thermal printer and may not be presentable. However, once run through a Xerox copier, memos and program listing will be as professional-looking and long-lasting as any made by a more expensive impact printer. The STX-80's thermal dots are more sharply defined than most impact dots, and the printed characters appear darker and denser than those made with most inexpensive impact matrix printers. Moreover, ASCII characters on the STX-80 are formed in a 5-by-9 dot matrix that allows for full descenders.

The STX-80 is a nonimpact thermal printer and was so quiet we couldn't measure its contribution to the general chaos of the room.

Like the Banana, the STX-80 is essentially a minimalist printer. It has two type sizes and/or faces, a slightly skinnier than usual "normal" 11-pitch and enlarged 5.5 pitch. The enlarged control code (SO to those who speak ASCII) only remains in effect until the printer receives a carriage return command (CR). Enlarged printing can also be canceled before encountering a carriage return by a special code (DC4). In other words, the STX-80 will only enlarge type one line at a time without being reinstructed to enlarge. This condition should not be a problem unless you have already existing software that assumes enlarged characters remain in effect until canceled.

The STX-80 handles graphics in two modes, 64 different block graphic characters or dot-addressable graphics using seven or eight of the nine dots in its printhead matrix, in columns 480 dots wide.

Front panel controls on the STX-80 include two square pushbuttons—ON LINE and LF—and two green LEDs—POWER and ON LINE. The platen knob on the right side allows manual paper positioning.

A DIP switch in the bottom of the paper well allows selecting a form length of 11 or 12 inches (although there is no form-feed pushbutton, the STX-80 does recognize a form-feed software com-

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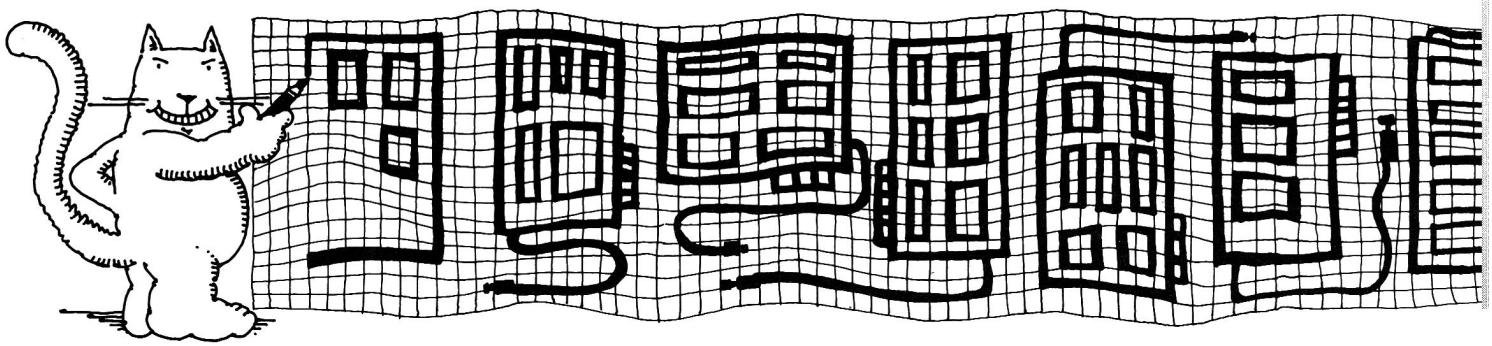

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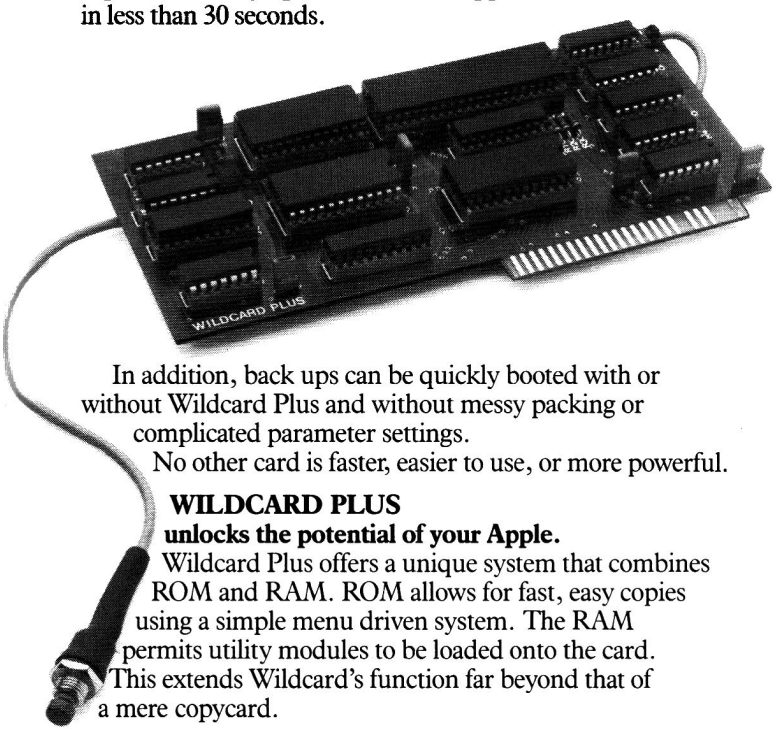

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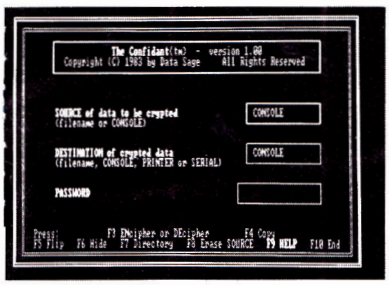

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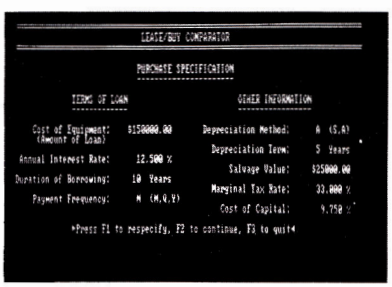

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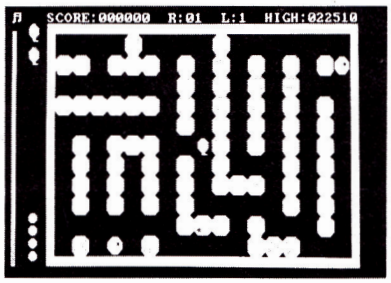

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mand), automatic line-feed with carriage return, 7-or 8-bit data format, and one of eight international character sets. Straight from its box, these switches were set so that the STX-80 worked perfectly with our Apple IIe.

The manual we received, marked "preliminary," is a scant 24 half-sized pages long. It is sparsely written but contains sufficient information to hook up and operate the machine. The contents are a strange mixture of detail (it shows waveforms of control timing signals in case you want to haul out your oscilloscope and make sure everything is all right) and nebulous, nearly meaningless generalities (such as an explanation of the printer's "structure"—it has mechanical parts, electronic parts and a power supply).

Note that the STX-80 has a brother, the STX-80T. They differ only in the block graphic characters stored in ROM. The STX-80 has symbols (clubs, hearts, diamonds, spades, and so forth) and lines, while the "T" features various shapes of blocks.

Conclusion

If you go looking for conclusions, you'll be disappointed. We did not rate the machines, because each one excels in some areas and fails in others. As you might expect, the least expensive printers have the fewest features. In other words, you'll have to ask yourself how much boldface printing and high speed are worth. Certainly the Apple printer is the most compatible and most convenient. But, again, that is for you to decide.

We've done the easy part. We tested the machines and found out what they can do. The hard job—choosing a printer—is yours. ✚

Product Information

Apple Computer, Inc.
10260 Bandley Drive
Cupertino, CA 95014
(408) 996-1010
Price for the Apple dot matrix: $695

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Epson America, Inc.
3415 Kashiwa Street
Torrance, CA 90505
(213) 539-9140
Price for RX-80: $494

CIRCLE 755 ON READER SERVICE CARD

Leading Edge Products, Inc.
225 Turnpike Street
Canton, MA 02021
1-800-343-6833
617-828-8150
Price for Banana: $249
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8301 South 180th Street
Kent, WA 98032
(206) 251-5500
Price for Spirit: $399

CIRCLE 757 ON READER SERVICE CARD

Star Micronics
P.O. Box 612186
Dallas-Fort Worth Airport, TX 75261
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HARDWARE

Soundtrap Stretch

A 26-inch wide acoustical printer housing that reduces noise to an average of 44dBA level for popular 136-column dot matrix and small daisywheel printers. Inside dimensions of the housing are 26 inches across by 17 inches deep.

The Soundtrap Stretch features a "peel out" slot for bottom feed printers and new louvers in the back panel for ventilation. An extra option package includes electrical power-surge protection outlets, a cooling fan, and a pilot light on/off switch.

The housing reduces noise from office printers, including: Apple Letter Quality, Brother HR-15, C. Itoh Starwriter, Epson MX 100, Mannesmann Tally MT 160/180, NEC, Okidata 83A, Qume Sprint 11, Smith Corona, Transtar 315 Color Printer, and Toshiba TH 2100 H/G. *(List Price: $189. Option package $49)*

Trace Systems, Inc.
1928 Old Middlefield Way
Mountain View, CA 94043
(800) 248-7223,
(415) 964-3115

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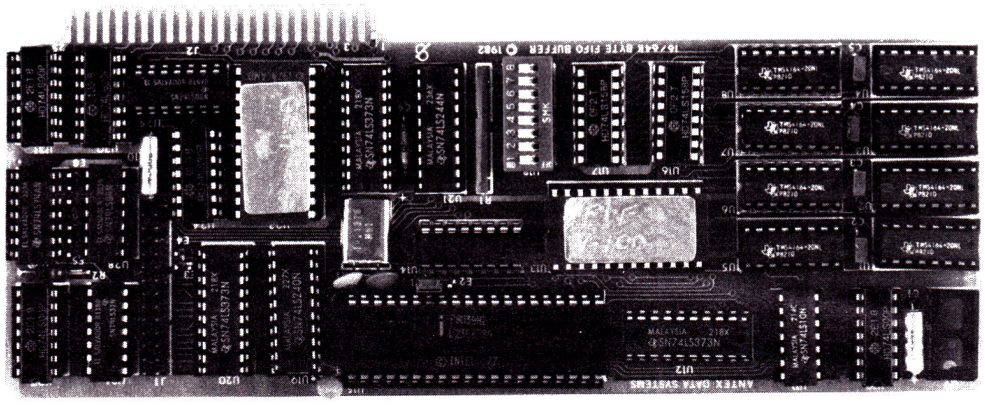

ADS-8211 Grafax Spooler/64, parallel printer interface from Antex Data Systems.

ADS-8211 Grafax SPOOLER/64

A parallel printer interface with 64K RAM buffer and an 8039 microprocessor. The internal RAM can hold approximately 20 pages of text, freeing the user's system for other applications.

The ADS-8211 includes a screen dump feature, holding a screen's display in memory for hard copy reproduction. It will copy and dump "HIRES" graphics screens as well as text. Graphic dumps can be of normal or inverse video, can be straight or rotated 90 degrees, and can be printed in either of two sizes.

The device includes a six-foot length of flat cable with a 36-pin Centronics-type parallel connector. *(List Price: $229)*
Antex Data Systems
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Mountain View, CA 94043
(415) 941-7914

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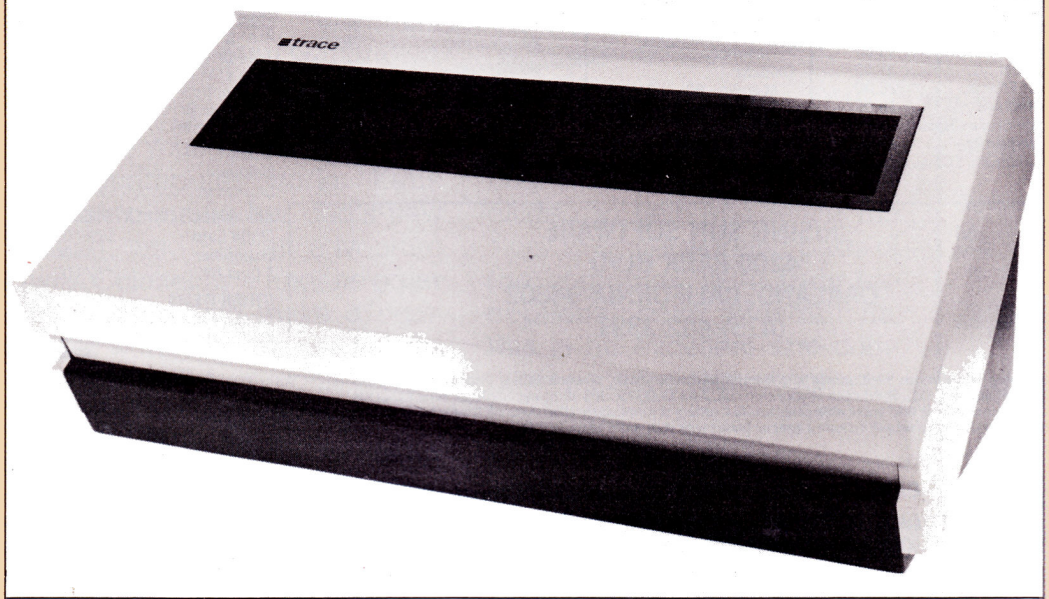


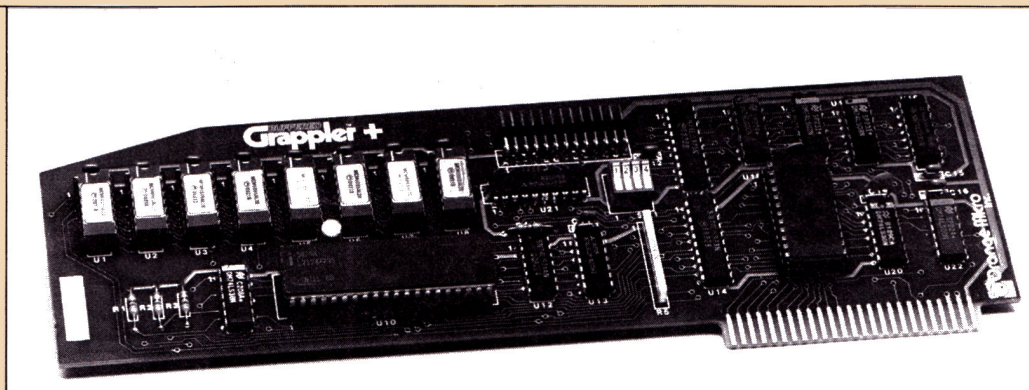
***Soundtrap Stretch,** acoustical printer cover from Trace Systems, Inc.*

SuperSprite

A plug-in graphics board allowing a user to program several animated objects on a display simultaneously. The board synchronizes background graphics, animated "sprite" graphics (characters capable of independent movement), sound effects and synthesized speech. Each sprite occupies space on a separate video plane, allowing the characters to move over and past each other.

The SuperSprite board offers 16 colors for sprites and background patterns, and additional colors can be created by mixing two or more standard colors. To add actual speech, the board incorporates the ECHO II speech synthesizer, providing a user's system with an unlimited vocabulary from typed input.

Software offered with the SuperSprite board includes *Ampersprite,* a programming language for use with *Applesoft,* allowing the user to assemble sprites of various sizes, shapes,



Grappler, a graphics interface board from Orange Micro.

and colors, to sequence their movements, and to program sound. *Amper-sprite* allows up to 32 different sprites to move on a display at the same time. Sound generation is independent of sprite operation, and can be programmed with simple commands to synchronize with the animation without pause for sound to occur. *(List Price: $395)*
Synetix, Inc.
15050 N.E. 95th
Redmond, WA 98052
(800) 426-7412
(206) 881-7110

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Half Track Disk Drive
A 5¼ inch floppy disk drive that provides 160K bytes of dual density storage. The drive is only one-half the height of an Apple disk drive.

The Half Track Disk Drive features half high design, contemporary slimline styling, cooling louvers, auto-eject of diskette for operator convenience, a quick-release controller cable, and 12 millisecond head access time.

The drive is rated at 8000 MTBF and comes complete with filer DOS 3.3, controller, and cable. *(List Price: $399.95)*
Requires: Apple II, Apple II+, Apple IIe, DOS 3.2 or 3.3.
Wholesale Technology, Inc.
1530 South Sinclair
Anaheim, CA 92806
(714) 978-9820

CIRCLE 793 ON READER SERVICE CARD

Bufferboard
A print buffer for the Apple II and Apple III computers that will hold up to 64K of memory and feed it to the printer at its own rate. This frees the computer for other uses while the printer is working.

The Bufferboard comes with 16K memory standard, which holds about five pages of text, and can be expanded to 32K or 64K. With the full 64K installed the Bufferboard stores up to 20 pages of text.

The Bufferboard comes with Orange Micro's Interface Docking System. This eliminates the need for a new interface; the Bufferboard fits into the Apple and "docks" onto all popular parallel printer interfaces, including the Grappler/Grappler+ interfaces, Epson interface, and the Apple printer interface.

All Bufferboard features are controlled by an on-board micro-controller. A built-in self-test automatically reads the number of memory chips installed while testing the board's components. The Bufferboard's automatic memory configuration eliminates the need to change switches and settings when additional memory chips are installed. The Bufferboard comes with its own interface docking cable and manual. *(List Price: Not available.)*
Requires: Not available.
Orange Micro, Inc.
1400 N. Lakeview Ave.
Anaheim, CA. 92807
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SOFTWARE

Geopolitique 1990
A new game that simulates international diplomacy and military confrontations. The player assumes the role of a President of the United States in the 1990's caught up in a power struggle with the Soviet Union and facing an economically troubled world.

Geopolitique has two phases, the diplomatic phase and the military phase. "Geopol" is a peaceful struggle for world domination between the U.S. and the Soviet Union. Raw materials, military alliances, capital, and economic concessions are all traded. The player's political savvy in international haggling will determine whether dominance can be gained without a shot being fired.

The "Geowar" phase simulates conventional warfare and has realistic features such as air strikes, amphibious landings, air superiority, and terrain considerations.

There are seven scenarios a player can choose from, ranging from today's volatile global situation to a number of hypothetical settings. *(List Price: $39.95)*
Requires: 48K, Apple II, Apple II+, Apple IIe, or Apple III, one disk drive.
Strategic Simulations, Inc.
883 Stierlin Rd., Bldg. A-200
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Apple-IBM PC File Transfer Program
A new system allowing transfer of files from the Apple to the IBM PC and XT. The product includes a communications program for the IBM PC and an adapter that enables the two systems to connect. The program contains several utilities that assist in program conversion and help prepare files for editing.

The Apple-IBM PC File

Transfer Program supports transfer of random files, text files, data files, binary files, and high level language programs such as BASIC, Pascal, Fortran, and Cobol. The program also supports *VisiCalc* electronic spreadsheet data, word processor files, CP/M, and more.

File concatenation is provided as well as the ability to send files of any length. Supported baud rates are 110, 150, 300, 600, 1200, 2400, 4800, and 9600. The user's manual contains tips on program conversion. *(List Price: $94.95)*
Requires: 64K, Apple II, Apple II$^+$, or Apple IIe, with Apple serial card, one disk drive, DOS 3.3, IBM PC, or XT, one disk drive, MS or PC-DOS.
Personal Computer Products
1400 Coleman Ave.,
Suite C-18
Santa Clara, CA 95050
(408) 988-0164

CIRCLE 787 ON READER SERVICE CARD

Navette

A software pattern design tool for handweavers. *Navette* allows the user to create warp and weft drawdowns which can be stored on diskette and combined to produce new and unusual block patterns. In the program's analysis mode, the user can edit a pattern and its threading, treadling, and tie-up are produced automatically.

Navette uses high resolution graphics permitting 16 harness patterns with warp repeats to 66 threads and weft repeats to 48 picks. Two pattern display sizes are available: 140 x 96 inches and 70 x 48 inches. The software's color-effect capability means that individual warp and weft threads may be designated as light or dark, significantly increasing pattern possibilities.

Combined with a printer, *Navette* can produce full pattern drawdowns simulating tight or open weave effects. Any graphics character may be used to represent dark threads in the drawdown printout. *(List Price: $39.95)*
Requires: 64K, Apple II, Apple IIe, one disk drive, printer.
Opcode Software
1909½ Vine St.
Berkeley, CA 94709
(415) 525-6997

CIRCLE 786 ON READER SERVICE CARD

CodeWriter

Software that allows users to design unique application programs without knowledge of computer programming. A user can write a program by simply typing the screen layout form and the calculations onto the computer's screen in plain English. *CodeWriter* automatically translates that plain English and writes the computer-language "code" which actually does the work in the computer.

The program generates software applications that use the computational power of the computer as well as its ability to store, organize, sort, calculate, and search collections of data. Applications including payables and receivables, sales analysis, customer and personnel files, mailing lists, invoicing, inventory and production tracking, order entry, and many others can be developed.

Once the application is produced, *CodeWriter* itself is put aside and the new application program is used. When a new application program is needed, the *CodeWriter* disk can be brought out again to write it. The software can also be used to modify programs originally generated with it.

CodeWriter is self-prompting and rejects improper or illogical input, giving the user a new chance to enter the proper information. *(List Price: $399)*
Requires: 64K, Apple II$^+$ or Apple IIe, 2 disk drives.
Dynatech MicroSoftware, Inc.
7847 N. Caldwell Ave.
Niles, IL 60648
(800) 621-4109,
(312) 470-0700

CIRCLE 785 ON READER SERVICE CARD

Automated Mental Health Systems

A microcomputer-based office management system designed for mental health practitioners, including psychiatrists, psychologists, and psychiatric social workers. The program automates the business aspects of a mental health practice by maintaining client history and performing billing tasks.

A user can maintain information on 225 active accounts on the system that can be used in private offices, clinics, or hospitals. Features include customized service descriptions, posting of services, account history recall, account billing, and generation of printed reports. A billing option that uses standard American Medical Association insurance forms is available.

The program is password protected and provides hard copy of ledger data in concise formats with full-year financial reporting capability. *(List Price: $695)*
Requires: 48K, Apple II, Apple II$^+$, or Apple IIe, two disk drives, monitor, 80 column printer.
Medical Office Systems
615 S. Frederick Ave.,
Suite 308
Gaithersburg, MD 20877
(301) 840-0440

CIRCLE 784 ON READER SERVICE CARD

GradeCalc

A grade and attendance management software package designed to work well with any teacher's existing grade format.

Users can keep all raw grades and assignment information on file. The file can average grades using a variety of methods ranging from percentage scores to letter grades. In addition to averaging, numerous reports can be generated, including a cumulative listing of missing assignments, grade totals, averages, grade book listings, and assignment summaries.

GradeCalc can also manage attendance records. Reports include cumulative totals of all attendance records and problem reports based on excessive absences or other problems. *(List Price: $29.95)*
Requires: 32K, Apple II, Apple II$^+$, or Apple IIe, one disk drive.
Tamarack Software, Inc.
Water St.
Darby, MT 59829
(406) 821-4595

CIRCLE 783 ON READER SERVICE CARD

Mineral Cave
An educational adventure game for elementary through high school students that provides practice in identifying various minerals using scientific testing procedures.

The player becomes an adventurer who, armed with a sword and carrying a sack of gold pieces, goes off to explore a cave. It is the adventurer's mission to travel through the cavern and correctly identify 10 different minerals, including malachite, azurite, topaz, feldspar, and others. A key of properties gives the explorer clues about what each mineral is like. *Mineral Cave* also calls on players to use mapping skills during their trek. *(List Price: $34.95)*
Requires: 48K, Apple II$^+$ or Apple IIe, one disk drive.
Teck Associates
P.O. Box 8732
White Bear Lake, MN 55110
(612) 429-5570

CIRCLE 782 ON READER SERVICE CARD

Lode Runner
Software that offers users 150 different game screens and a generator for creating original games.

Each of *Lode Runner's* 150 game screens features its own unique puzzles and challenges. Each level requires strategic problem solving and quick thinking in addition to lightning fast reflexes. A game generator lets users, unfamiliar with programming, design and save their own game screens. *(List Price: $34.95)*
Requires: 48K, Apple II with *Applesoft*, Apple II$^+$, or Apple IIe.
Broderbund Software
1938 Fourth St.
San Rafael, CA 94901
(415) 456-6424

CIRCLE 781 ON READER SERVICE CARD

Robographics CAD-1
A computer aided drafting and design system that produces scaled, technical drawings and custom graphics. Designers, illustrators, educators, and other business professionals can use this system to create building plans, mechanical drawings, schematics, flowcharts, and business graphics.

The *CAD-1* uses a high precision hand-held controller to draw lines, circles, arcs, and tangents to exact dimensions. Once completed, commonly used symbols and finished drawings are stored on library diskettes, and can be displayed in miniature for easy recognition and reuse through a graphic index system.

For professional quality output from the *CAD-1* system, two Robographics drafting plotters are availalbe to produce line-perfect drawings of up to 22 x 34 inches. For proof copy, any dot matrix printer with graphics dump capability can be used. *(List Price: $1,095)*
Requires: 64K, Apple II$^+$ or Apple IIe, two disk drives.
Chessell-Robocom Corporation
125 Pheasant Run,
Suite 2B
Newtown, PA 18940
(215) 968-4422

CIRCLE 780 ON READER SERVICE CARD

Fast Point Pen
A light pen and controller that can be used for cursor control and menu picking applications as well as low-resolution graphics tasks. Applications can be accomplished with software peaks at memory locations, and the pen is adaptable to existing software and new programs.

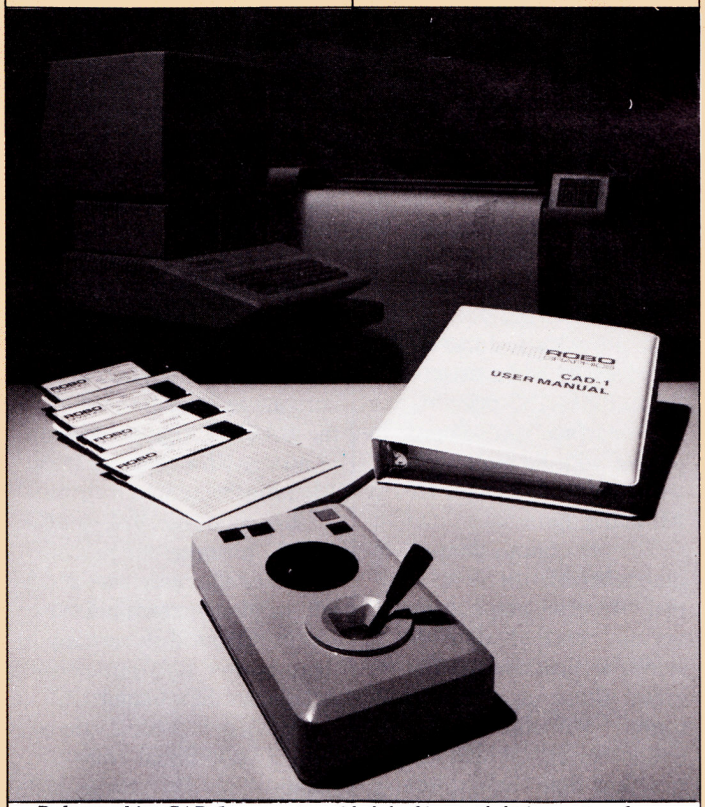
The Fast Point pen comes supplied with a controller card intended for slot 5 on the mother board, and a small extension board which plugs into IC sockets which normally house video multiplexer IC's. Those IC's plug into the extension board.

The light pen has a touch-sensitive switch which generates a signal when the tip is placed against an unblanked spot on the CRT. Minimum sensitivity is 7 FL spot brightness. *(List Price: $240)*
Requires: Apple II$^+$.
HEI, Inc.
1495 Steiger Lake La.
Victoria, MN 55386

CIRCLE 779 ON READER SERVICE CARD

Decimals
An interactive software program designed to help elementary through high school students understand and use fractions. The program's emphasis is on applying mathematical concepts to real life situations, not on rote recall of facts.

The eight topics covered in *Decimals* each contain two programs. The "A" programs let the student give the computer problems to solve, and then presents practice problems given by the computer.



***Robographics CAD-1**, computer aided drafting and design system from Chessell-Robocom Corp.*

The "B" programs are enrichment extensions of the concepts covered in the "A" programs, often presented in game format. The final "B" program is a review test for the entire series. *(List Price: $120)*
Requires: 48K, Apple II+, Apple IIe, one disk drive.
Quality Educational Designs
P.O. Box 12486
Portland, OR 97212
(503) 287-8137

CIRCLE 778 ON READER SERVICE CARD

Grappler+
A universal graphics interface which works with most popular printers. It combines on-board firmware for Apple HI-RES graphics with many new features, including an on-board dip switch for printer selection. There are 23 software commands available through the keyboard or user program.

The Grappler+ is compatible with the following printers: Anadex, Apple Dot Matrix, Centronics, C. Itoh Prowriter, Epson Series, NEC 8023, Okidata Series, PMC DMP-85, Star Gemini Series, and future printers. The interface allows all color features to be accessed when using the Prism 80 or 132 printers. The interface is also compatible with Apple hardware and with Pascal, CP/M, and Logo.

Simple control commands enable the Grappler+ to print graphics inversed, centered, double-sized, and rotated 90 degrees. Block graphic capability is available on the Epson Series, Okidata Series, and Star Gemini Series. Text commands include screen dumps, setting of margins and page lengths, auto-skip-over perforation, and word wrap-around with breakpoint at the nearest space. No software is needed to execute these commands. *(List Price: $175)*
Requires: Apple II, Apple II+, or Apple IIe, printer.
Orange Micro, Inc.
1400 N. Lakeview
Anaheim, CA 92807
(714) 779-2772

CIRCLE 777 ON READER SERVICE CARD

Amper-Magic
Software that allows users, with no knowledge of machine language, to add new commands to *Applesoft* BASIC. The menu-driven utility uses the ampersand function to access any number of machine language routines without knowing their addresses. The BASIC program can then pass variables back and forth to the routines. No pokes or peek are required.

Amper-Magic will attach the routines with names of the user's choice, and the program can be edited without regard to addresses. There is no interference with DOS, page zero, or the "scratchpad" area at hex 300. The new commands become part of the BASIC program. There is no need for separate Bload instructions.

Amper-Magic Vol. 1 offers 23 machine language routines. The user can also add original, relocatable routines from disk or copy them in directly from a decimal or hex listing. *Amper-Magic* Vol. 2 contains 27 additional commands. *(List Price: Vol. 1 $75, Vol. II $35)*
Requires: 48K, Apple II with *Applesoft*, Apple II+, Apple IIe, one disk drive.
Anthro-Digital, Inc.
P.O. Box 1385
Pittsfield, MA 01202
(413) 448-8278

CIRCLE 775 ON READER SERVICE CARD

Net-Works II
An electronic bulletin board for business, home, or hobby. Users can send messages to individuals, distribute memos to local and remote office locations, and call in for messages 24 hours a day.

The software automatically answers and records each phone call and asks for the caller's password or assigns a password to a first-time caller. The *Net-Works II* operator may screen the caller prior to password validation, and even charge a membership fee, if desired. Eight general interest bulletin board topics can be customized by the *Net-Works II* operator.

Net-Works II provides a "welcome" message and "Help" information for new callers. "Expert" callers see fewer menus and instructions. Callers may send private mail to each other, post or read public bulletins, receive programs or text files, and view the membership list. *Net-Works II* automatically notifies the caller if there is mail waiting. The bulletin board has an editor and other utility programs. *(List Price: $99.99)*
Required: 48K, Apple II, Micromodem II, one disk drive.
High Technology Software Products, Inc.
P.O. Box 60406
1611 N.W. 23rd
Oklahoma City, OK 73146
(415) 524-4359

CIRCLE 776 ON READER SERVICE CARD

Rhyming
An educational program for young children and others who need practice in rhyming.

Teachers can design custom lessons using relevant word combinations for their students and can replace the demonstration word pairs delivered in the program with up to 50 pairs of their own.

The computer randomly selects two words from the list prepared by the teacher. The words are flashed on the screen, and the student must decide if they rhyme or not. Students choose the number of problems per game. Average score and time are reported.

Because word pairs are teacher or user selectable, the program can be used for lessons in English, reading, foreign languages, and other areas. *(List Price: $19.95)*
Requires: 8K, Apple II, Apple II+, Apple IIe, one disk drive.
School and Home Courseware, Inc.
1341 Bulldog La., Suite C
Fresno, CA 93710
(209) 227-4341

CIRCLE 774 ON READER SERVICE CARD

Dollars & $ense
A family financial management program, featuring ease of use and a tutorial diskette. The program establishes and maintains a personalized financial database, useful in maintaining family budgets, keeping records of income and expenses, and in providing information needed to pre-

pare income taxes. *Dollars & $ense* allows a user to prepare graphs and reports which can be displayed or printed in color with appropriate hardware.

The program can be used on an individual level to reconcile checkbooks, to manage investments such as real property or stock portfolios, or to analyze personal expenses. Professionally, *Dollars & $ense* allows a user to calculate net worth, manage budgets for a small business, or project business profit or loss. In all, the user can identify up to 12 accounts of five types: assets, liabilities, expenses, income, and checking.

The *Dollars & $ense* package includes a demonstration/tutorial diskette, the program diskette, and a user's manual. *(List Price: $165)*

Requires: 48K, Apple II or Apple IIe; one disk drive.

Tronix Publishing, Inc.
Monogram Div.
8295 S. La Cienega Blvd.
Inglewood, CA 90301
(213) 215-0529

CIRCLE 773 ON READER SERVICE CARD

Buzzard Bait

A game program that pits the player against up to three pairs of birds who prey on humans in order to feed their young. The player is on a rescue mission to save people from the attacking predators. The game can be played with either a joystick or keyboard. *(List price: $39.95)*

Requires: Not available.

Sirius Software Inc.
10364 Rockingham Dr.
Sacramento, CA 95827
(916) 366-1195

CIRCLE 772 ON READER SERVICE CARD

First Categories

An educational program aimed at children who are just beginning to read and handicapped youngsters who have difficulty with categorization. The program uses graphics, speech, and text to train children in six noun categories on three levels of difficulty. The first level features graphics, speech, and text while the second and third levels use text and speech only. The categories are animals, body parts, clothes, food, utensils, and vehicles. *(List Price: $120)*

Requires: 64K, Apple II$^+$ or Apple IIe, one disk drive, DOS 3.3, Echo II speech synthesizer.

Laureate Learning Systems, Inc.
1 Mill Street
Burlington, VT 05401
(802) 862-7355

CIRCLE 771 ON READER SERVICE CARD

Seven Program Package

Seven software packages to help users keep track of addresses, schedules, and mailings.

The *Little Black Book* keeps track of names and notes electronically and indexes them by name and date. The correct spelling of the name is not required to find an entry. The package is available for hard disks as well as single floppy-drive systems.

The *Scheduler* organizes events and will review events or print out a daily schedule.

Roll-a-File and *Print-a-File* serve as an electronic card file that will search for clients according to specific criteria such as name, age, account number, ZIP Code. *Print-a-File* will print mailing lists or phone lists using the information retrieved with the *Roll-a-File* package.

Micro-Mass-Mailer eliminates the need for envelope stuffing by printing a message inside the envelope and printing the address on the outside.

The *Labeller* will design and print custom labels using either normal or large type and allows for automatic line centering.

Le Menu will access any DOS 3.3 program with only two keystrokes and is compatible with floppy and hard disk drives. *(List Price: Little Black Book, $249; Scheduler, $99; Roll-a-File, $79; Print-a-File $99; Micro-Mass-Mailer, $129; Labeller, $19.95; Le Menu, $49.95)*

Requires: 64K, Apple II, II$^+$, IIe, one disk drive. Printer optional.

Sophisticated Software
650 Foothill Boulevard
La Canada, CA 91011
(213) 790-9054

CIRCLE 770 ON READER SERVICE CARD

Aural Skill Trainer

A series of three programs that introduce students to music concepts. Program lessons are Intervals, Basic Chords, and Seventh Chords. The programs generate instructor reports on a printer. Discounts are available to schools for multi-copy purchases.

(List Price: Three-lesson series, $99.95, Individual lessons, $39.95 each.)

Requires: 48K, Apple II or Apple IIe, one disk drive. Printer optional.

Electronic Courseware Systems, Inc.
309 Windsor Road
Champaign, IL 61820
(217) 359-7099

CIRCLE 769 ON READER SERVICE CARD

BLAST Communications Utility

A communications program that transfers both binary and text files between microcomputers, minicomputers, and mainframes. *BLAST* (BLocked ASynchronous Transmission) programs use a high-level, SDLC/HDLC-type protocol that allows for reliable file transfers in both directions simultaneously over standard telephone lines at up to 4800 baud.

BLAST works with low-cost asynchronous modems, standard serial ports, and regular dial-up telephones. *BLAST* allows computers to perform efficiently over noisy phone lines, hard-wired circuits, satellite links, packet-switched nets such as Telenet, and local area networks such as Ethernet.

Either site may send and/or receive any files, programs, or commands error-free and convert text file formats to the format of the other system. Microcomputer versions of *BLAST* include terminal emulation facilities for accessing any host computer; text file uploading and downloading; and support for auto-dial/auto-answer modems. *(List Price: $250)*

Requires: 48K, Apple II, one or two disk drives, and any modem. CP/M version requires Z-80 board and 64K RAM.

Communications Research

Group Inc.
8939 Jefferson Hwy
Baton Rouge, LA 70809
(504) 923-0888

CIRCLE 768 ON READER SERVICE CARD

Data Transforms

Two programs from Data Transforms which allow Apple II users to expand the high-resolution graphics capabilities of the computer. The *Graphtrix Matrix Graphics System* allows users to insert high-resolution graphics into *Applewriter* text files. The system also adds footnoting, superscripting, and chaptering capabilities to *Applewriter* 1.0 and 1.1.

The other program, *Fontrix*, allows Apple users to create and print up to 16 high-resolution screens as a single graphic. *Fontrix* also allows the creation of special character sets that can be typed directly onto the extended graphics screen, either with proportional or non-proportional spacing.

Both *Graphtrix* and *Fontrix* support more than 200 combinations of dot-matrix printers and interface cards. *(List Price: Graphtrix, $65; Fontrix, $75*

Requires: 48K, Apple II, one disk drive, DOS 3.3 with *Applesoft* in ROM.
Data Transforms
616 Washington St., Suite 106
Denver, CO 80203
(303) 832-1501

CIRCLE 767 ON READER SERVICE CARD

Market Analyst

A menu-driven software package for stock market investors that charts data, maintains portfolios, and provides access to remote data bases for news and stock quotes.

The package features three sections; a Technical Analyst for computerized charting, the Portfolio Manager to monitor holdings, and News, Views and Quotes for online information access.

The Technical Analyst charts high-low-close bar charts and volume histograms and calculates and charts such technical studies as on-balance volume, accumulation/distribution, volume indicators, moving averages, and user-specified formulae. All charts are created interactively on the high-resolution screen and can be printed on a graphics printer.

The Portfolio Manager keeps track of multiple portfolios, making the holdings available for current gain/loss evaluations, yield calculations, short-term flags, and market appraisals. All reports are available on the screen or printer.

News, Views and Quotes is the teleprocessing section that provides access to remote data bases. It stores up to 30 pages of text for off-line viewing. *(List Price: $495)*

Requires: Apple II, Apple II$^+$, or Apple IIe, one disk drive, color or B&W monitor. Supports printer (graphics capability preferred) and modem.
Anidata, Inc.
318 South Black Horse Pike
Blackwood, NJ 08012
(609) 228-3034

CIRCLE 766 ON READER SERVICE CARD

More Magic

Two business programs for creating a directory/database and a spreadsheet which stores DIF files. *Magic Memory* is a directory/database system that creates a video address book on the monitor screen. Tabs on the screen designating alphabetic entries help locate names, addresses, and phone numbers. Entries can be deleted and transferred. In addition to the lettered tabs are 24 other tabs that can be labeled by the user to indicate anniversaries, birthdays, deadlines, etc. Each tab can store up to 255 entries. *Magic Memory* can also print out the complete address book.

Magicalc is a spreadsheet program that can use up to 512K bytes additional RAM. *Magicalc* includes individual column widths, 40- or 70-columns, or 80-columns with an 80-column video card. *Magicalc* uses the same keyboard commands as *VisiCalc* and it can load and save *VisiCalc* and DIF format files. *(List Price: Magic Memory, $99.95; Magicalc, $149.95.)*
Artsci, Inc.
5547 Satsuma Ave.
North Hollywood, CA 91601
(213) 985-2922

CIRCLE 765 ON READER SERVICE CARD

Teleminder

A communications program that allows a user to access and retrieve data from the Dow Jones News/Retrieval Service automatically in unattended operation. The program will connect with the commercial database, retrieve selected data, load it onto a diskette, and disconnect from the service. In addition, it can print the news and stock quotes.

With the optional *Tele-Pak I* utility, *Teleminder* can also transfer retrieved data directly into such applications programs as the *Dow Jones Market Manager, the Dow Jones Market Analyzer,* and to spreadsheet programs such as *VisiCalc, 1-2-3,* and *Multiplan. Tele-Pak I* can also transfer *Dow Jones Market Manager* data to *Dow Jones Market Analyzer* files, and vice versa. This allows users with both software packages to access the News/Retrieval service only once to obtain identical data in each program. *(List Price: Teleminder $195; Tele-Pak I $30 additional)*

Requires: 64K, Apple II, Apple II$^+$, two disk drives, 40-col. display, Hayes Micromodem or Super Serial-Card, and Hayes Smartmodem. For the Apple IIe an 80-column display card is also required.
Teleware Inc.
P.O. Box 729
Pine Brook, NJ 07058
(800) 225-0076
(201) 882-0466

CIRCLE 764 ON READER SERVICE CARD

The Media Director I & II

A program designed for radio stations, advertising and marketing agencies, and other businesses with an interest in maintaining data on radio time and comparative values. *The Media Director* software allows a user to enter basic data obtainable from rating services, such as Arbitron and Birch, and to calculate and compare the following indices: Average Persons Rating, Cume Persons Rating, Share of Audience, Gross Rating Point, Cost



UNLEASH THE POWER

Having been in the microcomputing industry for 10 years, V R Data Corporation has earned its reputation for microcomputing excellence. For over a year we have been making solid deliveries of the PANTHER establishing ourselves as THE SOURCE for proven, premium quality Winchester Disk Subsystems. The PANTHER satisfies the most demanding mass storage needs with capacities of up to 30 megabytes or more.

Utilizing 5 ¼" Winchester disk drive technology, and microprocessor based error correcting controller boards, the PANTHER continues to be the #1 choice of discerning professionals. Available with one or two drives in one enclosure, the PANTHER can support many combinations of fixed and removable drives.

Now V R Data Corporation proudly introduces the newest member in the Panther family of Winchester Disk Drives, the "CUB". The CUB is a sub-mini Winchester Disk Subsystem, representing the latest in innovative technologies. With advances such as 100mm thin film plated media with embedded digital servo, and switch mode power, the CUB placed V R Data well out ahead of the pack. Available in single (master) and dual (master/slave) drive configurations, the CUB provides the user with capacities up to 10 megabytes of fixed or removable storage media.

The CUB's sleek low profile design totally eliminates that overcrowded work area problem and adds a professional appearance to your system. The CUB removable media drives are ideal for 5 megabyte on-line storage as well as 5 megabyte backup for your fixed media drives. Adapter modules are availalbe for the most popular microcomputers. The PANTHER family of drives are availalbe at quality Computer Stores everywhere. If your dealer does not yet carry PANTHER Drives from V R Data, tell them the future has arrived.

VR data

777 Henderson Blvd. • Folcroft, PA 19032 • (215) 461-5300

CIRCLE 187 ON READER SERVICE CARD

Per Gross Impression, Cost Per Thousand Net Reach, Average Frequency, Average Time Spent Listening, and Turnover Rate.

The program can create the indices reports for an unlimited number of radio stations within a given market for each report. Each version of *Media Director* will create a file, and display, edit, print, and store a database for any market, time-of-day, and demographic group. *Version II* can also generate Reach + Frequency and Station Analysis by Daypart reports.

The software includes documentation and a walk-through tutorial. *(List Price: Version I $350; Version II $500)*

Requires: 48K, Apple II, Apple+, one disk drive, Z-80 card.

Anderson Associates
4 Irvine Row
Carlisle, PA 17013
(717) 245-2662

CIRCLE 794 ON READER SERVICE CARD

Charts Unlimited

A graphics program, enabling users to create drawings such as flowcharts, floor plans, engineering drawings, schematics, and similar charts. The program provides 36 predefined objects and 36 predefined symbols. Users may create their own alternate objects, up to 26 per file, with an unlimited number of files possible.

The *Charts Unlimited* program includes help screens and is menu-driven. Charts or drawings are created on a worksheet grid of 123 columns by 90 rows (equal to an 8½ x 11 inch sheet of paper). Users can mix text with graphics, in both upper and lower case, and in boldface. *(List Price: $195)*

Requires: 64K, Apple IIe or Apple II+.

Charts Unlimited
5084 Mosiman Rd.
Middletown, OH 45042
(513) 424-6733

CIRCLE 763 ON READER SERVICE CARD

The STARSPRITE System

A software system created for the SuperSprite Board which allows the board to produce background and animated graphics, sound effects and synthesized speech. It is made up of three packages the first of which is included with the SuperSprite Board. STARSPRITE I contains 2 two-sided disks that explain the features of the board and the entire software system. With this system the user can coordinate sprites and Apple graphics, create mazes and patterns and use the Echo II speech board from Street Electronics.

STARSPRITE II is designed for intermediate programming and stresses the use of the AmperSprite language from within the BASIC language. It contains utilities, tutorials and demonstrations on combining animation, sound and backgrounds. The most advanced program, STARSPRITE III, was created for the assembly programmer. It provides detailed information on all aspects of programming using the SuperSprite Board, including VDP high speed machine language, lazer algorithms, and Sprite painting merge routine. In each of its packages Avant-Garde has included an offer to review users' creations for possible publishing. *(List Price: $79.95 each)*

Avant Garde Creations, Inc.
1907 Garden Avė.
Eugene, OR 97403
(503) 345-3043

CIRCLE 795 ON READER SERVICE CARD

Word Attack!

A vocabulary building program for ages 8 through adult. Four separate exercises offer 600 words, their meanings and usage. *(List Price: $49.95)*

Requires: Apple II.

Davidson & Associates
6069 Groveoak Place #12
Rancho Palos Verdes, CA 90274
(213) 378-7826

CIRCLE 796 ON READER SERVICE CARD

Letterbank

A word processing applications package which provides more than 200 business letters. The letters can be modified and three different version of each subject are included. *(List Price: $99)*

Requires: Apple II

The Wyndham Group Ltd.
125 Mirona Rd.
Portsmouth, NH 03801
(603) 431-4800

CIRCLE 797 ON READER SERVICE CARD

Solving the Mysteries of Science

A science program designed for students in grades 7-9. The package is made up of ten general subjects, each covered in 24 lessons. Features include high resolution graphics and positive reinforcement for all answers. *(List Price: $39.95, $850 for 24 lesson series)*

Requires: Apple II or IIe.

Visual Materials Inc.
4170 Grove Ave.
Gurnee, IL 60031
(312) 249-1710

CIRCLE 798 ON READER SERVICE CARD

Epidemic

An adventure game based on the premise that a virulent disease is ravaging the world. The user is named director of the Center for Disease Control, and has at his disposal clean suits, X-rays, interferon, vaccines, gene splicing, and microwaves. If all these fail, an area in which the disease is totally beyond control can be destroyed. *(List Price: $39.95)*

Requires: Apple II+ or Apple III.

Strategic Simulations Inc.
Suite 108
465 Fairchild Dr.
Mountain View, CA 94043
(415) 964-1353

CIRCLE 799 ON READER SERVICE CARD

Calcu-Plot

A program providing users with mathematical utilities for converting complex equations into graphics formats. The software can solve a range of equations and accept data from the keyboard, disk files, or print-format VisiCalc files. Solved equations can be plotted singly or in sets of two or three, all on the same graph.

Users may enter their own equations or select from 16 Cartesian or Polar equations with unlimited choice of constants and limits.

Human Systems Dynamics
9010 Reseda Blvd., #222
Northridge, CA 91324
(213) 993-8536

CIRCLE 800 ON READER SERVICE CARD

Apple II

CP/M

IBM PC

SPECTRUM

Professional Software Products

MATHEMATICS SERIES

The Series Includes These 4 Programs:

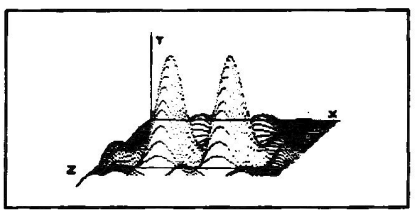
STATISTICAL ANALYSIS I: This menu driven program performs LINEAR REGRESSION analysis, determines the mean, standard deviation and plots the frequency distribution of user-supplied data sets.

NUMERICAL ANALYSIS: HI-RES 2-Dimensional plot of any function. Automatic scaling. At your option, the program will plot the function, plot the INTEGRAL, plot the DERIVATIVE, determine the ROOTS, MAXIMA, MINIMA and INTEGRAL VALUE.

MATRIX: A general purpose, menu driven program for determining the INVERSE and DETERMINANT of any matrix, as well as the SOLUTION to any set of SIMULTANEOUS LINEAR EQUATIONS.

3-D SURFACE PLOTTER: Explore the ELEGANCE and BEAUTY of MATHEMATICS by creating HI-RES PLOTS of 3-dimensional surfaces from any 3-variable equations. Hidden line or transparent plotting.

For APPLE II (48K) and IBM PC (64K) $50.00



BUSINESS SOFTWARE SERIES

Both Programs $250.00

A user-friendly yet comprehensive double-entry accounting system employing screen-oriented data input forms, extensive error-trapping, data validation and special routines for high speed operation. The series includes these two modules:

GENERAL LEDGER: A complete accounting system with these features:

- Up to 500 accounts and 500 transactions per month.
- Interactive on-screen transaction journal.
- Produces these reports:
  - Transactions Journal
  - Balance Sheet
  - Account Ledgers
  - Account Listings
  - Income Statement

For APPLE II and IBM PC $150.00

ACCOUNTS RECEIVABLE

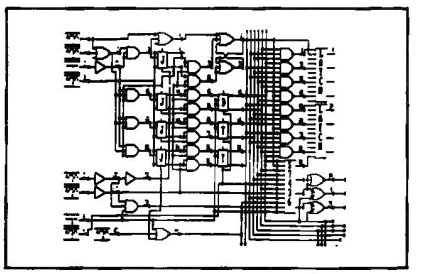
A flexible system with these features

- Up to 500 accounts and up to 500 invoices per diskette.
- Prints invoices, customer statements & address labels.
- Interfaces to General Ledger.
- Interactive screen-based invoice work sheet.
- Produces these reports
  - Aged Receivables
  - Sales Analysis
  - Account Listings
  - Customer Balances

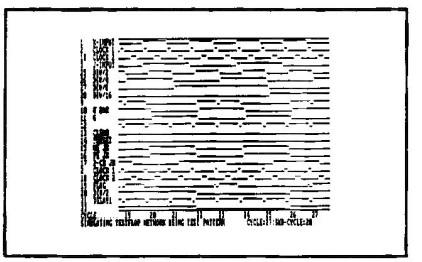
For APPLE II and IBM PC .... (2 DRIVES) .. $150.00

MICRO-LOGIC

An interactive graphics program for designing and simulating digital logic systems. Using the built-in graphics module, the user creates a logic diagram consisting of AND, OR, NAND, NOR, EX-OR, D, T, JK FLIP FLOP and powerful 16 pin user-defined MACRO functions. A typical page of a logic diagram looks like this:



The system provides on-screen editors for NETWORKS/MACROS DATA CHANNELS, CLOCK WAVEFORMS and GATES. GATE attributes include DELAY, TRUTH TABLE, NAME and I/O clocking.



The system is available for Apple II and IBM PC computers. A non-graphics version is available for CP/M 2.2 It uses the network editor to create netlists and text printer plots to display simulation results. All versions require 2- 5 1/4" disk drives.

For APPLE II, IBM PC (192K) and CP/M (70K) $450.00
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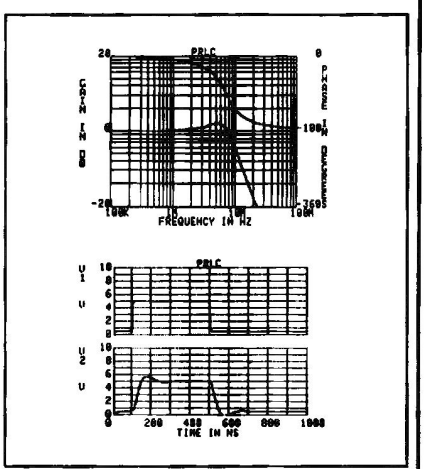

For APPLE II and IBM PC computers. A non-graphics version using an on-screen editor to enter networks and text printer plots to display simulation results is available for CP/M (2.2- 5 1/4" SSSD) systems. Requires 2 disk drives.

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ORDERING INSTRUCTIONS: All programs are supplied on disk and run on Apple II (64K) or IBM PC (128K) with a single disk drive unless otherwise noted. Detailed instructions included. Orders are shipped within 5 days. Card users include card number. Add $2.50 postage and handling with each order. California residents add 6 1/2% sales tax. Foreign orders add $5.00 postage and handling per product.

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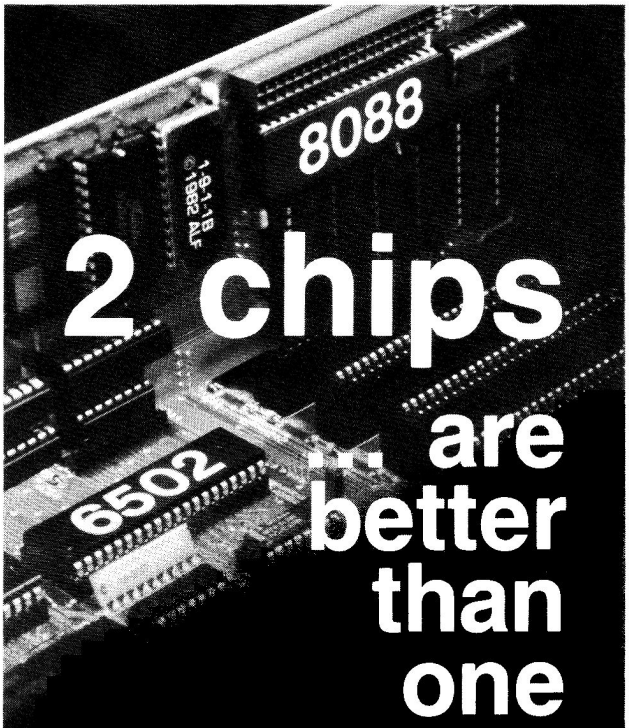

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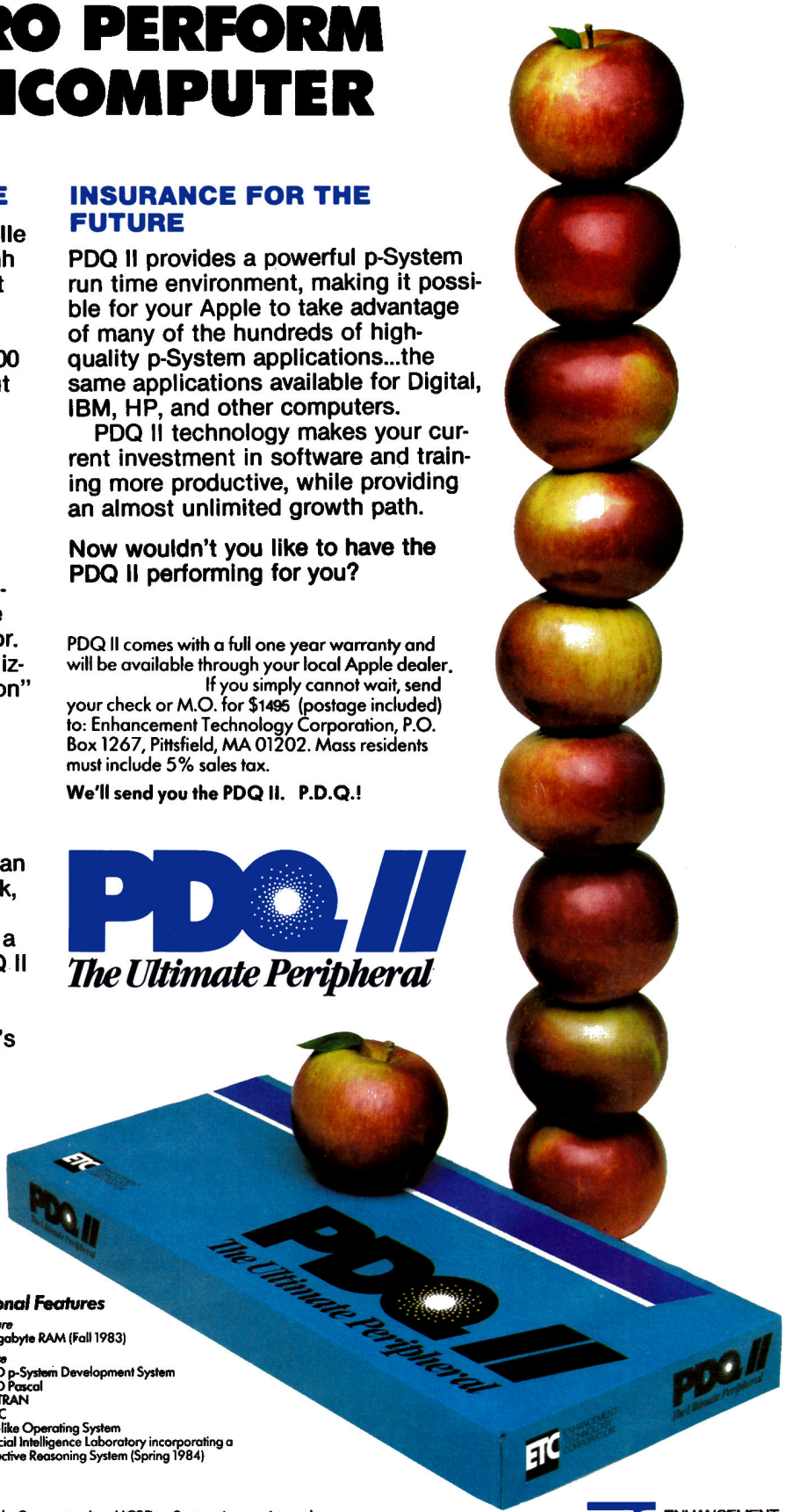

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- ETC MC68000 Assembler
- ETC MC68000 System Monitor
- ETC p-System (version IV) to Apple DOS Interface Utility

Languages and Software Systems Supported
- Applesoft BASIC Compatibility & Speed up
- Apple DOS 3.3
- UCSD p-System (version IV) Interpreter—executes UCSD Pascal, FORTRAN-77 and BASIC P-Code

Optional Features

Hardware
- 1 Megabyte RAM (Fall 1983)

Software
- UCSD p-System Development System
- UCSD Pascal
- FORTRAN
- BASIC
- Unix-like Operating System
- Artificial Intelligence Laboratory incorporating a Deductive Reasoning System (Spring 1984)

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HELENA ON CREATIVITY.



Name:	Helena Paoli
Age:	9
Home:	Belvedere, California
School:	Bel Aire
Hobbies:	Drawing, playing with dolls, reading, swimming
Ambition:	To be a fashion designer
Favorite software:	Creature Creator™ by DesignWare

"I like *Creature Creator* because it's kinda like drawing—only the pictures are alive! I can make different creatures, and then make them do lots of different dances.

"Lots of games—well, you just keep shooting or dodging things until you learn the pattern. Then you can beat it easily, and you get bored.

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