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5 FOR ACCURATE PRESENTATIONS


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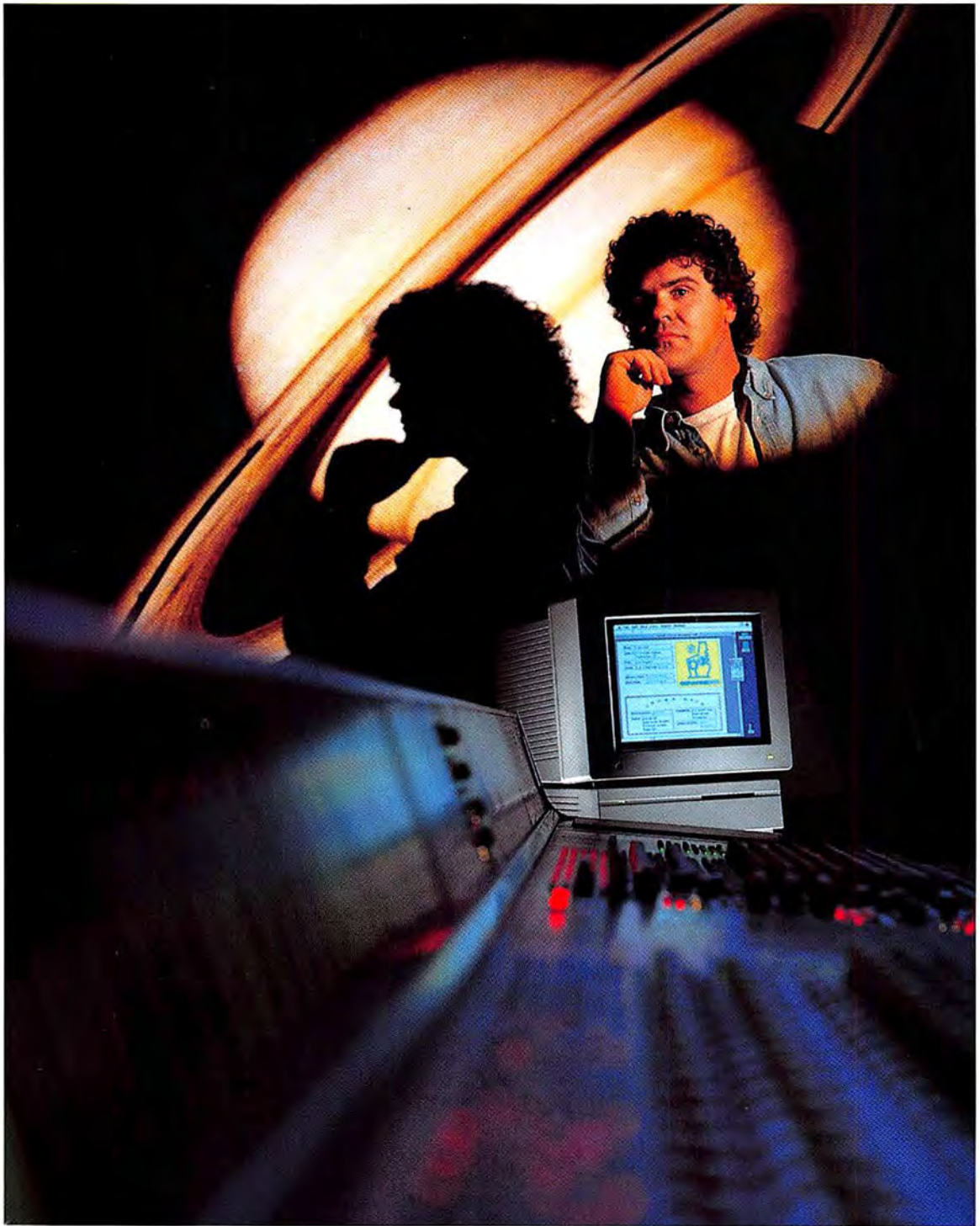
CD ROM Drives

16 PRODUCTS TESTED AND COMPARED

QuickTime — Your First Time

HOW TO MAKE MOVIES

 Macintosh IIfx



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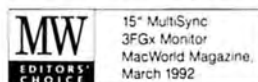


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BY JAMES A. MARTIN Should you get a flatbed or a hand-held scanner? Or should you opt for a higher-end model, like a sheet-fed or a slide scanner? What about color versus gray scale? This practical buyer's guide weighs the pros and cons to help you decide.

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BY DAVID POGUE Start with a fast Mac, find a video source, get a digitizing board, stir in some digital sound, and add a video editor. Now you're ready to follow our recipe for making your own digital movies.

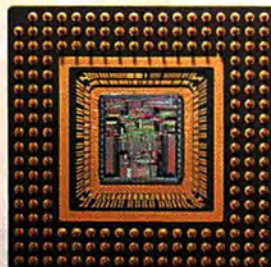


On the Cover

THE FIRST OF A THREE-PART SERIES DEMYSTIFYING THE MAC'S INNER WORKINGS. OUR FEATURE BEGINNING ON PAGE 136 EXPLAINS HOW THE MAC'S POWERFUL PROCESSOR PERFORMS ELABORATE DATA COMPUTATIONS. (PHOTO BY ALEX VIARNES.)



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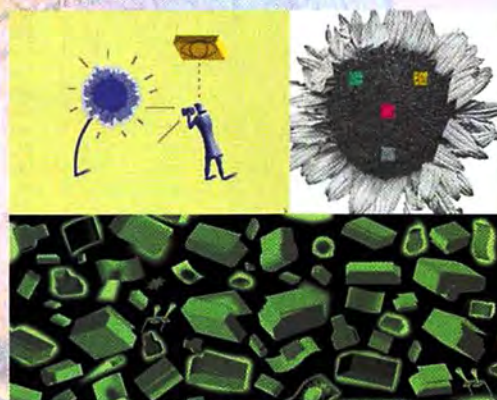


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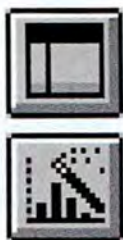
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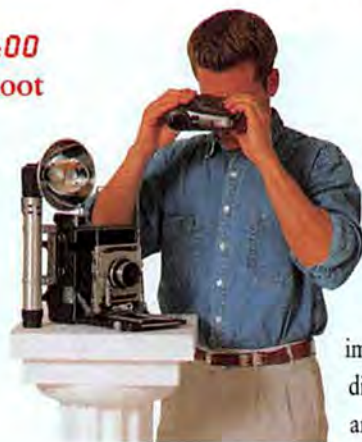


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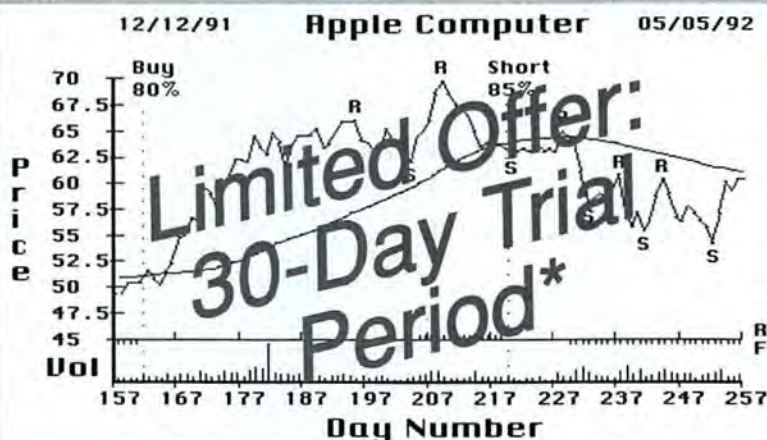
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QUESTIONS AND QUICK TIPS Direct questions or tips on how to use Mac computers, peripherals, or software (by mail or electronically) to: Quick Tips, Lon Poole. Please include your name and address.

CONSUMER ADVOCATE Been burned? Really steamed? Direct your concerns (by mail or electronically) to: Conspicuous Consumer, Deborah Branscum.

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John Sculley and Bill Gates shared a podium recently to announce Apple-Microsoft collaboration on database connectivity. Sculley said Apple will extend its Data Access Manager to support Microsoft's Open Database Connectivity tools and will develop a Windows client for Apple's Data Access Language, which Microsoft will market. Gates added that Microsoft will develop Mac products for Apple's upcoming RISC-based computers.

Quorum Back in Port: Quorum Software Systems has dropped a suit filed against Apple to block Apple's threat of a copyright infringement suit. Quorum's products include tools to help developers port Macintosh software to Unix. Quorum says the agreement protects Quorum customers against litigation by Apple.

Accelerated video boards are now shipping from Radius (408/434-1010). The PrecisionColor 8Xj and the PrecisionColor 24Xk deliver 8-bit color for \$599 and 24-bit color for \$999, respectively. Radius also began shipping the PrecisionColor Display/20S, a version of its current 20-inch PrecisionColor Display/20 color monitor that now lets a Quadra run 24-bit color without an add-in graphics adapter board.

StrataType, from Strata (801/628-5218), is a tool for extruding text into three dimensions, adding bevels, and coloring the text with photo-realistic solid shaders. The letters' Bézier curves can be modified in a 2-D view, but not after they are extruded into 3-D. StrataType (\$295) works with PostScript and TrueType fonts and can import Adobe Illustrator files.

The QMS 860 Print System is a 600-by-600-dpi printer that produces 11-by-17-inch output. It includes a RISC processor and its own multitasking operating system for controlling emulations, print queuing, and other complex functions. QMS (205/633-4300) expects to ship the printer in mid-August at a list price of around \$4500.

VideoSpigot Pro dropped in price, and SuperMac (408/245-2202) added to it the capability to transfer QuickTime movies to videotape. The new suggested retail price for the real-time digital-video board is \$1499, down from \$1599.

Synergy Software (215/779-0522) is shipping new versions of VersaTerm and VersaTerm Pro that provide MacTCP support for Serial Line Internet Protocol, making it possible to access TCP networks via modem. VersaTerm 4.6 lists for \$149, and VersaTerm Pro 3.6 lists for \$295.

Nikon Electronic Imaging (516/249-2121) plans to market ImageAccess, an image-cataloging database. ImageAccess (\$495) provides descriptive text fields that can be searched; can archive TIFF, PICT, EPS, and JPEG-compressed files; and, using a Nikon LS-3510AF scanner, can batch-scan slides and store a thumbnail of each image in the database.

PowerBooks get some rays with the SolarPower, a solar panel from Microtech International (800/626-4276). The \$189 panel clamps onto the PowerBook and, according to Microtech, provides enough power to extend battery life significantly, depending on available sunlight. SolarPower is expected to ship in October. **m**

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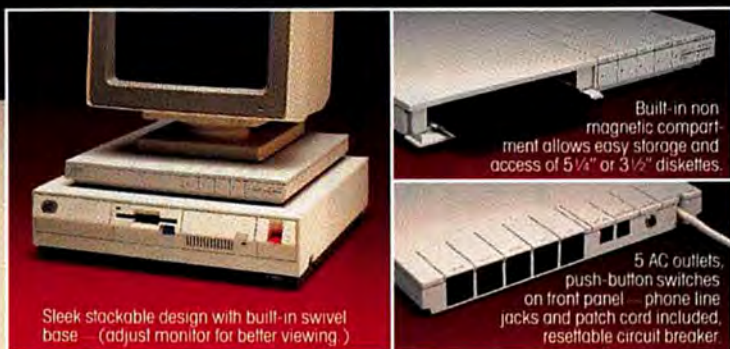


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Printer's Ink with a C

BY JERRY BORRELL

THE SIGN ON THE WALL OF the building says Books, Espresso, Magazines. Printer's Inc. is a bookstore located on Castro Street in Mountain View, California. Don't ask me why I go there, since I live 35 miles away, in San Francisco. Perhaps it's because when I lived in Silicon Valley eight years ago and was considering the job as editor-in-chief of *Macworld*, I went there to find a copy of the magazine. Perhaps it's because Printer's Inc. is one of those increasingly rare (at least in California) bookstores where you can buy a cup of coffee and read the books. I didn't notice *Macworld* on the shelves there during my most recent trip, but on my visit eight years ago *Macworld* fit in with the other non-mainstream magazines. In fact, there were four different issues sitting on the newsstand there in 1985. They somehow fit in with the atmosphere of the store, which invites you to sit and talk about anything from travel to philosophy to computers.

There aren't too many bookstores like that anymore. There used to be one on Chestnut Street in San Francisco. It had a little restaurant in the back and bookshelves up in the front. I would leave work at 8 or 9 p.m. and wander in for a late meal, and then over the course of dinner select a few books. I used to wonder whether the proprietors minded the crumbs in the books I looked at and didn't buy. But I also recall buying some extra books just to encourage them to maintain their policy. Another favorite place was the bookstore in Washington, D.C.'s Georgetown, on a street off Wisconsin Avenue, that I used to visit with my now-15-year-old son to buy *Asterix* and *Obelix* comic books. It's not there anymore. But the Harvard Bookstore on Newbury Street in Boston, where I lived for two years, still exists—a place to eat or buy a coffee and read books. There used to be a bookstore on Red Road in Miami, but that's gone now, moved to a shopping center. A lot of bookstores seem to have moved into shopping centers.

Now that I think about it, there are very few bookstores that I really enjoy anymore. Ones that really draw me in. Most bookstores today are more orga-

nized. Compact. Efficient. Some of the smaller chains are attractive, such as A Clean Well Lighted Place for Books in the San Francisco Bay Area. And City Lights, an independent local bookstore, still draws me in.

I don't know anything about the economics of selling books, but several things seem obvious in the stores I visit. Sales seem slow. Rents, and therefore the cost of doing business, must be high in modern shopping malls. The profit margin can't be much, especially given the trend toward book discounting. There are an enormous number of titles. And the range of titles or topics is amazing. I always admire the dedication that keeps bookstore shelves so full and well organized.

At the same time, it seems that people are reading less, with many watching television rather than reading. I wonder if the trend toward bookstore chains has been shaped by these factors. More important, I wonder, what will the trend become as even more information, like electronic magazines or books, is not distributed by bookstores? Several things will happen; one of them is likely to be the demise of the neighborhood bookstore.

Will Phone Jacks Replace Bookstores?

IN THE JUNE ISSUE I SUGGESTED THAT readers will have access to magazines like *Macworld* via phone lines before 1992 is over. Not just text versions or online services, but versions using full-blown graphics, video, and sound. And multilingual versions as well. In that scenario, a phone jack could begin to displace bookstores, or put enough additional economic pressure on this already stretched-thin distribution channel to cause even further changes.

It's not just the viability of a neighborhood bookstore, or the local Brentano's, Waldenbooks, or other bookstore-chain outlet that will be affected by the delivery of electronic magazines and books. College bookstores will change as well. My undergraduate experience was

shaped in part by my college bookstores. I used to scan the shelves of those bookstores to determine if a class would have sufficiently interesting reading for me to enroll. I would browse in the aisles reading texts or looking at books I could not afford to buy.

The inevitable changes in book distribution will reach libraries as well. I'm fearful of what may happen to libraries because I have a certain reverence for them. Libraries have worked so hard over the last 20 years to become more than a place for books, that they now successfully fulfill a multipurpose role of a community resource, a haven for children, a meeting place, a place to access computers for those normally without access, and much more. But without books, libraries will lose their central purpose. And just as major cities experienced the flight of the middle classes, so too will libraries experience the flight of those seeking information as the information they want becomes available in the home via phone lines. And as the people who vote to fund libraries see them as less useful for the needs of their children, they will be less likely to support them.

I recognize that's a very pessimistic conclusion about what is likely to happen. But it's well grounded. There are fewer bookstores today that I can treat like a second home. Libraries, at least in California, have been reducing hours, staff, and collections for a decade. And there are, of course, many citizens who have never had access to the kinds of bookstores and libraries I'm even talking about. How often do you find even Waldenbooks bookstores and multimedia-rich public libraries in ghettos?



*What happens to
our society
when books and
magazines
are electronic?*

Changes in Information Consumption

IT'S BEEN PUBLICIZED FOR A while that the average American household consumes six hours of television per day. There are fewer newspapers in the United States now than at the turn of the last century. Our information sources have changed. Companies such as

continues

Whittle Communications want to change information distribution through advertising—by offering schools, for example, information along with paid advertising. There's a trend in newspapers, such as *USA Today*, toward replacing articles with graphics. A trend for all magazines to make articles shorter. A trend in broadcasting toward airing stories in image and sound bites in place of substantive reporting. For me, there is little question that our consumption of information is changing.

Given such an environment, I wonder, as content development begins for electronic magazines, who will be the first to succeed—*National Geographic* or "Entertainment Tonight." Those into the market first will define what people come to expect, and I fear that something like "Entertainment Tonight" or other, commercial-like content is just as likely to be the outcome of electronic publishing as is a multimedia version of "Nature" narrated by George Page.

The Craft of Publishing

AS THOSE OF US WITH KNOWLEDGE and skills in traditional publishing begin to explore using video to supplement our stories, we have precious few role models. But I think we can actually improve on the original printed version of a story. Take *Macworld's* story "How to Keep Your Mac Current" (May, 1992), for example; adding video to that article could show you how to open the Macintosh to put in SIMMs—unlike text, which can only describe the process. And with sound to supplement the video, viewers can hear the sharp snap that a SIMM module should make when it is placed properly onto the Mac's system board.

As print editors, our video production skills are minimal, but so is the support of QuickTime for full-motion video. The limitations of the Macintosh mask our limitations in using video as we explore this medium. I'd like to think that we are going to bring the patience and dedication of monks working on illuminated manuscripts to any new electronic magazines, but time is money. The pressure to publish and succeed will compete with the desire to produce content ideally suited to new technologies.

Finding Information

THE CHANGE IN INFORMATION DISTRIBUTION brings other troublesome issues to the fore, including the issue of choice and the issue of access.

The concept of choice: Cable TV really elevated this issue, by offering viewers a wide selection of programming. Another aspect of choice that cable brought to the public is the ability to choose to view programs without advertising. Home Box Office legitimized the concept of advertising-free programming. I would like to see the HBO model for electronic magazines. I believe some people will pay a premium to avoid advertising. Particularly if they have the ability to watch advertising if they want—the electronic-magazine equivalent of the shopping channel is being pursued by most people discussing electronic magazines. For those of you who want this, never fear. Electronic magazines will offer readers even more choices, and more flexible choices. They'll raise the cable-initiated concept of choice to a much higher level. Not only will you pick magazine articles based on your interest, but also you'll be able to pick the advertising that you want based on what you desire to purchase.

The concept of access: One evening while I was busy pondering what would happen to people without the economic ability to access electronic magazines and

continues

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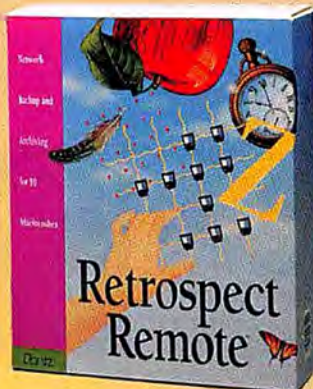
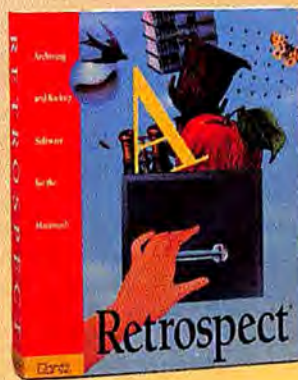
—MacWEEK, Dec. 1990

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—MacUser, Aug. 1991

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—Macworld, Nov. 1991



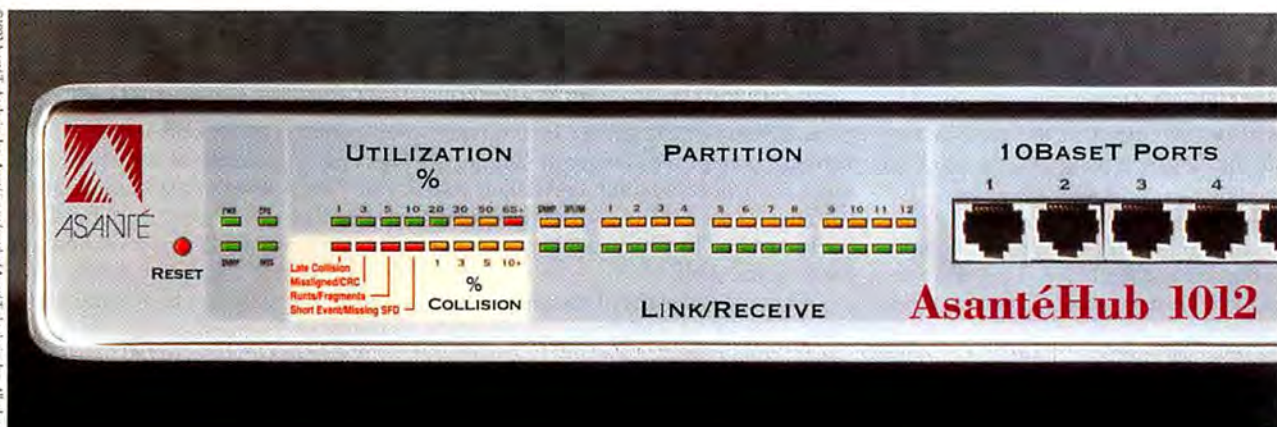
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books, I began to remember what access to books and magazines is like today. I remembered, in particular, a report I wrote while working in the Library of Congress on the notable lack of correspondence between the entries in the card catalog and the books actually on the shelf in the library.

I loved the stacks, the seemingly endless miles of shelves housing the millions of volumes in the library. They were my downfall. I lost months of evenings perus-

ing subjects that I shall never have time to go back to. Still, I learned a great deal about the problems faced by our nation's library of record. That many books are missing—stolen, lost, misfiled. Just plain gone. I stood in the gallery of the main reading room of the Library of Congress more than once as some crestfallen researcher learned that a request for books could not be filled because there was no book on the shelf.

That reminded me of the times that I

have gone to a bookstore, as I did recently looking for material on ancient Sumer (what is today southern Iraq), only to realize that despite all those gleaming shelves of beautifully crafted books, there was nothing on the topic I wanted. There was a short passage in a history of the Near East. A few pictures of southern Iraq in a coffee-table book. A definition of Sumer in an unabridged dictionary. I thought about the many times I have combed the shelves of bookstores and not found what I wanted.

Electronic books and magazines will change that. No more misfiling. No more missing books checked out by someone before me. Or an empty magazine slot on a rack. I'll have the ability through keyword searches to electronically retrieve all of the materials I mentioned above: the definition, the pictures, the historical passage. In fact, I'll find materials that would have been inaccessible to me on a bookshelf. I'll pull material from such a wealth of sources that even where there is no book on a particular topic, I'll be able to pull together so much that I may have the information I need. A kind of self-created, if unedited, book.

In that light, access to information will improve dramatically with electronic books and magazines. And I won't have to drive all over the Bay Area looking for a book on my topic.

What's It All Mean?

AS ELECTRONIC BOOKS AND MAGAZINES accumulate in data banks across the nation, information consumption will change again.

Some people will simply never see the books and magazines that we are creating—a situation much worse than not seeing HBO or MTV on a cable channel. But I suspect that people who can't watch "Yo! MTV Raps" now are unlikely to have access to Macworld Interactive either. People who are finding their public library doors closed are also unlikely to be able to hook up their computers to phone jacks and download a multimedia history of the Civil War for their children. Libraries will go on trying to provide the public with access to books and magazines, but the truth is that some books will simply never appear in print. Most new electronic magazines and books will not even be suitable for print publications.

Saddest of all, there will be even less likelihood that we'll be able to sit in a quiet bookstore over coffee and tell each other what is happening. In the 1890s American society was connected by new technologies. The technology of the 1990s is likely to make American society less connected. **m**

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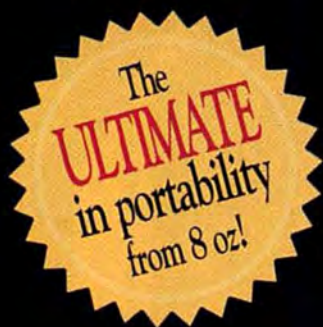
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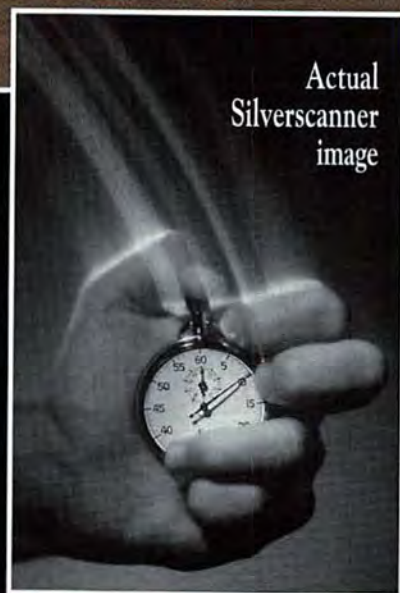
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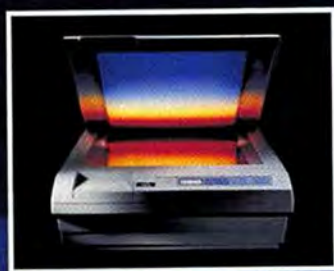
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Letters

OCTOBER 1992

Protest Defective Displays

I READ THE *CONSPICUOUS CONSUMER* column (July 1992) and immediately got hot. The PowerBook 170's voided-pixel problem is much more severe than the article indicates. Having personally bought more than three dozen PowerBook 170s since December 1991, I can tell you that only three had no voided (white) pixels. All the others had from one to five voided pixels, most in the center of the display.

My experience is that the vast majority of PowerBook 170 owners do not even recognize the existence or severity of the voided pixel problem, and if they did, they would be raising as much hell about having been sold a defective display as the people you referred to in your column.

My advice to PowerBook 170 buyers with voided pixels is to do what I have done: return the units for a refund or exchange, protest credit card charges, stop payment on checks, raise hell with Apple corporate headquarters, and alert potential buyers to the problem so they can check the displays before they pay. If all else fails, go to court. You'll win a refund or a replacement plus reasonable attorney's fees and court costs.

*Robert Dattore
Maitland, Florida*

Memory Hogs

IT'S TOO BAD STEVEN LEVY SINGLED out Microsoft for creating a monster out of what was once a fast, full-featured word processor (*The Iconoclast*, July 1992). He could also have pointed out how Aldus took a perfectly good piece of presentation software and turned it into an unwieldy, unforgiving beast called Persuasion 2.1. I am stunned by how miserable this new version can make my workday. But there's no going back—2.1 documents can't be saved in 2.0 format, and everyone else in our firm has upgraded.

I think we are beginning to see the limits to the usefulness of marketing input in software design. For years we have been told that Microsoft, Aldus, and other companies with similar reputations have listened to the customers and added new features galore at their behest. Now we have these omnibus programs that are inimical to the practical people who made them popular in the first place, since one of the most practical features of any software is efficiency. The problem is, it's easy to persuade companies to add to their next version; how are you going to get them to subtract?

*Aaron Barnhart
Evanston, Illinois*

BEING A PART-TIME USER OF Microsoft Word 5.0, I read with amusement Steven Levy's "Livin' Large." I say I'm a part-time user because even with my IIfx, 20MB of RAM, and a 210MB hard drive, I find Word 5.0 to be a sluggish hog—so much so that I use it only out of necessity. Annoying traits, such as overzealous screen-updating (every time a letter is typed) and torpid scrolling, make Word such an inefficient sloth, I'd rather use the story editor in Aldus PageMaker to input new text.

*Andy Hong
Cambridge, Massachusetts*

STEVEN LEVY IS AMONG THE ANnoying group of Mac whiners that has me fed up. Rather than marvel at the products companies such as Apple and Microsoft continue to develop and improve, Levy only seeks to complain about and amplify the trivial.

Get a life. I also have a Mac IIfx. Even with five applications on the original 40MB hard drive, my Word 5.0 always works perfectly. The only space problem was the amount of paper and ink wasted on your long-winded commentary.

*Alan Trudell
Anaheim Hills, California*

continues

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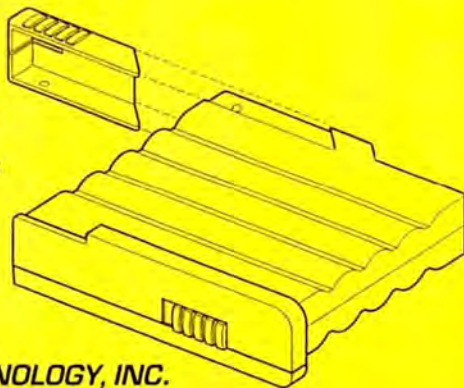
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PLI's Infinity Floptical 21MB should have received a 3-star rating:

Infinity Floptical 21MB

MW ★★★

(Reviews, September 1992). The Floptical 5020FL from Liberty Systems, which should have received a 1-star rating, is no longer available. The slow performance of the Liberty Floptical 5020FL was due to the power supply and not FWB's software.

Tempo II macro software and an RJ-11 cable are no longer included with Key Tronic's MacPro Plus keyboard ("Input Alternatives," June 1992).

Marianne Carroll's book is titled Marianne Carroll's Super Desktop Documents (Insights, July 1992).

MacLand offers toll-free technical support but no extended-warranty plans ("Low-Capacity Drives," August 1992). It also offers a 105MB Quantum-based drive.

The U.S. version of Architrion's Tech 2-D is called AEC Draw; Synttrion will be replaced with rendering technology licensed from Ray Dream; Unic's U.S. office is at 617/731-1766 (News, August 1992).

The RasterOps QuickPak board will begin shipping in late August or early September, and its price has not yet been set (News, August 1992).

La Cie offers a one-month money-back guarantee ("Low-Capacity Hard Drives," August 1992). Its 105MB drive uses a Quantum mechanism. Dealer sales are available only outside the United States.

Backup programs cannot back up to CD ROM drives ("Low-Capacity Hard Drives," August 1992).

Delta Tao Software's number is 408/730-9336 (Reviews, August 1992).

Truvel's number is 703/742-9500 (New Products, August 1992).

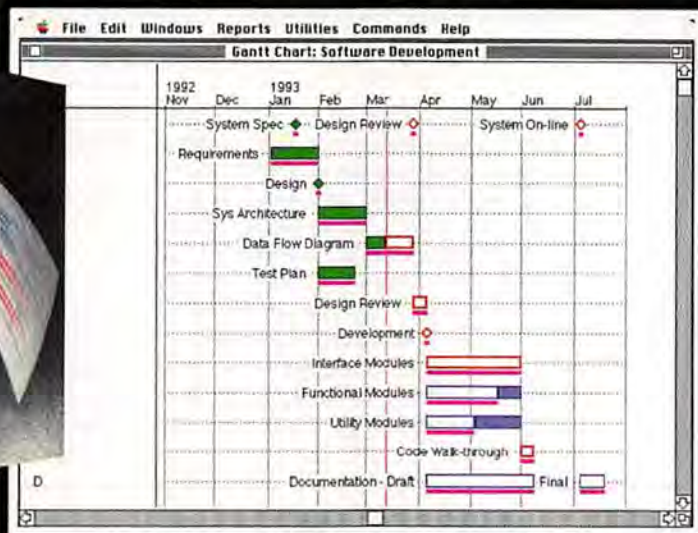
In Editors' Choice ("The Bigger Picture," September 1992), the E-Machines 8-bit video board that sells for \$449 should have been the DoubleColor SX. The Futura MX board named is a \$999 24-bit board.

EasyShare Mac Menu is available from Learning Performance Corporation at 800/926-3279. (New Products, August 1992). Prices range from \$99.95 to \$4995 for 1 to 100 users.

continues

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LEVY MIGHT WANT TO SEND A SIGNAL to the wretchedly excessive software hogs by using WriteNow 3.0. It is a fraction of the price of Word 5.0; it's fast, even on a Mac Plus; and it runs in a default memory allocation of 490K. No, I do not work at T/Maker, nor am I in any way associated with them. But I do believe if you don't like the software you are using, vote with your feet and support the developers who are doing the things you like.

Robert Stevenson
Sunnyvale, California

Those Reviewed Talk Back

IN THE ARTICLE "RENDERING: MAKING Realistic 3-D Graphics" (June 1992), David Poole does not include Infini-D in the list of products that excel at lighting, yet Infini-D offers the same features that he credits the other programs for—visual feedback and flexible control of parameters.

Poole also says that ElectricImage Animation System 1.03 has advanced capabilities for creating compound surfaces. However, ElectricImage allows you to use only two texture maps to create a compound surface, while Infini-D supports an unlimited number of texture

maps and mapping methods.

Poole states that "you may end up buying Infini-D for its effects, and another product for its overall quality." I would agree with anyone who says that Infini-D's antialiasing quality may not be quite what they need for broadcast video. However, I strongly disagree that Infini-D is not good enough for print work.

Finally, there seems to be a bias against midrange products under \$1000. Yet, the output from Infini-D and StrataVision 3D has easily held its own against expensive products. ElectricImage is fast, but how many readers can afford a \$7500 product?

Andrei Herasimchuk
Marketing Director, Specular International
Amherst, Massachusetts

We erred in not including Infini-D in the list of programs that excel at lighting, and we incorrectly stated that you can't create procedural textures with Phong shading. We were unclear about the use of compound surfaces in ElectricImage—the use of the alpha channel with textures gives ElectricImage advanced capabilities. Similarly, we were unclear in comparing ElectricImage's bump map abilities to those of Infini-D—Infini-D allows an unlimited number of bump maps; ElectricImage allows only two. But our reviewer felt that ElectricImage produces more pronounced, higher-quality bump maps.—Ed.

THANK YOU FOR YOUR RECENT REVIEW of Workspace (Reviews, July 1992). I believe that the negative aspects of your review arise from a misunderstanding of the program rather than from any design or programming defects.

In contrast to your assertions, Workspace indeed recognizes more than 23 applications. Workspace automatically loads 23 applications into the binders as a courtesy to the new user. All other applications are listed in the Binder Setup dialog box, ready for the user to move into binders at the click of a button.

Also in contrast to your review, the Workspace user need not navigate through layers of folders or wish for a Find function to assist the process. Everything needed for productive work—both applications and documents—is immediately available to the user from within Workspace.

Steven Paul Snyder
Workspace Product Manager, Ark Interface
Seattle, Washington

While it is true that loading applications into Workspace is not as difficult as my review made it seem, the lack of a fluid Find function is a significant shortcoming when it comes to adding existing documents to projects. And clicking on tools to launch applications

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tions adds little to what is already achievable in the Finder using System 7 aliases or other utilities. Although I found the interface appealing, Workspace simply didn't add enough functionality to warrant a higher rating.—Franklin N. Tessler

THE REVIEWER'S TESTING OF VERSIONMASTER 1.0.7 (*Reviews*, May 1992) on a stand-alone Mac demonstrated a lack of understanding of the purpose of the product. VersionMaster is a groupware product designed primarily to track document-version control in a Mac workgroup. The reviewer seems only to have considered the product for his own needs.

*Jerry Shields
President, Astar Technologies
Littleton, Massachusetts*

The reviewer tested the software on a stand-alone Macintosh in addition to tracking different versions of a document on the Macworld network.—Ed.

OCR Disparities

WHAT A DIFFERENCE A MONTH makes! In your June 1992 issue you gave a glowing review of WordScan and WordScan Plus (*Reviews*). The reviewer concluded, "If Calera were to knock \$300 off the list price of WordScan Plus,

I would easily recommend it over any other OCR product costing less than \$1000." Calera must have read the review, because they proceeded to significantly reduce the price of both products. I purchased WordScan.

Imagine my surprise at what a dog this product became in just one month. That's when, in your July issue, Macworld Lab tested all the major OCR players ("From Page to Pixel"). WordScan wasn't at the top, it was barely in the middle. The program was considered awkward and confusing to use.

I understand that different people have different opinions—Siskel and Ebert disagree. However, you should then present your reviews and Macworld Lab exposés as just one person's opinion. At the very least be consistent. A product can't be the best in the market and mediocre at the same time.

*David Weisbord
Gresham, Oregon*

Macworld believes the feature is an accurate evaluation of the OCR packages that were shipping at the time it was written. The review, written a few months earlier, based its comparative evaluation on WordScan 1.0 versus earlier versions of both AccuText and OmniPage. OmniPage Professional, the Editors' Choice overall in the feature, wasn't

shipping when the WordScan review was written.

The review gave the product three stars, which means that there was room for improvement, which is essentially what the author of the feature thought as well.—Ed.

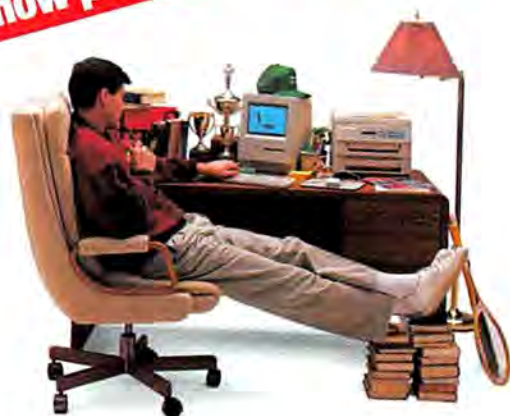
Fearing Obsolescence

I WAS AN INCH AWAY FROM BUYING a Quadra 700 when I read your article introducing the Quadra 950 ("The Quadra 950," July 1992). According to the article, the 950 is faster because of recent technological advances in the making of certain chips, including the Motorola 68040. I also noticed that the price of the Quadra 700 dropped considerably in the past month. Since the 700 contains basically the same components as the 900, does this mean we should expect the Quadra 750 to be released soon? I would hate to be put in the same situation as the owners of the now obsolete Quadra 900.

*Bryan Taylor
Dallas, Texas*

The continuing advancement of technology guarantees that almost any computer you buy now will be worth less and have a more powerful and less expensive counterpart a year from now. However, as owners of the Mac Plus, Mac II, and other older

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machines can attest, a computer is not obsolete until software manufacturers stop producing software for it.—Ed.

Disadvantages of BetterWriters

IT WAS WITH PARTICULAR INTEREST that I read your review of GDT Software's BetterWriters 1.0.1 (*Reviews*, July 1992). Seeking to improve the graphics output from my DeskWriter last January, I ordered this package. I abandoned it soon thereafter. It is true that the GDT driver provided somewhat better rendering of graphics under some circumstances. It uses halftones to render gradient fills, for instance. However, even there the driver cannot render a dual gradient-fill from Canvas 3.0, nor would the gradient fill survive being passed into a word processing document.

The GDT driver had a marked disadvantage rendering text. My reports from Micrograde 2.0.8 in 9-point TrueType Monaco font printed using this driver have the letters in each word bunched up, with double spaces between the words.

Recently, Hewlett-Packard released version 3.1 of its DeskWriter driver. While not perfect, it prints dual gradient-fills and rotated text from any application.

It maps colors onto a gray-scale image. It allows background printing. Furthermore, this driver has a built-in preview. And it is available at no cost.

Matthew Ware
Greensboro, North Carolina

FreeHand Accord

IN RESPONSE TO DEKE McCLELLAND's review of Aldus FreeHand 3.1 in the June 1992 issue (*Reviews*): If Aldus FreeHand is so weak, why is the lion's share of the work that is used and featured in the major Macintosh and computer graphics publications executed with it? The answer is in its intuitive approach to creating color graphics optimized for PostScript output. Graphic artists are willing to work with text dialog boxes in exchange for color, style, and layer palettes and direct-from-file color separations. Given the choice, anyone who has tried to work with Deneba Canvas's QuickDraw-PostScript hybrid approach to generating unpredictable output, and who works with timely production in mind, quickly turns to Adobe Illustrator or Aldus FreeHand. Anyone who has battled Illustrator's approach of direct selection/object selection, dithered Pantone color, limited page size,

limited import, and a single layer will choose FreeHand.

McClelland also states, "The fact that FreeHand can now open and edit some of its own EPS files qualifies as a step in the right direction." FreeHand cannot open its own EPS files. It can, through hot links and System 7 devices, open the file that exported the EPS file. EPS is, by design, an uneditable file format that allows an artist to supply a usable, printable, viewable file to clients and that allows programs to import the finished output of other programs.

B. Ware
Cleburne, Texas

First, EPS is not uneditable by design. Since its debut in March 1987, 11 months before FreeHand 1.0 shipped, Illustrator has provided a fully editable EPS format. Both FreeHand and Canvas can directly open and edit EPS documents saved in the Illustrator 1.1 format. With EPS Exchange, FreeHand can open and edit EPS documents saved in the Illustrator 88 and 3.0 formats as well.

Second, try this experiment. Check to make sure your FreeHand Filters file is in the same folder as the FreeHand application. Create a new document in FreeHand. Draw something but keep it simple, and whatever you draw, do not add text, since FreeHand cannot interpret an EPS document with text

continues

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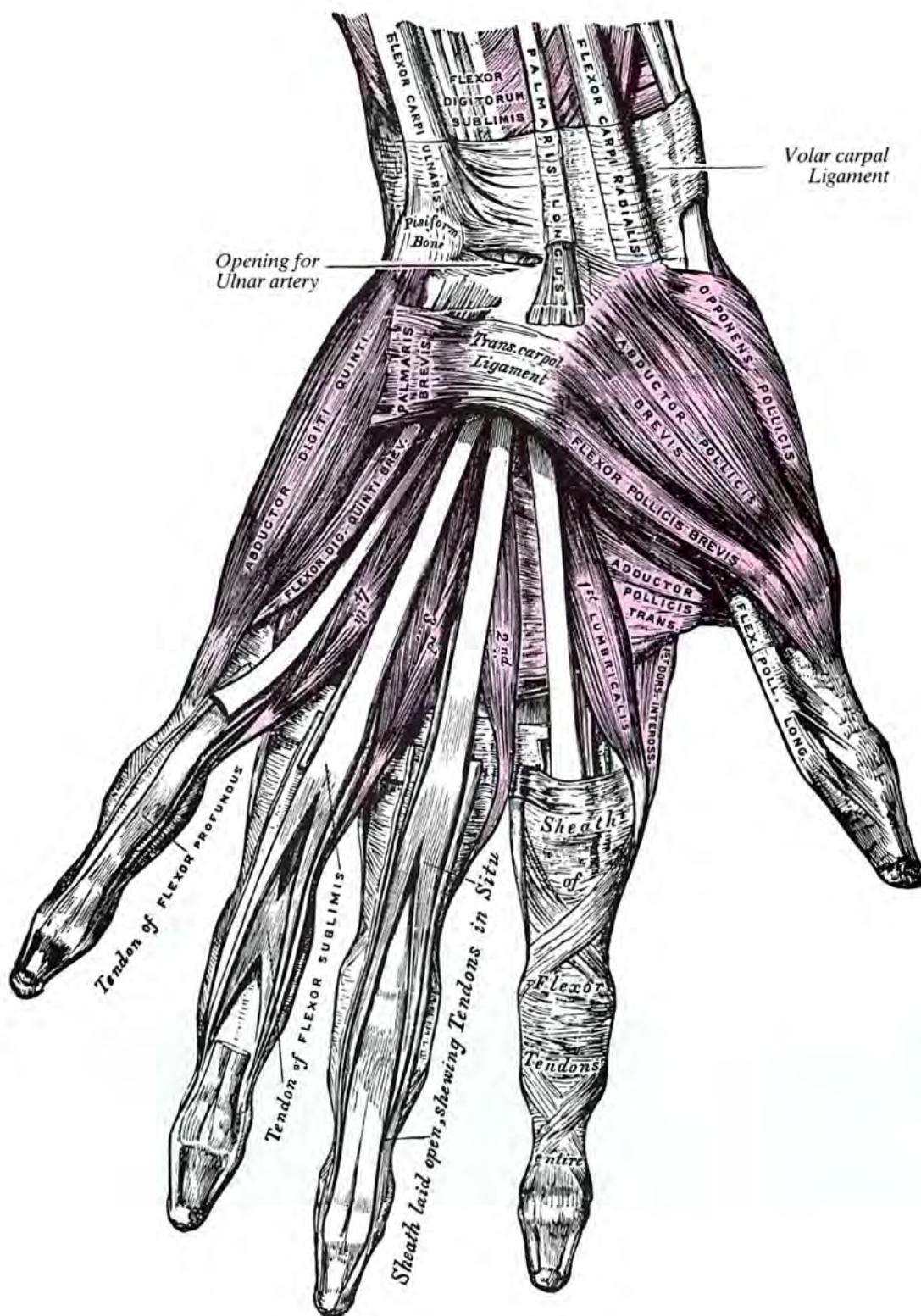


FIG. 482. — The muscles of the left hand. Palmar surface.

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in it. Export your document as a Macintosh EPS file. Close the document and do not save changes in the FreeHand file. If you want, quit FreeHand, restart your machine, and clear every possible means of recall to the original path. Then restart FreeHand and open your EPS file directly using the Open command.—Deke McClelland

Mum Mail-Order Company

I AM CURRENTLY INVOLVED IN A DISPUTE with a mail-order house, MacCenter of Austin, Texas, that I found through *Macworld*. The simple story is they not only refuse to repair a Seagate hard drive while it is still under warranty, but they refuse to even discuss the issue or return the hard drive to me. I tried to work through your *Conspicuous Consumer* complaint system, but MacCenter has not responded to your letter. I filed a complaint with the Austin Better Business Bureau, but MacCenter has also refused to respond to them. It has been over four months since I sent the drive to MacCenter, and things appear grim.

Michael Maciag
Orange, California

Since January 1991 we have received 16 complaints about MacCenter; *Macworld* has no record of any

direct responses from MacCenter about the complaints, though Mr. Maciag reports that he did get his drive back after continued effort. For information on how to protect yourself when ordering by mail and specific facts on 38 mail-order companies, see *Conspicuous Consumer*, November 1991.—Ed.

Readers Respond to Readers

IN HER RESPONSE TO ONE OF STEVEN Levy's columns, Julia Lipton Skalka refers to "astrology and other self-help information" (*Letters*, July 1992). Science is information, astrology is fiction. Those who seriously use a horoscope to guide their lives are really in need of help, self- or otherwise.

Kristian Truelsen
Orlando, Florida

I AGREE WITH GEORGE FORCE (*Letters*, May 1992) that the McClelland book on Canvas 3.0 is a dud, but that is where Mr. Force and I part company.

Canvas 3.0 does contain a few minor bugs, but what piece of software doesn't these days? And how could unlimited, 800-number tech support be considered lousy? This guy is unbelievable when he says the documentation is sparse: with a 164-page tutorial section and another

680-plus pages of technical details and examples, what does Force want? A 20-minute videotape on each command?

Gary Van Aken
Littleton, Colorado

Looking for an Index

AS A NEW USER, I PARTICULARLY enjoy the equipment and software critiques. I presume there must be some index. I am sure I can find back issues of *Macworld* at our local library. Can you send me such an index, if it exists?

Ronald Nilson
Vancouver, Washington

Indexes for the previous year's issues ran in the January 1985, 1986, 1987, 1988, and 1990 issues and in the February 1989 and 1992 issues. For the 1990 index, send a self-addressed, legal-size envelope with 75 cents postage to 1990 Index, *Macworld*, 501 Second St., San Francisco, CA 94107.—Ed.

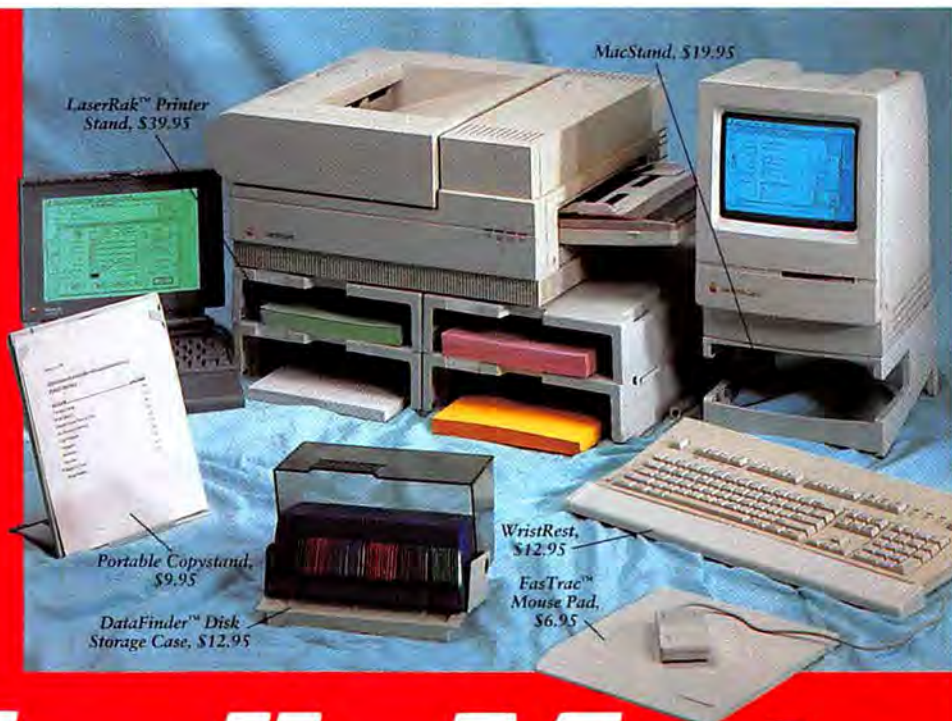
Mice or Mouses?

IN YOUR "INPUT ALTERNATIVES" ARTICLE (June 1992), you used the plural of *mouse*, as in a computer mouse, as *mice* continues

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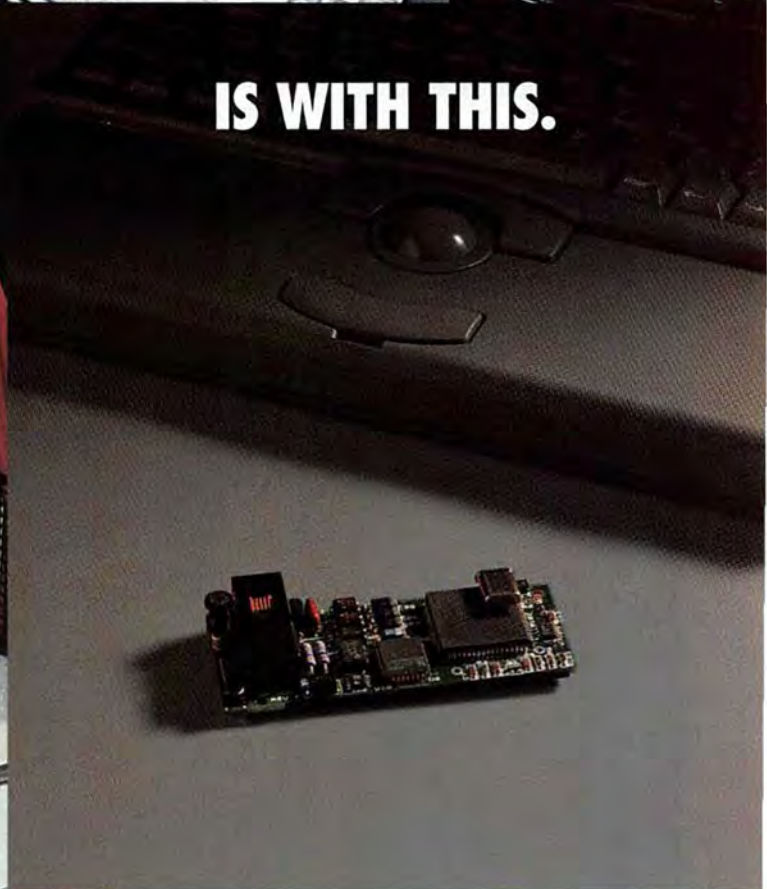
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several times. I had always thought that the plural of *mouse* was *mouses* in the computer word form.

Matthew Haskett
Modesto, California

Webster's Ninth New Collegiate Dictionary (Merriam-Webster, 1986) shows a definition for the computer mouse but does not show any plurals for it other than *mice*. A panel of professional copy editors, when queried, agreed that the plural for a mouse, of any kind, is *mice*.—Ed.

File-Cataloging Shareware

RECENTLY GOT A DISK FROM YOU labeled the "Best of Educorp." There was a program on there called FileTree, which worked for me once, then no more. My letter to the author, Jody Kravitz, was returned by post office with the address unknown.

I am surprised there are not more programs like FileTree. I'll bet there are thousands of disk hoarders out there who could use a program like that. Do you know where I can find a working version of FileTree or any program that will list the contents of my disks?

David Bowen
Canyon City, Colorado

FileTree is available on America Online but has not been updated since 1989, and we have no current address for Jody Kravitz. Another disk-cataloging program, DisKeeper, is available for \$20 from J. Geagan, 7H Laurel Hill Rd., Greenbelt, MD 20770.—Ed.

The Computerized TV

AS A MAC CLASSIC II USER, I AM starting to get a little annoyed with having the small 9-inch black-and-white monitor. I use PageMaker and have problems doing page layouts because of the small size. I was wondering if there is any reasonably priced product on the market that would let me use a TV as a monitor. I would like to use a TV because I have one that I could use, and I can't afford the large monitors that I would like to have.

Mike Hutchinson
Saint Louis, Missouri

You can add a larger computer monitor to your Macintosh Classic II, and several companies have products that allow you to watch television on your computer monitor, but we know of no company that makes a product that allows the use of a television monitor as a Macintosh screen. Moreover, the quality of a television would be too poor for effective work with PageMaker; see "Black-and-

White Monitors," *Macworld*, July 1992, for an overview of low-cost screens.—Ed.

Portable, Not PowerBook

HAVE NOTICED SOME VERY LOW prices for the Macintosh Portable. I was wondering whether you had an old magazine issue with a large article about the Macintosh Portable, similar to your article on the Macintosh PowerBook series that was in the December 1991 issue.

Curt Harris
Lake Bluff, Illinois

We ran a feature article on the Macintosh Portable in our November 1989 issue. For back issues, write to Back Issues of *Macworld*, c/o Snyder Newell, P.O. Box 7046, San Francisco, CA 94120-9727; the cost is \$6 per issue, \$20 overseas.—Ed. **m**

Letters should be sent to *Letters, Macworld*, 501 Second St., San Francisco, CA 94107, or electronically to CompuServe (70370,702), MCI Mail (294-8078), America Online (Macworld), or AppleLink (Macworld1). Include return address and daytime phone number. Due to the high volume of mail received, we are unable to respond personally to each letter. We reserve the right to edit all letters. All published letters become the property of *Macworld*.

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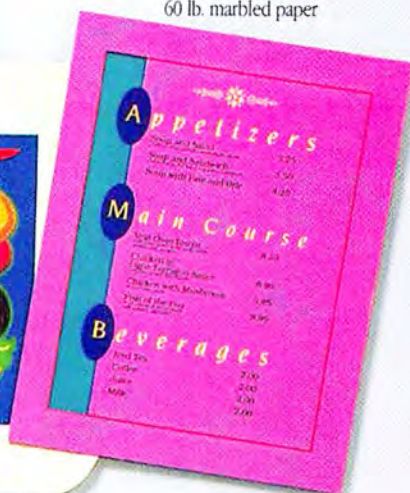
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Art Beat

Behind Macworld's graphics

BY CATHY ABES

Artist: Louis Fishauf is creative director and one of the founding partners of Toronto-based Reactor Art & Design. He has been a Macintosh user since 1987, when he received a Mac Plus as partial payment for an Apple ad he produced.

Hardware: Mac IIx with 32MB of RAM, a 400MB internal hard drive, and a RasterOps ColorBoard 264; 13-inch Apple-Color High-Resolution RGB Monitor; two SyQuest removable-cartridge drives; Wacom graphics tablet; Sharp JX300 color scanner.

Software: Adobe Illustrator 3.2; Adobe Photoshop 2.0.1.

How It Was Done: For the illustration that opens our feature this month on QuickTime, Fishauf used a combination of scanned photos and created images. The 300-dpi scans include photos of a Greek bas relief, a camcorder, and a box of popcorn, as well as three photos of a horse and rider from the Eadweard Muybridge stop-motion photographic studies done around the turn of the century; the image behind the funnel and the triangle was of a Video-Spigit board, which Fishauf scanned in directly.

In Illustrator he created an initial page with crop marks containing the free-form background, the computer, and the tabletop. He selected the computer and the tabletop, and turned them into guides (using the Make Guide command under the Arrange menu) to hide them. Now only the background was visible in the Illustrator file, which Fishauf then saved. After opening the Illustrator file in Photoshop, in the resulting EPS Input Options dialog

box he changed the default resolution to 200 dpi and set the mode to RGB—an RGB file is three-quarters the size of a CMYK file. In Photoshop, he pasted the free-form background into an alpha channel, where he inverted it to white on black (to mask out everything but the kidney shape). Then he used the Gaussian Blur filter (set at about 10 pixels) to soften the edges.

Fishauf applied four different background textures to the free-form shape to

represent the four-step transition from real life to film to video to digital technology. Beginning with a new grayscale Photoshop file, he combined the Add Noise and Emboss filters to create the uppermost, grainy texture. For the second texture, he opened up a black-and-white pattern file and, using the lasso tool, he made a 20-pixel feathered selection and pasted the selection over the first texture. Using the Paste Controls command he set the opacity to 30 percent

to make the grainy texture underneath show through, and chose the Darken Only option to keep the darker areas of the texture visible. Using the lasso tool again, with the same feather setting, he selected the lower portion of the background, where he wanted to place the third texture; he pixelated the second, granular, texture with a Mosaic filter (set to 15 pixels per square) in that selected area. Finally, for the fourth texture, around the lower edge of the free-form shape, he applied the DCI Wind filter (a

continues



The illustration that opens our QuickTime feature on page 170.



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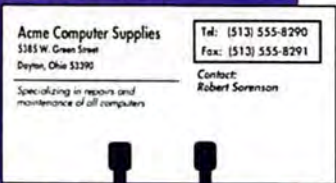
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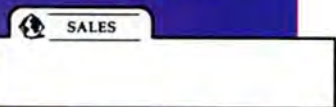
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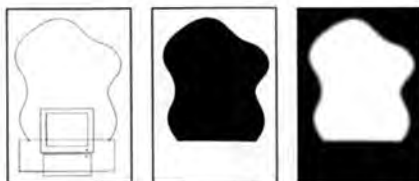
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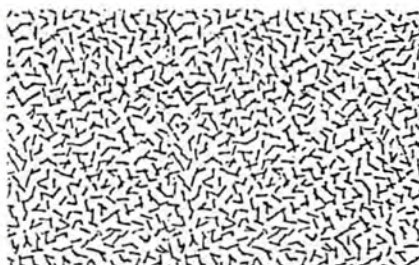
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The Illustrator file that contained the shapes of the free-form background, the Macintosh, and the desktop (left). The Illustrator file opened within Photoshop at 200-pixels-per-inch resolution (center). Only the free-form background appears because the other objects were converted to invisible guides in Illustrator. The background shape in the alpha channel (right) after the artist blurred the edge with the Gaussian Blur filter in Photoshop.



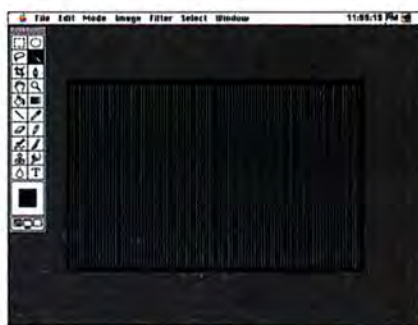
The original texture Fishauf scanned in for the free-form background.

third-party filter that's not part of Photoshop) to simulate electronic static.

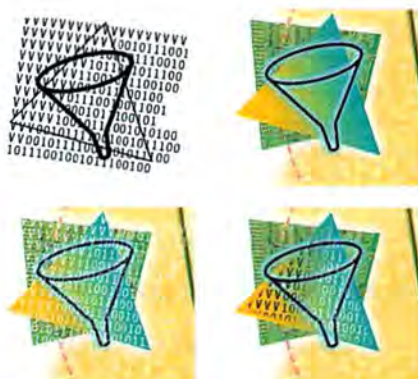
To convert the gray-scale file to RGB color, he used Adjust Hue/Saturation (Image menu). Then he copied the colorized textures and chose Load Selection (under Select menu) to bring the alpha channel into the main (empty) file and define the free-form background area, into which he would paste the textures.

Next, Fishauf went back to his Illustrator file and used the Release All Guides (Arrange menu). The next image he wanted to bring into his Photoshop file was the desktop, so he made everything else a guide and resaved the file. Then in Photoshop he placed the desktop as a floating selection. Because Fishauf had used the Place command, Photoshop used the crop marks from the original Illustrator file to precisely position the desktop shape at the bottom of the textured background. He then opened a wood-grain texture and used Color Balance and Contrast/Brightness to lighten the texture and bring out the grain pattern. After copying and pasting the texture into the floating selection, he again went back to the Illustrator file, released all guides again, selected the two rectangular shapes of the computer, made everything else a guide, and painted the rectangles with a white fill and no stroke, then resaved the Illustrator file. After placing the rectangles in the Photoshop file, he used Paste Controls to set the opacity to 80 percent so the wood

continues



The middle horse-and-rider photo and the black-and-white pattern Fishauf used to create the vertical scan-line effect (top). An alpha channel was created and the selected area was filled with the vertical-line pattern (center). After loading the selection from the alpha channel, he used the Brightness slider to create the scan-line effect (bottom).



The funnel, the triangle, and the type objects created in Illustrator (top left). First the triangle and then the funnel were placed in the Photoshop file over the scanned image of the VideoSpigot board (top right). After colorizing the triangle and applying the halo effect to the funnel, he placed the type (bottom left). While the type was still a floating selection, the excess was trimmed away and the type was filled with a black-to-white blend (bottom right).

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grain and some of the background would show through.

The horse-and-rider photos originated as gray-scale scans that he assembled in a Photoshop file. Then he converted the gray-scale file to RGB, using Hue/Saturation to give it a sepia tone. Fishauf used the Blend tool to produce the top-to-bottom color transition between the three photos. In the Blend Tool Options dialog box, he set Mode to Color Only and Color Space to HSB-CCW to blend all the colors in the spectrum between his background color (blue) and his foreground color (red) in a counter-clockwise direction.

To reinforce the theme of transition from natural to digital images, Fishauf treated each of the horse-and-rider photos in a slightly different way. For the top photo, he pasted in a sky blue background with fluffy white clouds at 50 percent opacity. For the middle one, he devised a pattern consisting of one row of white pixels and four rows of black pixels, selected that, and chose Define Pattern (under Edit) to create vertical white lines on a black background. Then he created an alpha channel of that shape, filled it with the pattern, and loaded the selection into the RGB file to select only the white areas of the pattern—every fifth row of pixels; setting the Brightness control to 60 bright-



The scanned image of the Greek bas relief was cropped with the marquee tool (left). After the selection was saved in an alpha channel, the Spatter filter (from Aldus's Gallery Effects) was applied to



give it a rough edge (center). The alpha channel was loaded into the gray-scale file of the Greek bas relief, which was then copied and pasted into the main illustration (right).

ened those white rows to create the vertical scan-line effect. On the bottom picture Fishauf used the Mosaic filter to create a bitmapped look. After pasting the three-photo sequence into the main illustration as a floating selection, he used the Perspective command to squeeze it at the bottom.

Next Fishauf selected and copied a square portion of the scanned Video-Spigit board, then distorted it in Photoshop. After creating the funnel and the triangle in Illustrator, he placed the triangle in Photoshop and filled it with a blue-to-orange blend. Then, once he'd

placed the funnel as a floating selection, he copied it to the Clipboard, feathered the selection by 6 pixels, and made the current background color light blue. Next he deleted the selection, replacing its black edge with a soft blue halo, and pasted the original black-edged funnel over the halo. After placing the type over the funnel, he eliminated the areas outside the triangle using the lasso tool with a feathered edge and the \propto key (to subtract from a selection rather than add to it). While the floating type was still selected, he filled it with a black-to-white blend.

To create the rough edge around the Greek head, Fishauf converted the original gray-scale to RGB and gave it a blue tone. After selecting the rectangular area with the marquee and saving it to a new alpha channel, he used the Spatter filter (from Aldus's Gallery Effects) to roughen the edge of the rectangle. He loaded the selection into the gray-scale file. Then he copied and pasted it into the main illustration, where he colorized it and rotated it at an angle. The scissors and clap board were created in Illustrator and pasted in at 70 percent opacity.

To compensate for the difference between the illustration's screen and printed versions, Fishauf used a home-brewed method of color correction. First he created a file that contained four miniature copies of the illustration (resampled down to 100 dpi). Experimenting with contrast/brightness settings, he saved a different batch of settings for each copy. He had a high-resolution ink-jet color proof made to see which of the settings worked best, then used those settings on the final file. From experience, he's learned that boosting brightness between 15 and 20 percent and contrast between 5 and 10 percent usually gives good results.

The illustration (excluding research and preparation) took roughly 20 hours to create, and the final RGB file size was 10.5MB. **m**

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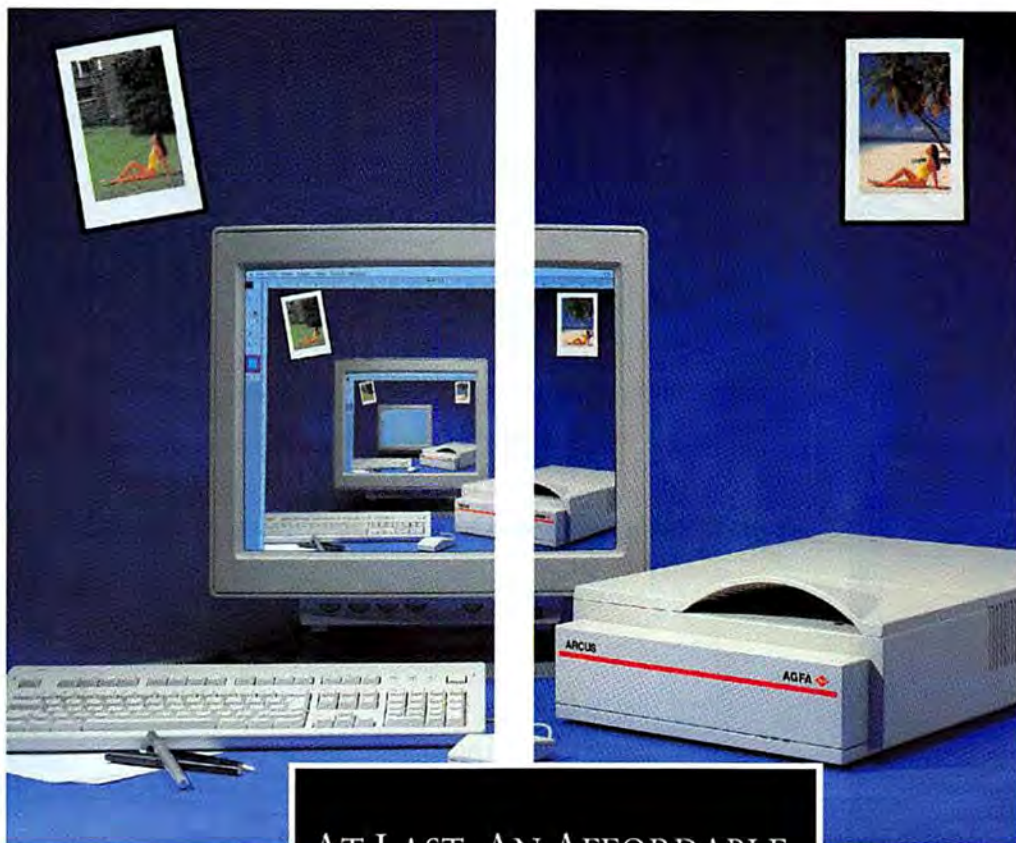
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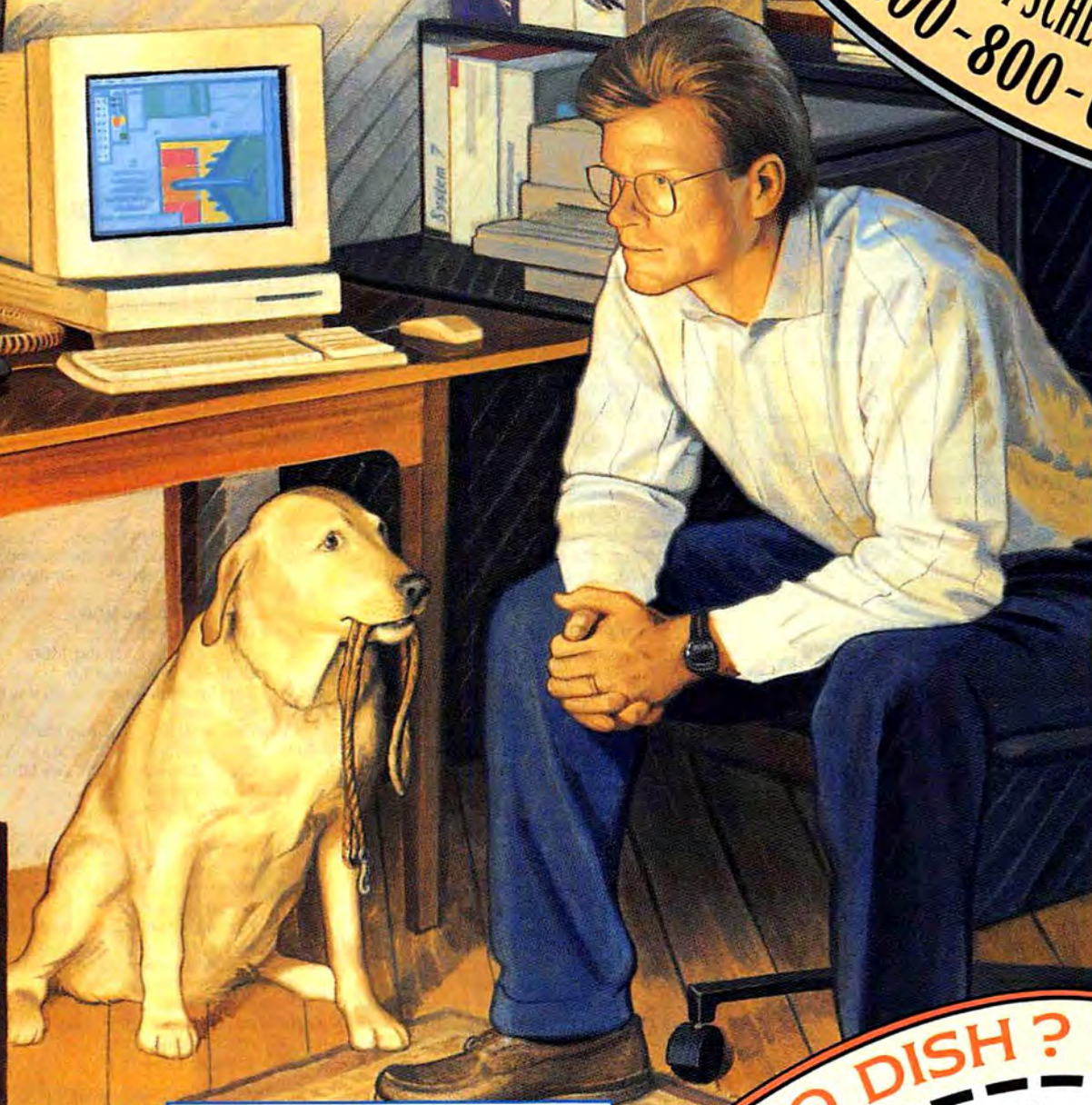
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 5886 ① FastLabel 3.1.6 45.
 ★ **WordPerfect ... 60 day MBG**
 3800 ① WordPerfect 2.1 279. 4711 Upgrade 89.
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 3554 ① American Heritage Dictionary 1.0 59.
 ★ **Working Software ... 60 day MBG**
 5896 ① Last Resort 38. 3792 ① Spellswell 2.2 44.

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 ★ **Adobe Systems**
 ① Adobe Type Sets for Business ea. 95.
 ① Adobe Type Library (Vol. 1-275) call
 ① Adobe Type On Call (CD-ROM) 56.
 8794 ① Adobe Type Reunion 1.0.2 41.
 6957 ① Adobe Type Manager 2.0.3 59.
 5750 ① Plus Pack 2.0 118. 6098 ① TypeAlign 61.
 6053 ① Adobe Premiere 2.0 (Sept. '92) 305.
 4145 ① Adobe Illustrator 3.2 (with ATM) 368.
 8171 ① Streamline 119. 6644 ① Photoshop 548.
 5001
 ★ **Aldus ... 30 day MBG**
 6674 ① Aldus Personal Press 2.0 99.
 2461 ① Aldus Gallery Effects 1.0 128.
 3506 ① SuperPaint 129. 3507 ① Super 3D.. 325.
 4751 ① Persuasion 325. 1330 ① FreeHand. 394.
 7088 ① PageMaker 494. 7541 ① IntelliDraw 199.



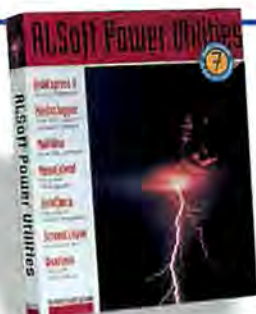
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 ★ **Baseline Publishing ... 30 day MBG**
 8055 ① Screenshot 1.2 34.
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 2251 ① Type Essentials: Headlines 44.
 ① Type Essentials (all others) ea. 69.
 ★ **Broderbund Software**
 3572 ① Kid Pix 1.2.. 34. 7293 ① Companion 23.
 1427 ① Print Shop 35.
 6281 ① TypeStyler 2.0 (with ATM) 126.
 ★ **Claris ... 30 day MBG**
 2518 ① MacDraw Pro 275. 7505 ① Upgrade 95.
 8007 ① Claris CAD 2.0 599.
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 8037 ① Freedom of Press Light 3.03 (17 fonts) 84.
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- ★Deneba Software ... 30 day MBG
- 3227 **Canvas 3.04** 259.
- ★Expert Software ... 30 day MBG
- 4870 **Expert Color Paint 1.0** 29.
- Fractal Design
- 5425 **Painter 1.2** 235.
- ★Letraset ... 30 day MBG
- 4709 **LetraStudio 139. 6300 FontStudio** 359.
- Light Source
- 3733 **Ofoto 1.1.1** 275.
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- 7441 **SwivelPro** 479.
- 3450 **SwivelMan** 619.
- 7653 **MacroModel** 999.
- ★MicroMaps ... 30 day MBG
- 7556 **MapArt (PICT) or 7555 (EPS)**..... ea. 89.
- ★Microsoft ... 30 day MBG
- 2878 **PowerPoint 2.01E** 245.
- Postcraft International
- 2210 **Effects Specialist 1.04** 89.
- Quark
- 7612 **QuarkXPress 3.1** 549.
- ★Specular International ... 30 day MBG
- 4962 **Infini-D 2.0** 647.
- Terrace Software
- 9970 **Mum's The Word Plus (gardening)**... 107.



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- ★T/Maker ... 30 day MBG
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- ★Virtus Corporation ... 30 day MBG
- 4488 **WalkThrough 1.1** 309.

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- 1352 **TouchBASE or 3314 DateBook**... ea. 79.
- 7411 **TouchBASE & DateBook Bundle**..... 122.
- ★Aladdin Systems ... 30 day MBG
- 7410 **StuffIt Space Saver**..... 34.
- 6740 **StuffIt Deluxe 3.0 (Aug. '92)** 65.
- ★Aldus ... 30 day MBG
- 5100 **SuperCard 1.6** 195.
- ★ALSoft ... 30 day MBG
- 9808 **MasterJuggler 1.58** 25.
- 9807 **DiskExpress II 2.11** 48.
- 5204 **ALSoft Power Utilities 1.0.2** 62.
- ★Alysis Software ... 30 day MBG
- 2687 **SuperDisk 49. 1608 More Disk Space** 42.



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7068 **INITPicker 2.02**—Stops INIT conflicts that cause start-up crashes. "Our pick as the front runner," *MacWEEK* (6/90) **\$38.**
 2913 **Redux 1.63**—The "better, simpler backup," *MacWEEK* (12/91). For power-users & novices **49.**

- Apple Computer
- 1074 **System 7 Personal (w/free PCTV video)** 79.
- 3413 **System 7 Group Upgrade Kit**..... 249.
- 7072 **QuickTime Starter Kit** 149.
- ★ASD Software ... 30 day MBG
- 7085 **FileGuard 2.7 (1 user)** 138.
- 7422 **(5 user)**... 479. 7423 **(10 user)**... 799.
- ★Baseline Publishing ... 30 day MBG
- 7783 **INIT Manager 1.1** 33.
- 3114 **INIT Info Pro 1.0** 39.
- ★Berkeley Systems ... 30 day MBG
- 2198 **More After Dark (M.A.D.)**..... 23.
- 5737 **After Dark 2.0V** 28.
- 2196 **After Dark & M.A.D. Bundle** 39.
- ★Casa Blanca Works ... 30 day MBG
- 1593 **Drive 7 2.2** 49.
- ★CE Software ... 60 day MBG
- 1727 **CalendarMaker 3.0.1** 31.
- 8024 **QuickKeys 2.1.2** 93.
- ★Central Point ... 30 day MBG
- 5041 **Mac Tools Deluxe** limited special 89.
- ★Clarix ... 30 day MBG
- 8734 **HyperCard Development Kit 2.1** 139.
- ★Connectix ... 30 day MBG
- 8441 **CPU 1.0 (Connectix PowerBook Utilities)** 49.
- Coral Research
- 7310 **TimeLog**..... 62. 7309 (10 Pack) ... 399.



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6740 **StuffIt Deluxe 3.0**—Compression solution solves all your needs from archiving to transparent compression **\$65.**
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- ★Dantz Development ... 30 day MBG
- 3393 **DiskFit Pro 1.0** 72.
- 5255 **Retrospect 147. 7945 Remote 1.3** 264.
- 7946 **Remote (10 Pak) 147. 3112 (50 Pak) 649.**
- ★ElseWare Corp. ... 30 day MBG
- 4871 **Checklist 2.02** 62.
- 1507 **Barcode Kit or 1506 Datasheper** ea. 62.
- ★Fifth Generation ... 30 day MBG
- 4287 **PYRO! 4.01 27. 3955 Suitcase 2.1** 53.
- 7704 **Public Utilities (Aug. '92)**..... 98.
- 8286 **SuperLaserSpool 3.0** 99.
- 5178 **FastBack Plus or 5725 DiskLock**... 125.
- 7404 **Disk Doubler 3.7.5** 45.
- 4838 **AutoDoubler**.. 45. 6092 (10 pak) ... 295.
- ★FWB, Inc. ... 30 day MBG
- 7929 **Hard Disk Utilities Personal Edition**... 49.
- 2999 **Hard Disk Toolkit 1.1.1** 125.
- ★ICOM Simulations ... 30 day MBG
- 6296 **Intermission**.. 29. 3731 **OnCue II**.. 29.
- ★Inline Design ... 30 day MBG
- 7068 **INITPicker 2.02** 38.
- 2913 **Redux 1.63 or 2936 HAM** ea. 49.
- ★Insight Development ... 30 day MBG
- 6171 **MacPrint 1.3** 92.
- ★Kent Marsh Ltd. ... 30 day MBG
- 9513 **FolderBolt 1.02** 71.
- 1839 **NightWatch II** 89.
- ★Kiwi Software ... 60 day MBG
- 6267 **Kiwi ENVELOPES! 3.1.6** 32.
- 3518 **Kiwi POWERWINDOWS 1.0** 50.
- ★Magic Software ... 30 day MBG
- 7267 **AutoSave II 26. 7270 Backmatic**.. 50.
- ★Microcom ... 30 day MBG
- 4803 **Virex/Mac**.. 57. 8561 **911 Utilities**.. 89.
- ★MicroMat Computer Sys. ... 30 day MBG
- 3732 **MacEKG II** 99.
- ★Nine to Five Software ... 30 day MBG
- 9767 **Reports 2.5** 125.
- ★Now Software ... 30 day MBG
- 1793 **Now Up-To-Date**... 65. 2366 (10) . 395.
- 6925 **Now Utilities 4.0**... 95. 8471 (10) . 775.
- ★ON Technology ... 1 year MBG
- 6385 **On Location 2.0** 75.
- Palomar Software
- 8210 **PLOTTERgeist 2.0** 249.
- Peripheral Land, Inc. (PLI)
- 7326 **Mac-to-DOS** 99.
- ★Symantec ... 30 day MBG
- 5176 **Symantec AntiVirus for Mac (SAM)**... 64.
- 6748 **Norton Utilities for Mac 2.0** 95.
- 3421 **THINK Pascal 165. 2688 THINK C** 199.
- 9957 **THINK Reference 1.0** 68.
- Teknosys
- 5203 **HELP!** 88.

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- 8266 **SimEarth 1.1**..... 40.
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- 2707 **Puzzle Master**..... 26.
- 8525 **Casino Master**... 39. 8524 (Color).... 45.
- ★ **Cyan ... 30 day MBG**
- 6320 **Manhole 1.6**..... 19.
- ★ **Davidson & Associates ... 30 day MBG**
- 3922 **Talking Spell It Plus**..... 29.
- 2574 **New MathBlaster Plus**..... 34.
- 8278 **Alge-Blaster Plus**..... 34.
- EARTHQUEST**
- 8050 **EARTHQUEST or 3118 Ecology 1.0** 34.
- Electronic Arts**
- 5702 **4D Boxing**.... 32. 1907 **PGA Golf**.. 39.
- ★ **Expert Software ... 30 day MBG**
- 6219 **Expert Astronomer 1.0**..... 29.
- Graphic Simulations**
- 4756 **Hellicats Over the Pacific 1.0.3**..... 39.
- ★ **Great Wave ... 30 day MBG**
- 6693 **KidsMath 2.0 (Color)**..... 25.
- 1513 **ReadingMaze (Color)**..... 35.
- 4334 **NumberMaze**.. 25. 8527 **(Color)**.. 35.
- ★ **HyperGlott Software ... 30 day MBG**
(French, German, Italian & Spanish)
- Word Torture** ea. 34. **Tense Tutor** ea. 38.
- Pronunciation Tutor**
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- ★ **Inline Design ... 30 day MBG**
- 1562 **3 in Three or 1944 Swamp Gas**.. ea. 31.
- 8809 **Tesseract 31. 3414 Mutant Beach** 39.
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- 1894 **BattleChess (3D animation)**..... 29.
- 1893 **CheckMate (infinite play levels)**..... 31.
- ★ **Learning Company ... 30 day MBG**
- 2670 **Reader Rabbit 3.0 (CP) (ages 4-7)**.... 34.
- 3687 **Super Solvers: Midnight Rescue!**..... 34.
- 3281 **The Writing Center 1.0**..... 51.
- ★ **Leister Productions ... 30 day MBG**
- 7126 **Reunion 3.0**..... 115.
- ★ **MECC ... 30 day MBG**
- 3963 **Oregon Trail 1.0**..... 28.
- Number, Word, or Super Munchers** ea. 28.
- ★ **Microsoft ... 30 day MBG**
- 2868 **Fight Simulator 4.0 (CP)**..... 42.
- ★ **Multimedia Library ... 30 day MBG**
- 7312 **Educ. Series V. 1-Animated Relativity** 105.
- ★ **Nordic Software ... 30 day MBG**
- 8258 **Turbo Math Facts 2.0**..... 24.
- 8257 **Preschool Pack - Color 2.0**..... 34.
- 7470 **Jungle Quest 30. 7537 Kolor Klips** 37.
- ★ **Penton Overseas ... 30 day MBG**
- VocabLearn/ce Levels I & II (Span., Fren., Germ., Ital., Rus., Japan., & Heb.)**... ea. 35.
- VocabLearn/ce Level III (Span., Fren., Germ., Ital., Rus., & Japan.)**..... ea. 35.
- ★ **Personal Training Sys. ... 60 day MBG**
Training for System 7, Excel, Lotus 1-2-3, Persuasion, FileMaker Pro, PageMaker, Illustrator, FreeHand, Word, HyperCard, QuarkXPress, ClarisWorks & Mac..ea. 59.
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- 3545 **EcoQuest**..... 35.
- 3552 **Leisure Suit Larry V or 7396 Red Baron** 39.
- ★ **SoftStream ... 30 day MBG**
- 4489 **Galactic Frontiers**..... 38.
- Software Toolworks**
- 4619 **Mavis Beacon Typing 1.3 (CP)**..... 32.
- ★ **Spectrum Holobyte ... 30 day MBG**
- 4835 **Tetris 1.3**.. 28. 3017 **Wordtris 1.0**.. 27.
- 3459 **Falcon 2.2.2 or 8181 Vette 1.0**... ea. 33.



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- 8098 **LSAT Prep**..... 35.
- ★ **Toyogo ... 30 day MBG**
- 7624 **NEMESIS Go Master 5.0**..... 38.
- 7623 **NEMESIS Go Master Deluxe 5.0**..... 99.
- ★ **Voyager ... 30 day MBG**
- 2809 **The Annotated Alice, 2836 Hitch Hiker's Guide to Galaxy, 2820 Jurassic Park** ea. 15.

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- 7013 **Voice Navigator SW w/Headset Mike**.. 325.
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5201	The Miracle (piano teacher) 349.
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4114	VideoSpigot IIsi 379.
4164	VideoSpigot (for NuBus) 449.
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7679	Spigot & Sound (NuBus) 779.
7678	Spigot & Sound Pro (NuBus) 1649.
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*Highlighted Data ... 30 day MBG	
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7313	Sound Series V.1-Music for Multimedia 105.
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Software Toolworks	
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8066	QuickMail (5 user) 249. 8067 (10) 375.
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DaynaPORT SCSI/Link (BNC or 10 BASE-T) 269.	
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9634	DoveFax Plus .. 265. 4111 NuBus 299.
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2196 **After Dark & M.A.D. Bundle**..... 39.

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9961	PhoneNET Card PC 209.
2206	PhoneNET StarController 307 879.
4802	Star 357 ... 1025. 4814 Star 377 ... 1299.
*Freesoft ... 30 day MBG	
6115	White Knight 11 85.
*Global Village ... 30 day MBG	
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8945	TelePort/FAX 2.1 145.
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7720	PowerPort/Silver 439. 7710/Gold 589.
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5101	HayesConnect 3.0 (modem sharing) .. 75.
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5970	OPTIMA 96 Modem for Mac 389.
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9726	Entry Level SoftPC 2.5 125.
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3441	SoftNode 1.0 105. 3454 (10 Pack) 699.
Logicode Technology	
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5524	Quicktel Xeba M9696XV 369.
5523	Quicktel Xeba M1414XV 399.
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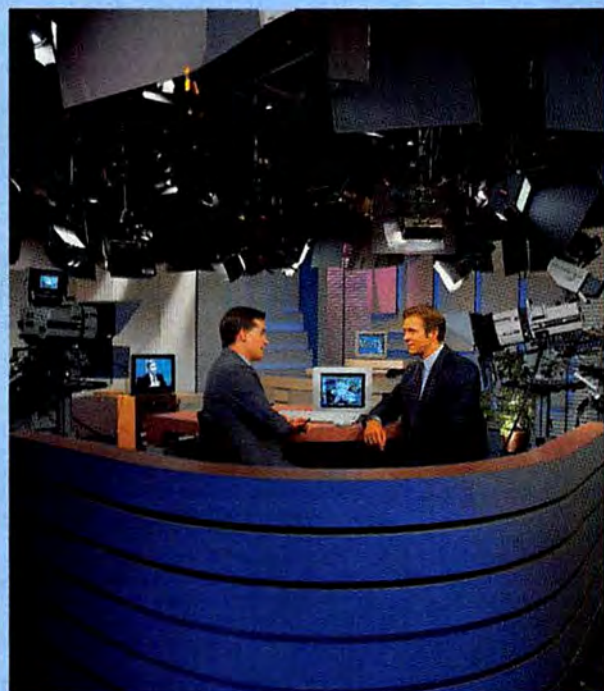
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- 2466 **Mac 2B Interface (with Retrospect)**... 149.

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- 5898 1" 80 MB Port...449. 5899 120 MB.. 559.
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- 5533 MDS 44 SyQuest w/AutoDoubler..... 479.
- 5532 MDS 44 SyQuest w/Norton Utilities..... 479.
- 5534 MDS 88 SyQuest w/AutoDoubler..... 589.
- 5535 MDS 88 SyQuest w/Norton Utilities..... 589.
- 5529 44 MB Cart. (3 pak) 199. 5528 (5 pak) 329.
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- 6432 3 1/2" Optical Media..... 65.
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All Thumbs

BY STEVEN LEVY

VOICEOVER: Are you ready, America? Have you upgraded your hard drives? Expanded your memories? Have you installed QuickTime, Apple Computer's amazing system extension for running often-postage-stamp-size video clips on your own computer screen? If so, you're ready for "Queak Previews," where your two favorite critics introduce you to all the hot clips and then make often indefensible pronouncements about them! Here they are . . . Geeeeeene and Roger!

ROGER: We've got to lose that announcer.

GENE: You've got to lose some *weight*. Or do you have a few loaves of bread stuffed under that sweater?

ROGER: Obviously, the last 20 hours of decompressing QuickTime files has gotten to Gene. Believe me, we had a hell of a time getting these things onto our system. They came on CD ROM, SyQuest cartridges, bundles of high-density floppies, and high-capacity hard drives—but we finally have everything ready for our old reliable MoviePlayer. And may I say that multimedia has never been better?

GENE: You may, but we're running late already. So here's the first clip, which appeared on the ever-popular Apple Computer QuickTime Developer's Disk. It's called *Engineers in the Shower*.

Gene and Roger turn toward a wall-size monitor in the front of the room, displaying the Mac desktop. A small portion of the screen shows the clip.

Location: A communal bathroom with three shower stalls, side by side. Several males, approximately in their late twenties, wearing T-shirts and baggy jeans, are frantically running into the showers, fully clothed. (The water is off.) Then they immediately run out of the stalls, slamming the flimsy frosted-glass shower doors. The sounds are a jangly, metallic clatter of doors slamming, the feverish patter of sneakers on bathroom tile, and the heavy breathing of people unaccustomed to physical exertion. Finally one leans to the camera and

says, "These are trained professionals—don't try this at home." Soon thereafter, as they breathlessly scuttle out of the room, we hear a giggly voice asking, "Are we recording?"

ROGER: Gene, this is just another one of those teen-oriented QuickTime clips, where a bunch of adolescents turn on a video camera, act like morons, and think it'll be considered clever when everything is digitized and stuck on a Macintosh. Where are the new ideas? Is this the golden age of media? To me, this is a big thumbs-down.

GENE: Once again, Roger, you miss the point. I find *Engineers in the Shower* to be a hard-hitting yet poignant exposé of the working conditions at one of the country's most admired computer companies. Working 90 hours a week trying to create a new era in computer media has obviously driven these young wage-slaves to the point of insanity. They're scrambling like rats in a cage! The amazing thing is how their employer slyly placates them—by allowing them to tape their own mental breakdowns with a cheap camcorder, and then actually including the clip in a CD ROM distributed by the company! Besides, I think it's fun, especially since the choppy images give it a fast-forward, Mack Sennett feeling.

ROGER: Gene, don't you know that almost every QuickTime clip is choppy like that? Unless you run them on a Quadra 950?

GENE: Well, to me it's still a thumbs-up. Now, our next clip is bound to be controversial. In the spirit of Oliver Stone's *JFK*, comes 11/23/63 Extra! It's a HyperCard stack that professes to prove, beyond all doubt, that the Kennedy assassination was a conspiracy. And the linchpin of all this is the Zapruder tape, which is included as a QuickTime clip.

They turn to the monitor. The familiar, if unusually blurry, image of the presidential limo that day in Dallas, after the first shot. Kennedy's head is bowed, and

Jackie, in pink suit and pillbox hat, is cradling him. Suddenly part of his head seems to explode, and he is violently thrown backward.

ROGER: Now, that was only part of the Zapruder film, but the clip's creator promises to digitize the entire thing later on. What makes this unusual is that the viewer can play with the film with a utility called QuickTime Detective, which supposedly helps you prove the original film has somehow been tampered with.

GENE: I vote for a thumbs-down. How do we know that the QuickTime clip hasn't been tampered with?

ROGER: Good point. Using QuickTime and a program like Adobe Premiere, one can manipulate images all sorts of ways, altering reality. Just because you see something on a video doesn't mean it happened. What if this guy is *part of the conspiracy*, and he painstakingly flipped the digits to make it look like John Connally shot the president? Still, this is a good example of how QuickTime clips can vividly portray historical moments. Thumbs-up.

GENE: I'm glad you mentioned Premiere, because Adobe includes a CD ROM loaded with QuickTime clips. Here's an example, called *Evening*.

First we see a pearl necklace, then an empty dress of the short black variety. The dress is suddenly filled with a woman, a model who is sort of a low-rent Annette Bening. We get a brief glimpse of someone else, but mostly this is a one-woman show, a montage of views of the woman in her skimpy dress. The most dramatic shot is an upward pan—tote to hair—that follows her curves. There are lots of fades, double exposures, zooms, and the like. The sound track is a deep Hammond organ, playing moody R & B.



Live!

Gene and Roger

rate

QuickTime

clips

GENE: Sort of an MTV clip. I give it a thumbs-down.

ROGER: Try VH-1. But I like it anyway. Thumbs-up.
continues

GENE: Funny, though. Did you ever notice how much QuickTime clips are engineered to the low attention spans of MTV viewers? Since it's extremely difficult to accommodate clips longer than 20 seconds or so, the creators wind up stuffing in all sorts of special effects, quick cuts, and gimmicks.

ROGER: Yeah, a lot of stunts with text, too. I think artist Jenny Holzer is the patron saint of QuickTime artistry.

GENE: And also, as we see in *Evening*, a focus on sex. Is it inevitable that the cutting edge of every visual media winds up as lurid exploitation of the female body?

ROGER: Is this a politically correct diatribe? Have you been reading *Backlash*?

GENE: Wake up and smell the coffee, Roger. You won't believe how quickly sleaze has oozed into the world of QuickTime clips. Let me show you this Quick-

Time 4th Dimension database that a fellow named Craig Hosoda entered into the Macworld QuickTime Festival.

ROGER: Craig Hosoda? Isn't that the guy who wrote that book *The Bare Facts Video Guide*, that identifies and rates the nude film appearances of every actor and actress in Hollywood? That's a great book!

GENE: You *would* think so, Roger. Here's his database.

The 4D interface comes on the screen. Roger, working a keyboard, begins typing in the name of Jodie Foster. A record exists that lists her movies and shows a picture of her. Roger points-and-clicks at the picture, which is from the film Backtrack. It shows Foster exiting a shower. She is dressed appropriately for the scene.

ROGER: A big thumbs-up. Just imagine what the perverts who swap porno TIFF files on the networks will do with this technology!

GENE: Don't imagine, it's happening already. My thumb goes down. Now for a final word, from Apple's QuickClips CD ROM disc. It's a little piece called *Sculley*.

A black screen fades into a tight head shot of Apple chairman John Sculley, seated in a busy office, wearing a dark suit and a green tie. Somewhat tentatively, he makes the following prediction, presumably about QuickTime: "I believe that it is an important enough new technology that it's going to create not just a series of businesses, it's probably going to create an entire industry. If you go out 15 years from now, people probably won't talk about the computer industry as they do today, uh, they'll probably talk, um, about, uh, the tools industry, which will include interactive multimedia. . . . They may talk about the information management industry, um, but we'll probably have a different nomenclature 15 years from now. . . ."

ROGER: It kind of reminds me of one of the witnesses in that Warren Beatty movie *Reds*. Or one of the speakers in *The Sorrow and the Pity*. Searing stuff. I give it a thumbs-up.

GENE: It's thumbs-down for me. Roger, don't you get it? You're looking at the presentation but not following the content. Try to comprehend what the man is saying. Do you really believe that QuickTime is going to change the industry so much so that it will explode the computer industry into an array of other industries?

continues

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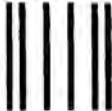
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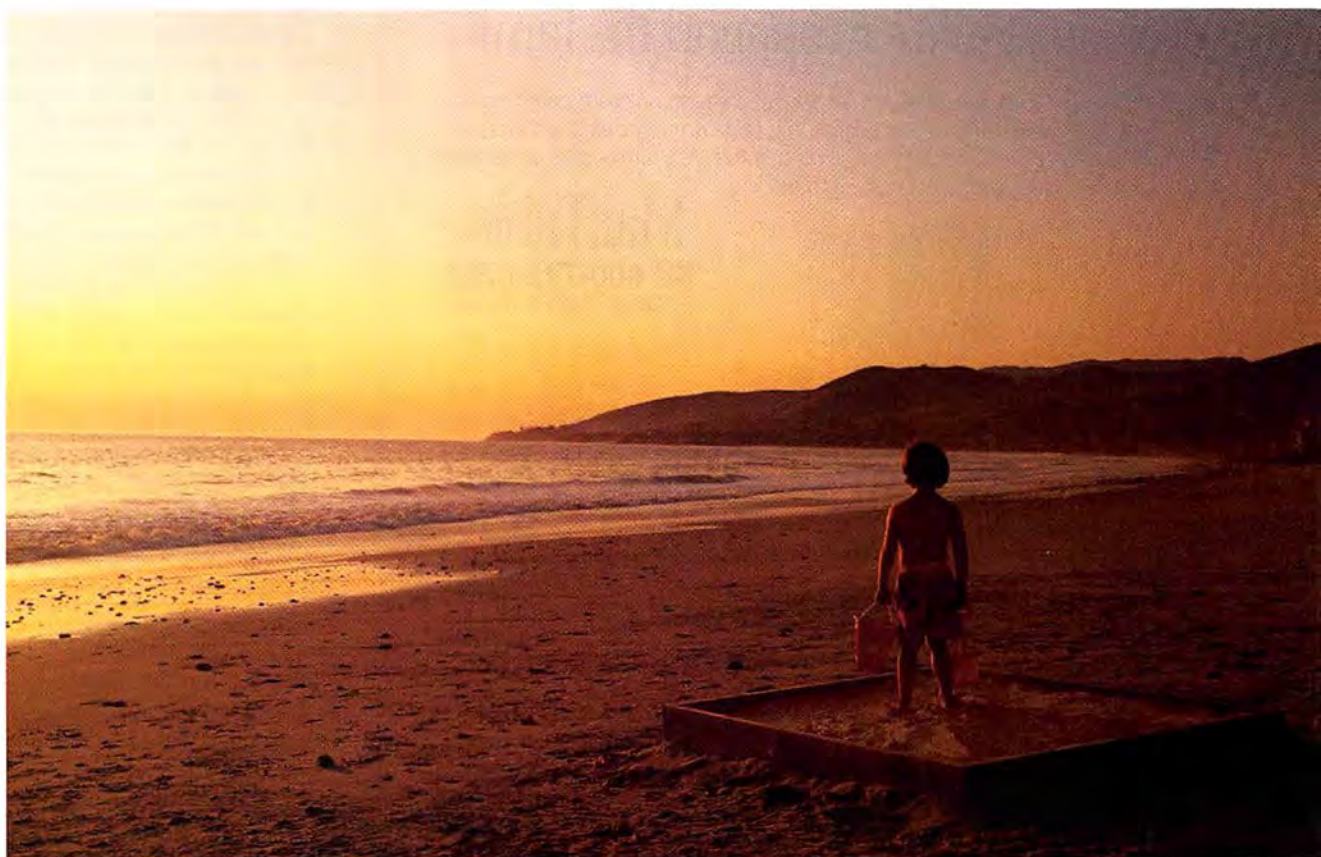
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ROGER: Who knows what the computer industry will be in 15 years? But I do know one thing—QuickTime does teach us that integrating video technology into computer media is much, much harder than anyone suspected. I think Apple has done a great service by making it possible to use QuickTime clips, and one day in the not-too-distant future we will all have powerful enough computers, video add-in boards, and enough storage space to make use of it without going through the terrible contortions we suffer with now. And, ideally, all that horsepower will be affordable. On the other hand, if you want to make a statement as Sculley does, I still think that the way to do it is to write it down and edit it. To be honest with you, I had to watch that clip four times before I really understood what he was saying. The first three times I saw it, all I noticed was that somewhere in the background a guy in a yellow shirt was walking across the office.

GENE: Roger, you actually seem to be making sense here. Let's wrap up the show while we're still ahead.

ROGER: Can't we watch that Jodie Foster clip one more time?

GENE: Only if she grants Craig Hosoda permission to exploit her image in that manner.

ROGER: Get *permission* for stuff you picked up from a VCR movie to use in a QuickTime clip? Dream on.

GENE: Wrong again, Roger. It's only a matter of time before the Multimedia Police elbow into the game and put the hammer down on all the fun. It'll be thumbs-down on piracy.

ROGER: Maybe by then our computer will be powerful enough to run QuickTime clips big enough to fill the screen, and they won't be choppy!

VOICEOVER: You can bet on it, Gene and Roger! In the future Multimedia will be Nirvana on Earth! We'll have new nomenclatures! And a document, be it a spreadsheet or a press release, won't be a document without at least one QuickTime clip!

GENE and ROGER (*in unison*): We've got to lose that announcer!

Fade to black. m

STEVEN LEVY's most recent book is *Artificial Life* (Pantheon, 1992).

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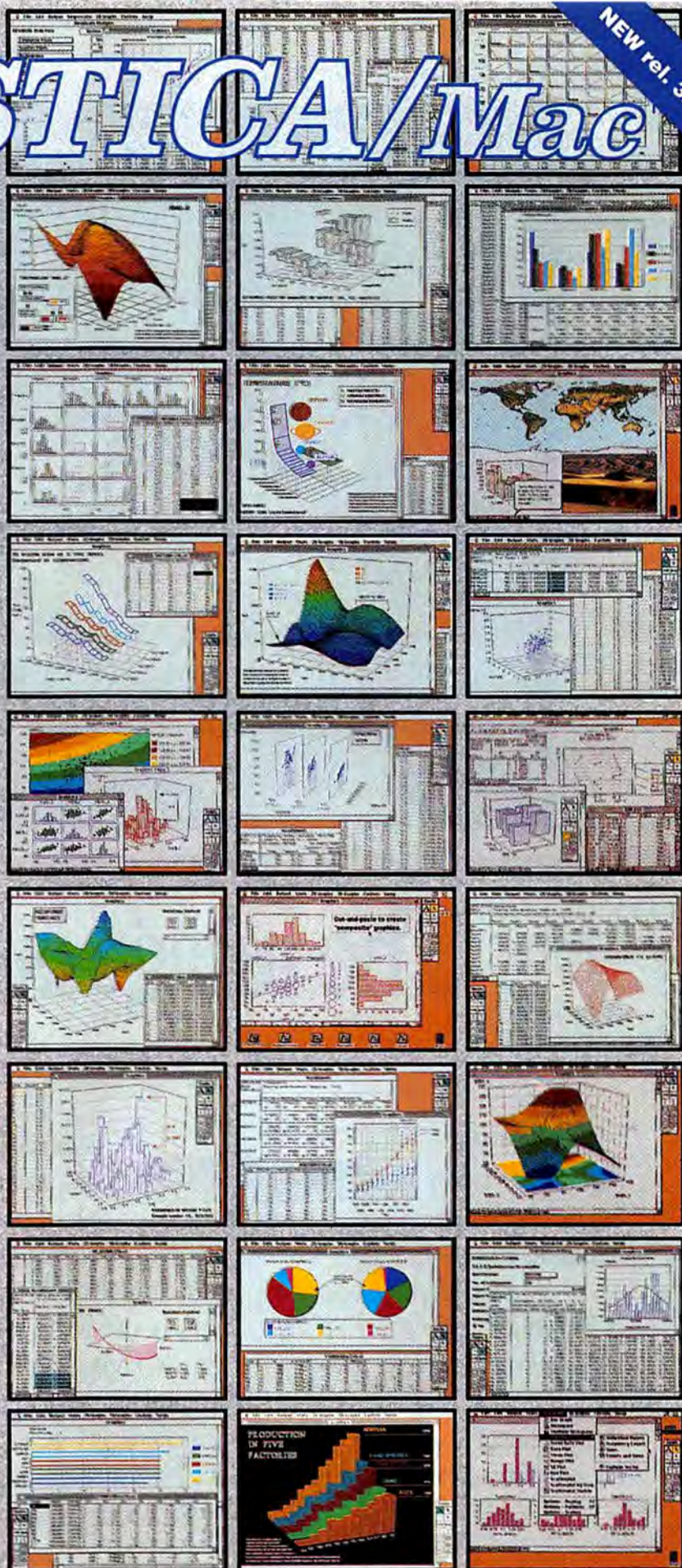
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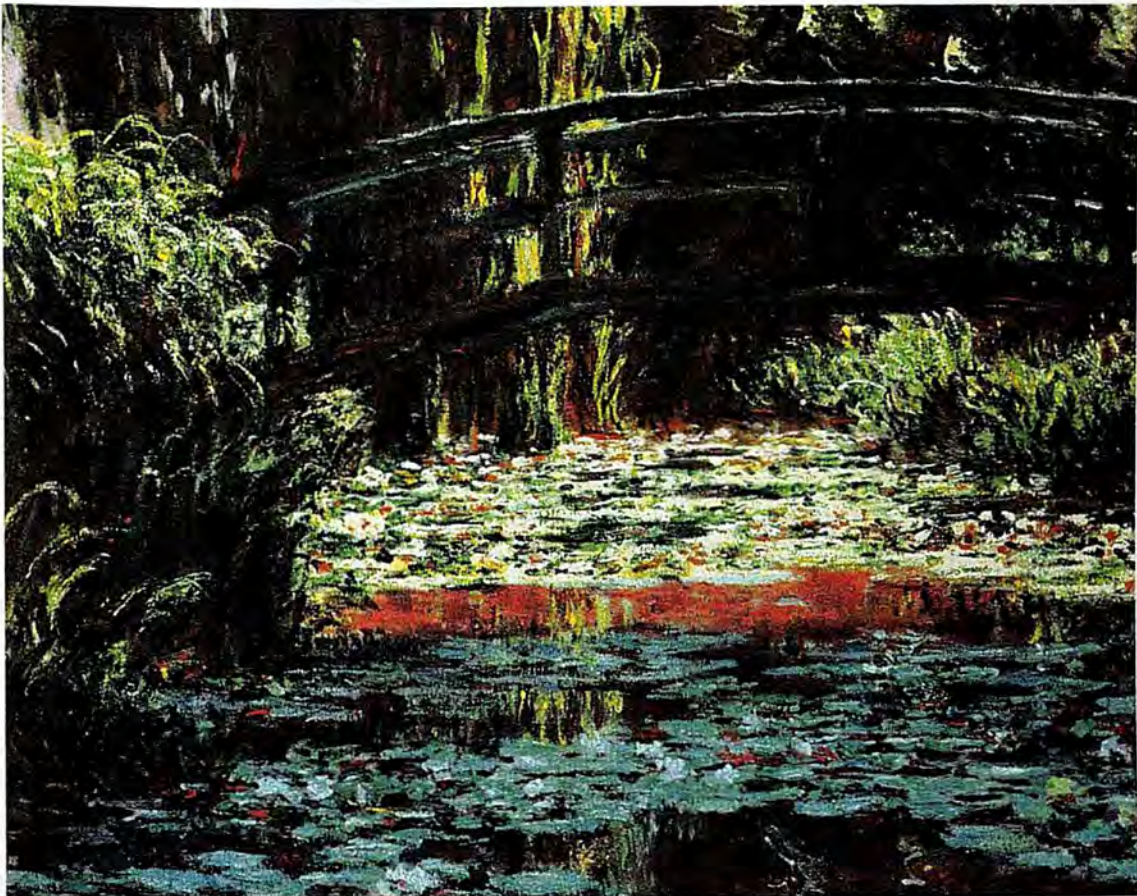
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Fortunately, the printer isn't.

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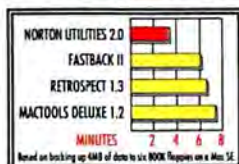
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SYMANTEC.

How Ehman Inc. Unraveled

BY DEBORAH BRANSCUM

EHMAN INC., A MACINTOSH peripherals company founded in 1985, hit on a winning strategy near the end of 1988 by introducing Mac owners to inexpensive hard drives. The Evanston, Wyoming, upstart became one of the fastest-growing businesses in the United States. Sales under the Ehman and Cutting Edge labels boomed to \$30-plus million in 1990. But despite the record numbers, Ehman Inc. didn't make a dime that year—it actually lost an estimated \$300,000.

The company's financial struggle ended in April 1992 when founder Michael Ehman shut the office. The company, which has not filed for bankruptcy, has an estimated \$4 million in debts (see *Conspicuous Consumer*, August 1992). A new company, called Bridgette, is now selling Ehman-labeled drives and monitors under Michael Ehman's direction from the San Diego suburb El Cajon.

How Michael Ehman made the transition from managing Ehman Inc. last year to managing Bridgette this year is a matter of intense interest in Wyoming. The state guaranteed a \$500,000 private bank loan to Ehman Inc. and also made a direct loan of \$50,000 to the company. Both loans were secured by Ehman Inc. inventory, and both loans are in default. The state of Wyoming will have to pay an Evanston bank the considerable difference between the value of the remaining inventory and \$500,000, and probably take a complete loss on the other \$50,000.

According to internal corporate documents and interviews with key sources, Ehman may have caused his company to violate the terms of his company's state-guaranteed loan by transferring inventory and business equipment from the old, failing enterprise to a new one unencumbered by debt. Ehman denies that he did anything wrong in moving from Ehman Inc. to Bridgette, a company he is working for as an unpaid consultant. A family member, he said, owns Bridgette.

Profile of an Entrepreneur

WHEN I ASKED MICHAEL EHMAN WHY his old company unraveled, he invoked bad sales forecasts, accounting problems, and a lack of controls. He said Ehman Inc.

didn't have access to seasoned executives and alluded to a power struggle with former company officials. He also mentioned a shortage of skilled workers, and his own lack of management skills. But when I asked former employees and associates of the executive why the company unraveled, they pointed to Michael Ehman.

Michael Ehman is a bright, talented salesperson who got in over his head, according to sources. Several large Ehman Inc. creditors said Ehman is an honest, stand-up guy. Former employees I spoke to admired his drive and commitment but said he is a lousy manager who is more comfortable with hardware than humans and who changes plans as often as he changes clothing.

Rapid growth has damaged many companies, including those with more-experienced managers. In fairness to Ehman, it shouldn't be surprising that he ran into problems with the company. Ehman was an entrepreneur, not a manager, and worked as a petroleum engineer before starting a Macintosh business out of his home.

But as Chrysler head Lee Iacocca is fond of saying, you need to lead, follow, or get out of the way. According to interviews with former employees and sources close to the company, Michael Ehman couldn't do any of those things well. He tried to lead, but couldn't stay focused on a single plan of action, pushing the company first in one direction, then another.

In February 1991, for example, Ehman founded Sterling Solutions, an off-brand hard drive company in Salt Lake City. Sterling had only two employees and sold drives made by Ehman Inc. Sterling was supposed to steal sales from other no-name companies and increase the overall sales volume. Instead, it flopped, and closed its doors after a few months.

Ehman couldn't follow, either, or get out of the way. Time and time again he hired people to save Ehman Inc., gave them responsibility, grew disillusioned with their work, felt betrayed, and then de-

nounced them. Sometimes he had good reason to feel betrayed, but not always, sources said. "I picked the wrong people," said Michael Ehman. "I continually staffed the company with people who were not ready for the job from an experience and ability standpoint. I had some real talented people, but they didn't have the background yet... That was my biggest shortcoming—I didn't build a good team."

According to former employees, and Michael Ehman himself, the company had few controls to speak of. Tales abound of confusion, misinformation, and waste. Of customers who paid for one monitor but received two. Of accounting failures, inventory problems, and tracking issues. "We had a sale at one point where we were actually losing money on the product, which we didn't know, because of incorrect cost estimations," said Peri Vastardis, a former salesperson for Ehman Inc. "Every unit we sold—and we sold 400 to 500 of these things—we were losing money on."

Associates paint the picture of a chaotic company generally without consistent plans, controls, or profits. And they describe a man in charge who resisted paying suppliers and often acted impulsively. "Michael Ehman is his own worst enemy," said Dave Watson, a former associate.

Bridgette's Birth

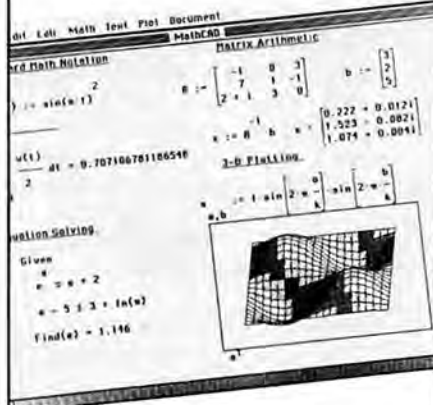
EHMAN INC. HAD A HISTORY of financial ups and downs even before it began selling hard drives, but its most serious troubles began in early 1991, when the company lost a \$1.1 million credit line provided by a financial services company. Several months later the state of Wyoming stepped in with the \$500,000 loan guarantee for operating costs, but the loan was too little, too late, according to Michael Ehman. Although company officials were optimistic about Ehman Inc. in October 1991 (see *Conspicuous Consumer*, February 1992), their enthusiasm soon faded. By December

continues



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controls or profits,
the company
was in trouble.
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way out?*

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1991, sales had dropped so dramatically that, Ehman said, he began trying to sell the company.

The next month, in January 1992,

The advertisement features a black and white photo of Michael Ehman, a man in a suit, standing in front of a large stack of hard drives. Below the photo is a testimonial in quotes: "I Make Hard Drives Reliable On The Inside Because My Name Goes On The Outside." The text continues with a story about how Ehman's company, Ehman Inc., has become a reliable supplier of hard drives for various industries. The ad also includes the Ehman logo and contact information.

"Basically what you had was a failure of one of the largest companies in the industry without it hurting the customers," said Michael Ehman about the transition from Ehman Inc., the company advertised above, to Bridgette Inc. He said Bridgette will focus on improving technical service and support for its own products and those of other companies.

Ehman Inc.'s chief financial officer, Dan Ollar, drew up Nevada incorporation papers for a new company to be called Phoenix, a fitting name for what Michael Ehman must have hoped would be his company's rebirth. When that name was unavailable, Ehman told Ollar to use the name Bridgette, in honor of his daughter, born at the beginning of the year.

Also in January, Michael Ehman met with Cliff Wildes, president and founder of a competing peripherals company called Microtech International, to discuss whether Microtech would be willing to manufacture drives for Ehman Inc. At the same meeting, Ehman asked Wildes if he would be interested in funding a new company, should Ehman start one. Wildes said no to both deals. Undeterred, Ehman continued looking for capital through early spring. But, according to Ehman, none of the potential investors he spoke to wanted to assume Ehman Inc.'s debts or stay in Wyoming, as required by the terms of the state-guaranteed loan.

Without investors or significant sales, Michael Ehman shifted to another plan. By March 1992, Bridgette's incorporation papers had been accepted and filed. In mid-April the few remaining Ehman employees were laid off, and by April 23 the Ehman Inc. 800 telephone number was ringing in Bridgette's new office in San

Clemente, California. There Michael Ehman managed the new company in office space rented from Questronex, the independent supplier that had built hard drives for Ehman Inc. and was now providing them to Bridgette.

Investing in Monitors

IN EARLY MARCH 1992, ACCORDING TO a source close to Ehman Inc., Michael Ehman outlined an ambitious plan of action that involved all the companies he managed. One provision was finding investors to assume Ehman Inc.'s debts. Other provisions of the plan included a loan from Wyoming Software to Bridgette. With that money, Bridgette was to buy monitors from Ehman Inc. and then resell them to Bridgette's own customers, according to the source.

As mentioned earlier, Ehman said he couldn't locate investors willing to assume Ehman Inc.'s debt. But on March 13, 1992, he forged ahead with at least part of the plan by obtaining a \$35,000 cashier's check from Wyoming Software, another company he managed (see "What about Business Sense?"). The check was made out to Ehman Inc., according to former Wyoming Software executive Jim Acton, who said Michael Ehman made it clear to him that the money was intended for Bridgette. Acton said he saw a promissory note that outlined terms for Bridgette to repay the loan, and a consulting agree-

*Tales abound of
 confusion, misinformation,
 and waste. Of accounting
 failures and tracking issues.*

ment that required Wyoming Software to pay Bridgette \$2000 per month for consulting services, whether or not consulting actually took place.

The \$35,000 went to one of Ehman Inc.'s creditors. Display Technologies of Elgin, Illinois, built monitors for Ehman Inc., invoiced the company, and then held the monitors for Ehman Inc. until they were shipped to customers at Ehman's request. By March, Ehman Inc. owed the supplier a considerable amount, and Display Technologies was threatening to stop

continues

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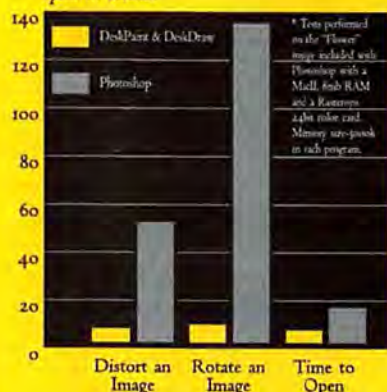
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Circle 161 on reader service card

What about Business Sense?

Recently readers have written with questions about Business Sense. Some users may be wondering what has happened to the product, which company is publishing it now, and what an accounting program has to do with Ehman Inc. Here's an update.

Business Sense began life as an accounting package called Turbo Maccountant, which Macworld reviewed in October 1986. Digital Etc., the small company that developed it, sold the rights to Monogram Software, which marketed the product as Business Sense in 1987. A few years later, Digital Etc. reacquired the rights to the program and then licensed them to a new company in June 1990. That company was called Inman Software and was started by Michael Ehman and two consultants to Ehman Inc.

According to interviews and legal documents, the Inman partnership dissolved in April 1991 after the two other principles lost a power struggle with Michael Ehman over the course of Ehman Inc. He became sole owner of Inman, which shut down. A new company, which used the same employees, emerged in August 1991. It was called Wyoming Software Corporation. As Michael Ehman explained it to me at the time, "Some California investors bought licensing rights to Business Sense . . . I do not have an equity position in Wyoming Software, although I have been retained as a consultant." According to interviews and company documents, Ehman managed the company as president. The California investors were apparently one person, Ehman's mother.

Ted Wood, a former Ehman Inc. employee who started working at Wyoming Software, badly wanted the rights to Business Sense for himself. So he negotiated an agreement with Michael Ehman in September 1991 to buy the outstanding shares of Wyoming Software Corporation from Ehman's mother. Wood claimed he made monthly payments faithfully. But he was unable to make two balloon payments. On January 30, 1992, Ehman regained control of the company when he went to the Wyoming Software office in Evanston, Wyoming, with a sheriff and had the locks changed, at least nominally on behalf of his mother.

According to former executive Jim Acton, Wyoming Software wanted to broaden its user base, so the company made an upgrade deal with Software Toolworks, which publishes Dollars & Sense. Wyoming Software paid Software Toolworks for the right to notify Dollars & Sense users of a recent upgrade and sell them the upgrade plus a free copy of Business Sense 1.5.

The mailing in early February 1992 was fairly successful in terms of responses, but there was a hitch. Digital Etc. indirectly halted shipment of the completed Business Sense version 1.5 because of allegations involving unpaid royalties. As a result, Wyoming Software was forced to send users Business Sense 1.4.1, which had fewer features than the version they paid for. (Version 1.5 solved a low-level printing problem and, for the first time, allowed data to be imported into the program, according to Acton.) The company did promise users who bought the Dollars & Sense upgrade package a free upgrade to Business Sense 1.5; it's not clear whether everyone who requested the upgrade got one.

The dispute between Wyoming Software and Digital Etc. was resolved when the principals signed legal documents in April 1992 that amounted to a peace treaty between them. At the same time, Michael Ehman left the company in the hands of Jim Acton. There are differing accounts of what happened next. Acton said he resigned from the company in April. Ehman said Acton agreed to take over Wyoming Software and didn't follow through on the deal.

In any case, Wyoming Software was essentially dissolved. On May 7, 1992, Jim Acton sent a letter to Michael Ehman about the company that reads in part, "I am returning your proposal unsigned. What little was left has been either repossessed by unpaid vendors, used to pay payroll, returned to Ehman headquarters, or blown off."

Jim Acton and Ted Wood have licensed the marketing rights to Business Sense from Digital Etc. and started a new company, called Business Sense Inc. (307/877-2231 or 800/377-4954), to distribute it. Acton is in charge of technical support and oversees the small Kemmerer, Wyoming, office, while Wood manages sales from West Jordan, Utah. Version 1.6 of Business Sense is out and includes a new check-reconciliation function and improved import and export features, according to Acton. The company is working to resolve any consumer problems that may have arisen in the transition from Wyoming Software to Business Sense Inc., Wood said.

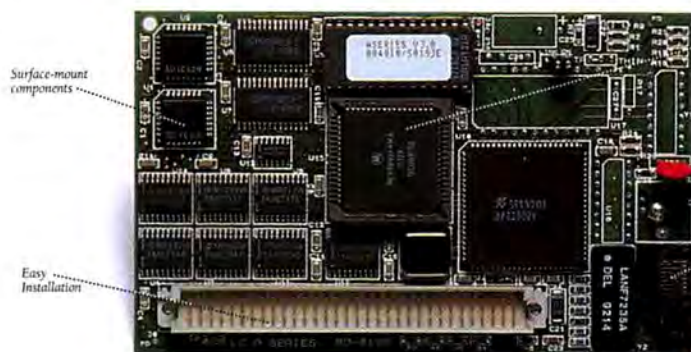
releasing products if payment wasn't forthcoming, according to Ollar. So at Michael Ehman's request, Ollar sent Display Technologies a payment of some \$40,000 shortly after the \$35,000 check from Wyoming Software was deposited into the Ehman Inc. bank account.

A few days later, around March 16,

Ehman Inc. instructed Display Technologies to ship 264 monitors and 264 graphics boards from Ehman Inc. inventory to a customer in California. The order, which covered about half of Ehman's total inventory, was unusual because the monitors were being sold for less than

continues

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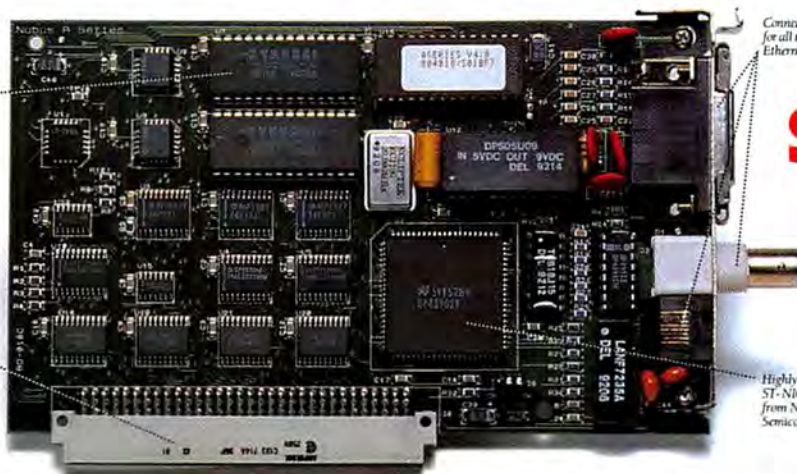
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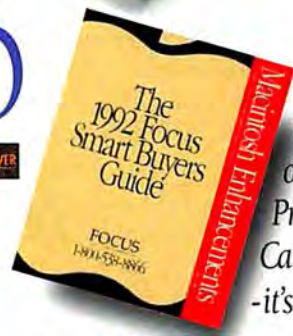
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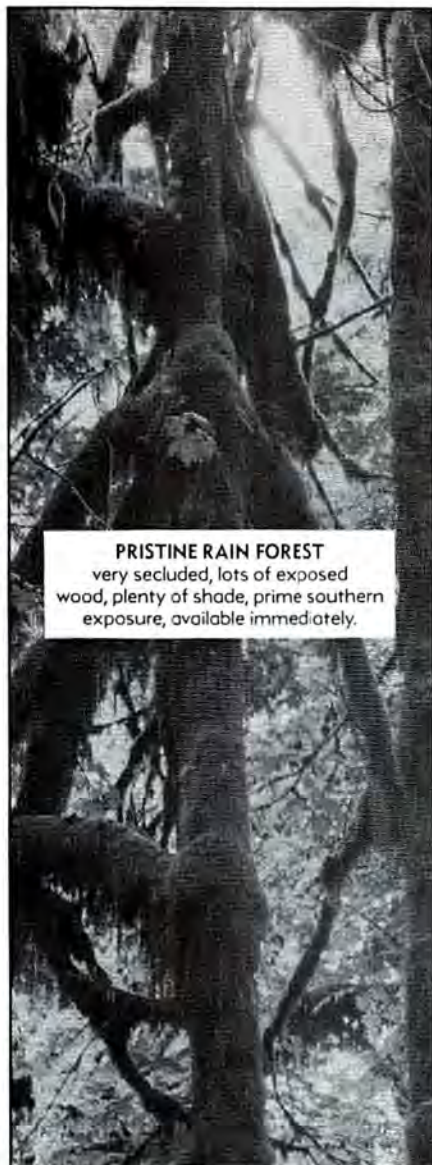
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what they cost Ehman Inc., according to Ollar. Display Technologies didn't have any graphics boards but shipped 264 cartons of monitors to San Clemente, Cali-



John Cox followed Ehman to Bridgette and left, disenchanted, after a short time. "I don't think Mike Ehman should be allowed to own or operate a business until he learns to take care of his employees, his vendors, and his customers," said Cox.

fornia—Bridgette's future home—on March 30. It was a neat trick—\$35,000 from Wyoming Software mingled with \$5000 from Ehman Inc. and then arrived at Display Technologies as partial payment on the existing Ehman Inc. inventory. Shortly afterward, Ehman instructed that part of that inventory—worth about \$150,000 if sold at retail prices—be shipped to his new company, Bridgette.

The problem with the transfer, according to sources, is that by March 16 Michael Ehman was working to leave Wyoming so he could open Bridgette in California. Ehman Inc. would soon close its doors. And in that case, all of Ehman Inc.'s inventory belonged to the private Evanston bank that had loaned Ehman \$500,000 and to the state, which had guaranteed the unpaid loan.

Ehman denies that any transfer of assets took place between Ehman and Bridgette, and he denies that the state of Wyoming had any legal claim on the monitors at all. In fact, he said, Wyoming is in better shape now as a result of the monitor purchase by Bridgette because Bridgette must repay Ehman—and thus, the state—for the purchase. (That logic ignores the money Display Technologies lost on the deal by never receiving full payment for the monitors, assuming the state didn't actually have rights to Ehman's inventory. And if the state did have rights to the inventory, as sources claim, that argument overlooks the below-cost sales terms that the state of Wyoming might have been able to better if it retained the inventory itself.)

John Cox remembers the monitors well—he called them "Bridgette's funding source." No profits could be expected

from hard drive sales, because Questronex had agreed to supply products to Bridgette only if *all* the profits from drives went toward the debt Ehman Inc. had run up with that company. So selling monitors may have been the only way Bridgette could have been funded, although Ehman denies that was the case.

Another theory, suggested by a source close to the company, is that Ehman was trying to protect a family member's investment of close to \$20,000 in Bridgette. The funds, which were intended for Bridgette—a company that didn't exist at the time—were deposited in Ehman Inc.'s bank account in January and went to pay for advertising. That made the family member an unsecured Ehman Inc. creditor, according to the source. But as Michael Ehman explained it to me, Bridgette actually funded Ehman Inc. by providing the company with needed funds, and it was only reasonable for the investor to protect his investment by buying discounted inventory in return. (Inventory that was worth, remember, about \$150,000 if sold at retail prices.)

The Comeback Kid?

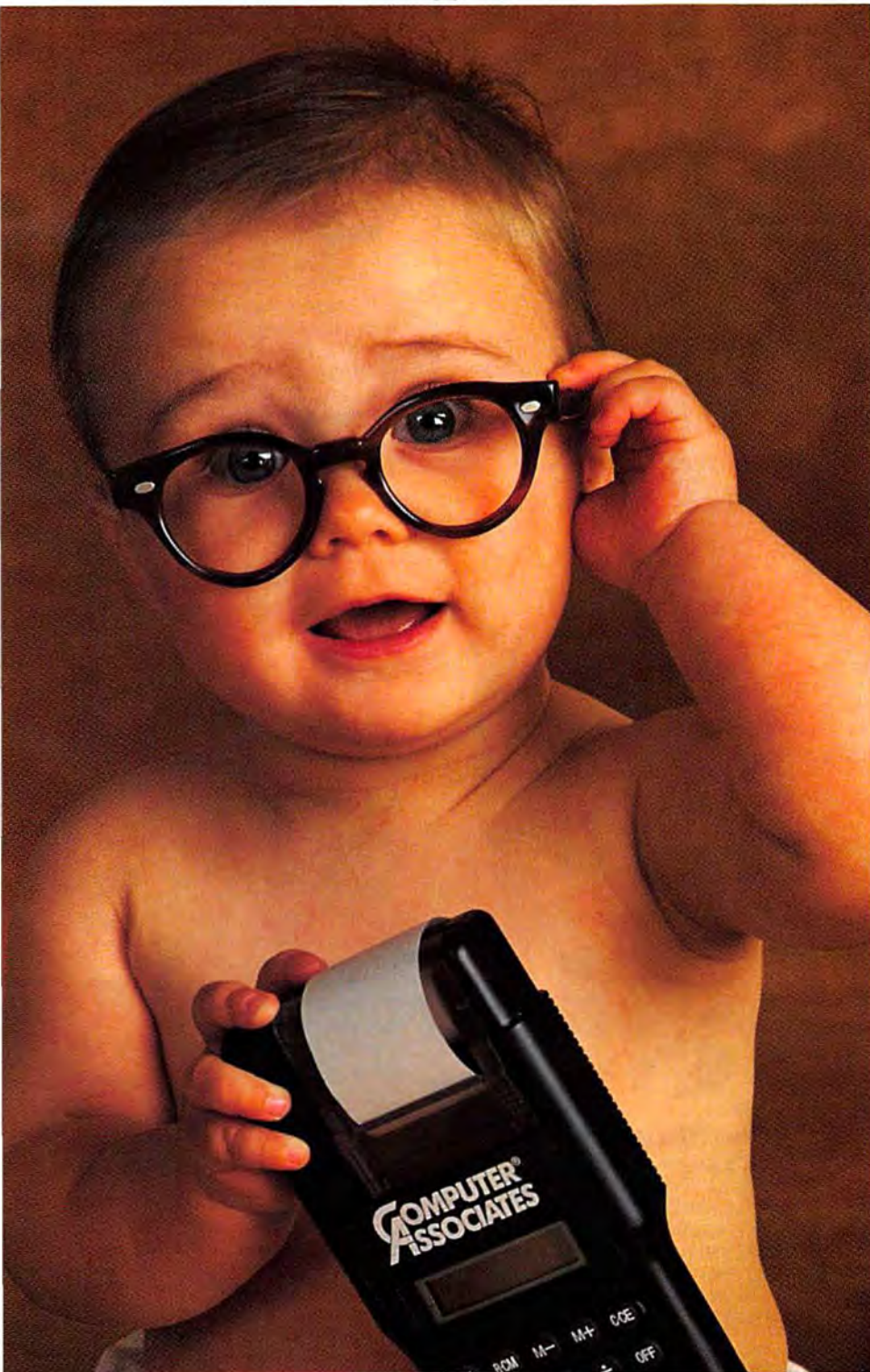
LATE LAST SPRING, MICHAEL EHMAN sent overdue commissions to some former Ehman sales people and repaid some local businesses that had been burned when Ehman Inc. closed its doors. Questronex is no longer building hard drives for Bridgette, which moved to El Cajon, California, where it continues to sell products via Ehman Inc.'s former 800 line. In June, Bridgette employees worked to repair and return drives under warranty to Ehman customers, said former Bridgette consultant Randy Carter. And in the last week of July, Bridgette ran an ad in *MacWeek* for an inexpensive two-page monochrome monitor and 120MB hard drive.

According to Ehman, Bridgette is spending \$5000 a month on telephone bills to support old Ehman Inc. customers. And at press time *Macworld* has received about five complaints from Ehman and Bridgette customers, far fewer than the number we received from Jasmine customers when that company closed. Ehman said he should be judged on his actions the past several months and reiterated his concern for his customers. Will Michael Ehman be the comeback kid? Let me know what you think. **m**

Research assistance by CAROLYN BICKFORD.

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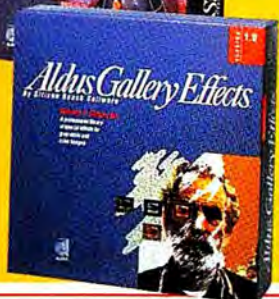
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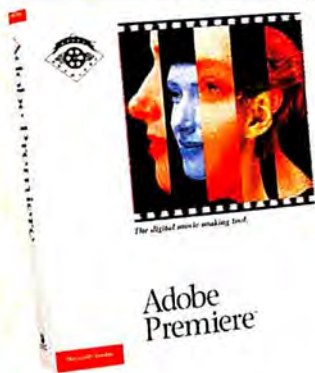
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- Competitive upgrades require proof of purchase of qualifying software.
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- Defective software replaced immediately. Hardware repaired or replaced at our discretion.
- Return Authorization Number must be obtained prior to returning any item. Call Customer Service Hotline: 1-800-248-9946 weekdays 9am to 6pm PT.

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MODEMS & FAX

Global Village

00948 Powerport V.32 W/SR Fax 488 ☐

00949 Teleport Fullfax 218 ☐

Hayes

04796 Hayes Ultra 9600 w/Smartcom758 ☐

MacTurbo

00977 MacTurbo 24/96 Fax 149 ☐ ✓

00408 MacTurbo Plus Modem 89 ☐ ✓

Prometheus

00507 Home Office 24/96 w/Voice 258 ☐ ✓

00877 Home Office Ultima Ext 488 ☐ ✓

PSI

04948 Powermodem 24/96SR Int 205 ☐

Supra

04351 Supra Fax Modem Plus 178 ☐

NETWORKING

Asante

00348 Asante 10T HUB/12 528 ☐

00819 Asante Maccon + 30IE MC 258 ☐

00324 Asante Maccon + LC MC 314 ☐

04933 Asante Maccon 3 IIsi 249 ☐

00511 Asante Maccon 3 Nubus 64K 218 ☐

Cayman

00181 Gator Box GS 1858 ☐

CE Software

04168 QuickMail 2.5.2 10 User 375 ☐ ✓

Dayna

00003 Dayna Etherprint 10T EP0101 342 ☐

Farallon

04739 24 Port Star Control. PN377 1298 ☐ ✓

00353 Phonenet CDR PC LHK PN380208 197 ☐ ✓

00828 Phonenet DIN 8 10pk PN310 197 ☐ ✓

00829 Star Controller 300Ser PN307 886 ☐ ✓

03333 Star Controller En PN507 1358 ☐ ✓

Shiva

02542 Shiva TeleBridge 408 ☐

PRINTERS, INPUT & DISPLAY DEVICES

Advanced Gravis

02741 Mousestick Joystick ADB 58 ☐ ✓

Applied Engineering

04956 AE Plus Drive - 1.44/800k FD 298 ☐

Articulate Systems

03932 Voice Navigator II 588 ☐ ✓

Caere

04459 The Typist Plus Graphics 458 ☐

DataDesk

04318 Mac 101E Kyb w/Quickkeys II 2.194 ☐ ✓

Dest

03929 Dest Scan/ Recognize OCR 684 ☐

Generation Systems

04588 Gen. Sys. 14" Ctr Mon 498

Kensington

00638 Kensington Notebook Key/Pad 104 104 ✓

Logitech

04258 Mouseman Mac 76 ☐ ✓

02561 Scanman Mod.32 Digital Dkrm294 294 ☐ ✓

00570 Scanman Mod 32 w/Catchw Pro378 378 ☐ ✓

Micron

00608 Xceed MacroColor II 24Bit Brd468 ☐

Microtek

00369 Microtek 600ZS Ctr/Gray 1398 ☐

00370 Microtek ScanMaker 1850S 1898 ☐

04047 Microtek TrueLaser Printer 1398 ☐

NEC

04985 MACFG 24X Ctr Intfc Crd 1598 ☐

00578 MACFG 8X Ctr Display Intfc Cd798 798 ☐

07144 Multisync 3FG 15" Mon 658 ☐

07143 Multisync 4FG 15" Mon 778 ☐

07399 Multisync 5FG Mon 17" 1398 ☐

Radius

04901 Powerview 539 ☐

04206 Radius Pivot Display Ctr 277 1298 ☐

Rasterops

00005 24 Stv 2536 778 ☐

00521 24XLTV 2888 ☐

03482 Video Expander 484 ☐

Sigma

00571 Power Pg PVM-GR 1500A 784 ☐

00399 Power Portrait 15" PLT 784 ☐

Sony

02566 Sony 1304 14" Mon w/Cbl 695 ☐

SuperMac

05125 SuperMatch 20" Dual Trinitron2698 ☐

00613 VideoSpigot NuBus 428 ☐

05111 VideoSpigot Pro NuBus 1458 ☐

Texas Instruments

04096 TI PS 17 Laser w/Apple Talk 1298 ☐

04313 TI PS 35 Laser w/Apple Talk 1699 ☐

Thunderware

00520 Lightning Scan Pro 256 488 ☐

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00599 24bit UC 630 w/Photoshop 1389 ☐

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00087 12x12 Static Sur 421E 935 ☐

03677 SD-420E 12x12 StdSur 718 ☐

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03428 Two 1x8 1MB SIMMS (80NS) 68 ☐

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04987 Powerbk 6MB SRan 140,170 368 ☐

03584 4x4 for I/IIx Only 548 ☐

03585 4x4MB fx 189 ☐

03583 4x4MB SE30/IIx, CI, Quadra 124 ☐

03976 LC 2-4MB 258 ☐

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05442 Syquest 44MB 5pk 328 ☐ ✓

02183 Syquest 44MB Cart Unfo 69 ☐ ✓

04142 Syquest 44MB Cartridge 5pk 328 ☐ ✓

05443 Syquest 44MB 10pk 649 ☐ ✓

00183 Syquest Cart 88MB 106 ☐ ✓

STORAGE DEVICES

FWB

00506 100MB Pocket Hammer Dr 748 ☐

Iomega

09728 Bern Transport 90MB DR 694 ☐

Mass Micro

00332 DataPak MO/128 3.4" Optical 1629 1629 ☐

00336 DiamondDrive 120P 2" Dr 549 ☐

00337 DiamondDrive 210P 2" Dr 949 ☐

00972 DiamondDrive 80P 1" Port 439 ☐

00971 Hitchhiker 80 679 ☐

04062 Mac Micro DataPak 88 798 ☐

00175 Mass Micro Datapack 45 Rem 598 ☐

NEC

05444 NEC CDR 37 w/Mac Interface 388 ☐

05445 NEC CDR 74 w/Mac Interface 578 ☐

05414 CDR 37 w/CD Gallery 475 ☐

05415 CDR 74 w/CD Gallery 698 ☐

PLI

04881 DPI 105MB Q Ext Quantum 498 ☐

04451 DPI 45MB Syquest 548 ☐

04880 DPI 52MB Ext Mini Dr 358 ☐

02181 Infinity 40 Turbo HD Rem 598 ☐

00182 Infinity 88 Turbo HD 799 ☐

04698 Infinity Opt Sony 3.5"128MB 1628 ☐

Sony

00590 Sony 3.5" Opt Disk 60 ☐

UTILITIES

Alsoft

00628 Power Utilities 64 ☐ ✓

ASD

03286 FileGuard 138 ☐ ✓

03323 FileGuard Office Pack 10 798 ☐ ✓

DataViz

04771 MacLink +/Translations 6.0 108 ☐ ✓

Fifth Generation

04776 Suitcase II 2.0 49 ☐ ✓

FWB

00555 Hard Disk Toolkit 124 ☐ ✓

GDT

00642 PowerPrint 94 ☐ ✓

Insignia

04768 Soft / AT 2.5 299 ☐ ✓

Maxa

05026 Snooper Kit, SW & Nubus 164 ☐ ✓

05025 Snooper Software 124 ☐ ✓

Now Software

04191 Now Utilities 3.0 84 ☐ ✓

Salient

04955 Auto Doubler 44 ☐ ✓

03515 Disk Doubler 3.7 44 ☐ ✓

Symantec

04890 Norton Util 2.0 for Mac 98 ☐ ✓

00116 SAM 3.0 64 ☐ ✓

Teknosys

00867 Help! 1.02 88 ☐ ✓

Get the Most Out of System 7 With Super 7 Utilities



1 Mighty Menus:

Are tear off menus which are available to you from any application including the Finder.

2 Printer Picker:

You'll select your printers from one, handy pull-down menu.



3 Super Comments:

Displays Get Info comments in Open dialogs and lets you create Get Info comments in the Save and Save As dialogs.

4 Desktop Extras:

Allow you to move or copy a file, folder or group of files and folders to a destination folder without opening up all the folders, thus saving time and eliminating desktop clutter.



5 Trash Alias:

Automatically deletes aliases of applications, files or folders when those files are emptied from the trash, eliminating dangling aliases. This utility alone can save you hours of frustration and confusion.

6 Helium Pro:

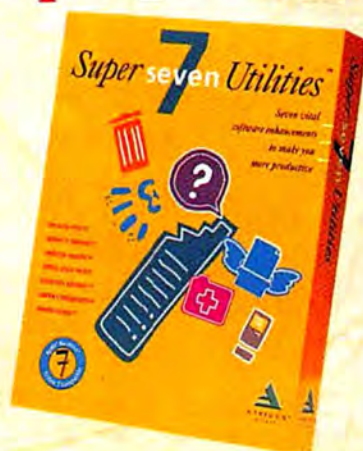
Lets you toggle Balloon Help on and off with quick keyboard commands.



7 Speed Beep Pro:

Allows you to customize the warning tones generated by your Mac.

Environmentally-Responsible Software: Atticus Software is one of the first companies to provide a return envelope so that customers may return the folding box and cardboard liner for re-use. Extra consideration has been given to the package to minimize waste. All materials are recyclable.



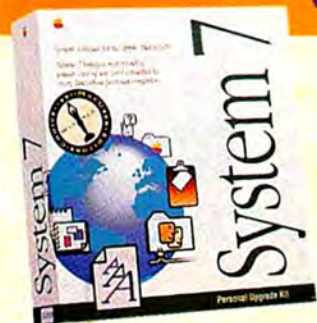
Super 7 Utilities.....\$62

Atticus Software #05679

This collection of seven vital performance enhancement utilities exclusively for System 7 makes your Mac more powerful and productive than ever. Each utility is easy to install and use.

Atticus Software provides FREE and unlimited technical support for registered users. Support personnel can be reached via telephone, fax and America OnLine and CompuServe information services.

7 Super Reasons To Switch To System 7



System 7.0 Personal Upgrade\$78

Apple Computer Co. #05433

3 File Sharing:



If you're part of a network, you can share any folder or volume on your hard disk with other users—without using a dedicated server!

4 Better Font Handling:

Apple's new scalable-font technology is now built into every Mac, giving users the benefits of smooth type at sizes from 1 to 32,768 points, on-screen as well as on paper.



5 Aliasing:



Imagine that you could keep every file from every disk, cartridge, and network server you have access to—on your hard disk. Imagine that you could arrange your work by date, topic, application, filename—all at the same time.

6 Finder Windows:

Organizing and accessing files is much easier with System 7.



Super 7 Utilities • System 7—Bundle

Now you can purchase both super-productive programs for one incredible low price. If you're not running System 7 and Super 7 Utilities, you're not getting the most from your Mac. This offer will last for a limited time, so order today! Our Mac sales advisors are standing by at 1-800-248-0800. #05758



1 Multitasking:

If you haven't been using MultiFinder, the gentle push of System 7 will introduce you to the world of doing two or more things at once. With System 7 you can always open more than one application at a time!

2 Publish and Subscribe:

"Publish" part of your document (graphic, chart, text...) to one or several other documents. When you change the original, the others will update automatically!

7 Balloon Help:

Point to any element in any application and click. Balloon help tells you what it is and how it works!

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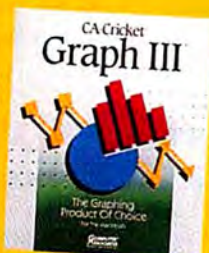
\$134

Looking for a complete entry-level accounting package? Simply Accounting contains everything you need to get up and running in a flash: a primer that walks you through basic accounting principles, understandable documentation and a complete tutorial. Computer Associates #04475 ✓

CA-Cricket Graph III

Designed for scientists, engineers and business people, CA-Cricket Graph offers all the powerful features you need—data access and manipulation, multiple chart types, graph attributes and formatting—in an easy-to-use package. Computer Associates #00203 ✓

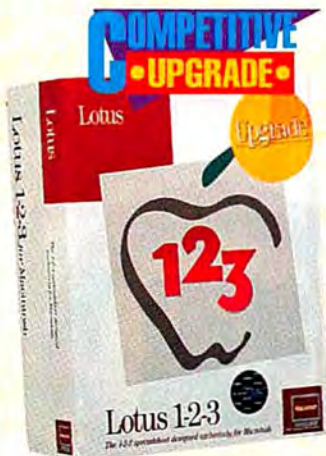
\$134



Cricket Draw III 1.1

\$199

CA-Cricket Draw is the fully-featured drawing program for producing professional-quality graphics on the Mac. It features high-end drawing power with its Bezier-based tool palette, flexible color interface and more. Computer Associates #04414 ✓



Lotus 1-2-3 for the Mac Competitive Upgrade

\$94

Move up to the power of Lotus 1-2-3, designed exclusively for the Macintosh. Upgrade from a competing spreadsheet at this enticing upgrade price. Lotus 1-2-3 is powerful and easy to use. You'll find innovative spreadsheet capabilities that provide intuitive access to commonly used functions. It even allows you to customize your desktop to fit your individual work style. And it's completely compatible with Apple's new System 7 operating system and all earlier versions of 1-2-3. To qualify simply send us the first page from the user manual of your competing spreadsheet software product. Lotus #00518

Lotus 1-2-3 for the Mac #00507 \$328



MacMoney 3.5

\$57

MacMoney is a full double-entry personal and small business bookkeeping system and financial planning tool. MacMoney tracks expenses, bank accounts, credit cards, assets, liabilities, cash and income. You can create up to 250 accounting categories and divide transactions among as many as 8 categories. Survivor Software #01582 ✓

Invoice It #02814 \$48

White Knight 11

\$81

White Knight 11 (previously known as Red Ryder) has been called the best all-around telecommunications program available. It gives you technical sophistication, flexibility and user-friendliness... at a great price. Freesoft #02881



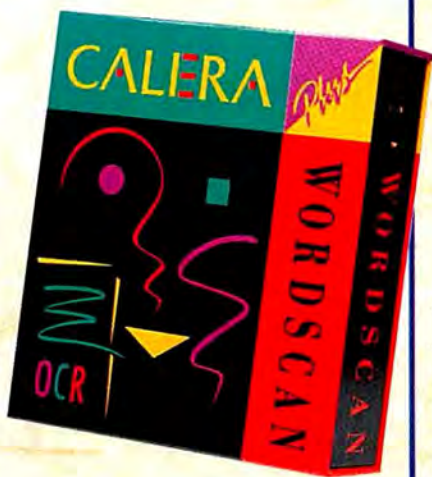
SCAN IT RIGHT WITH WORDSCAN PLUS

WordScan Plus for the Mac

\$374



WordScan Plus is one of the most sophisticated OCR systems you can purchase for your Macintosh. It recognizes virtually all business fonts and page layouts and it's capable of capturing everything from bold, italic and underlined fonts to tables, lists and multiple columns. Plus, you get a super-advanced Pop-Up Verifier which displays an enlarged original image of any questionable word or character for effortless on-screen proofing and editing of the scanned document. You also get Multi-Zone Templates, AutoClipping, Style Sheets, Multi-Job Processing and more. Calera Recognition Systems #04412



Volume 4: World Flags

\$67

Volume 4: World Flags Contains exquisitely detailed national and civil flag illustrations from all the independent and dependent countries of the world, plus various international, organization and code flags. Dream Maker #04282 ✓

CODE #21002

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TransWarp CI w/ FPU

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Make your Mac IIci as fast as a IIx! With the TransWarp CI static RAM cache you'll get reliable performance at more than

twice the speed of the standard IIci. TransWarp CI includes a System 7-compatible Control Panel Device that allows you to turn the accelerator on and off as desired. The software also includes a SANE patch called '882 Express. This patch can improve the speed of programs that use Apple's SANE package for their math functions by as much as 500%. The board also includes a 50MHz 68882 Floating Point Unit (FPU) math chip. The FPU greatly enhances the speed of math functions, dramatically improving the performance of spreadsheet, CADs and other math-based programs. Applied Engineering #04072

► The Speed

TransWarp CI was designed specifically for the Mac IIci—without compromise. Using a 64K fast-static RAM cache together with a 50MHz 68030 processor, TransWarp CI gives you reliable performance at *more than twice the speed of the standard IIci*.

► The Fit

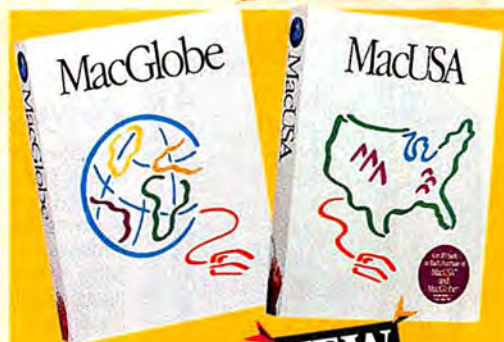
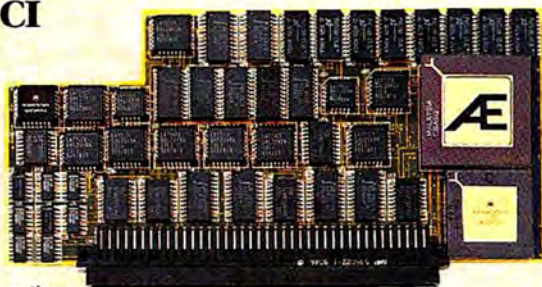
The board plugs directly into the IIci's cache socket. Its thoughtful design allows room for mass storage 5.25" hard drives.

► The Enhancement Experts

Best of all, TransWarp CI accelerators are manufactured by Applied Engineering, long a leader in Apple enhancement products. AE has more than twelve years of experience producing feature-laden peripherals that set the standard for quality and reliability.

► The Warranty

TransWarp CI is covered by the manufacturer's full 1-year warranty covering parts and labor.



NEW

MacGlobe

\$44

MacGlobe is the geography tool for anyone whose interests transcend their own time zone. It Provides stunning country maps and global information that you can use for presentations, overheads and reports. PC Globe #04328 ✓✓

MacUSA

\$32

MacUSA captures the rich panorama of life in America and puts it right in the palm of your hand. MacUSA is the ultimate national portrait, endlessly entertaining and informative, loaded with colorful maps and charts, even state flags and state songs. PC Globe #05479 ✓✓

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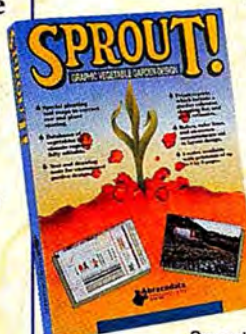
With Architecture you'll draw your own floor plans, side view building plans and plan structural details. The program automatically indicates scale, calculates lumber and does detail drawing. The overlay feature allows layering of details such as electrical or plumbing schematics and multiple floors. Abracadata #03609 ✓✓

Design Your Own Home Interiors

Interiors makes it easy to plan the decor of your home or office. Use the drawing tools and supplied patterns to bring your interiors to life! View the room from the top or from four different side perspectives. Abracadata #03611 ✓✓

Design Your Own Home Landscape

With Landscape you get a variety of drawing tools and patterns to help you plan. Use the built-in object library or draw your own trees, shrubs, etc. then view your design from four different perspectives. Plants can be aged on screen to help you determine proper placement. Comes with a variety of drawing tools and patterns. Abracadata #03610 ✓✓



Sprout!

\$42

Sprout! is a complete computer planning tool for vegetable gardeners. With it you can easily produce a graphic, scalable garden plan with correct plant and row spacing. In addition,

Sprout! contains a fully editable database of vegetables for 7 climate regions. Prints out garden layouts, calendars, shopping lists and reports. Abracadata #05085 ✓✓



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Power Portrait

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This affordable, easy-to-install full-page display plugs directly into the SCSI port of your PowerBook, Classic, ClassicII SE or SE/30 computers. Its 15" full-page display features built in acceleration that lets you race through graphic displays. Choose between 72, 80 and 88dpi. Create a virtual two-page desktop to power through multi-page tasks. Granite color to match PowerBook. Sigma Designs #00571

The Platinum Power Portrait

#00399 \$784

PowerModem

24/96 SR Internal

\$205

Make your Mac work harder for you with the unbelievably affordable PSI PowerModem. The PowerModem is not only an internal send/receive fax modem, but it's also a 2400bps Hayes-compatible data modem. The Fax is Group III compatible, sends at a full 9600bps and receives transmissions at 4800bps. PowerModem will dramatically improve your PowerBook's performance. It lets you continue to work in any application while its intuitive software performs in the background. PSI #04948



Premiere Leather PowerBook Case

\$138

Pamper your PowerBook, in style! The Targus Premiere Leather PowerBook Case establishes a new standard of quality for business-related luggage. This dual-purpose case combines a luxurious, feature rich, leather briefcase together with a functional laptop carrying case. The Premiere offers four fully-lined document sections in addition to a padded computer compartment. The zippered portfolio section features Velcro-secured disk pockets, pen/pencil and business card holders, two pockets for miscellaneous items, a snap-on key ring and a pouch for your glasses. Targus #05284

Universal

PowerBook Case #07454 \$68



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#05646

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CPU offers unmatched convenience. Choose menu items and dialog box selections directly from the keyboard. Spindown the hard disk, adjust the backlight, invoke security, or sleep with a single keystroke.

More Productivity

Designed exclusively for the PowerBook, CPU instantly adapts to your changing environment. A flexible menu of personal settings like Home, Office, Travel, Meeting or Power Saver lets you work more efficiently. CPU even adjusts your settings automatically between battery and AC power use.

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This "aggressively priced package" (MacWEEK 6/92) is "the first utility program to help conserve power and manage security on PowerBooks" (InfoWorld 7/92). CPU provides all this and over a dozen other controls, including Instant-Wake, Cursor Finder, Battery Manager, and the unique LCD Screen Saver.

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Norton Utilities 2.0 ↓↓↓↓½

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Now Utilities 3.0 ↓↓↓↓½ **\$83**



According to MacUser, "Now Utilities is a must-have for experienced users and novice users alike." Included in the collection are: Super Boomerang, rated as the best of the Open & Save dialog box enhancers; StartUp Manager, a powerful extension manager; and WYS/WYG Menus, which groups font families together by typeface. Plus you get: NowSave, Screen Locker, AlarmsClock, Profiler, MultiMaster, DeskPicture and NowMenus! All components are System 7 compatible. Now Software #04191



Infinity Optical 3.5" Drive

\$1628

The next phase of optical technology has arrived! The PLI Infinity Optical read/write drives redefine high-capacity data storage. You can store up to 128MB of data on a single cartridge that is almost indestructible, and weighs less than five diskettes. Each cartridge is highly resistant to shock and magnetic fields, providing safe and portable storage. Ideal for transporting graphics files, databases or any complex software across the office or the nation. Significantly more affordable than the first generation rewritable optical drives and almost twice as fast, the Infinity Optical 3.5" makes the benefits of magneto-optical storage available to everyone. Backed by the manufacturer's 1-year warranty with support provided toll-FREE. PLI #04698



Infinity 40 Turbo

\$598

PLI's Infinity 40 Turbo provides you with all the storage flexibility you need, and the transfer speed you're looking for. Handy removable cartridges provide infinite storage potential. With PLI's TurboCache disk accelerator software, you can achieve near zero effective average access times. PLI drives are notorious for long life and dependable service. All PLI drives are factory tested to meet the highest industry specifications. One cartridge and all the necessary cables are included. PLI #02181

PocketHammer50 Hard Drive

\$524

This rock-solid, built-to-last drive delivers high-end dependability for valuable data. High performance, superb engineering and reliability are built into every compact PocketHammer drive. It's small size and low weight (barely 4 pounds) make it easy to transport and secure. Assembled by hand utilizing brushed aircraft aluminum enclosures, PocketHammers function flawlessly in the most demanding environments. For professional users whose data is irreplaceable, the PocketHammer is the only choice. The PocketHammer50 includes external SCSI termination, push-button SCSI-ID selection, external fuse and software. FWB #00505



DupLocator **\$58**

Find and organize your duplicated files, fast! DupLocator quickly locates and lists duplicated files. You can then use DupLocator's tools to sort, sift, serialize, identify, delete, move, copy, compare, color, catalog, compress or modify the listed files. It works with floppies, hard disks, removable media, CDs, tape drives, shared volumes—just about any storage media that can be identified as a Macintosh formatted volume. It will even mount the most stubborn of SCSI devices. It's capable of handling over 16,000 volumes at once! The highly acclaimed "Batch" feature provides a temporary storage place for files to be manipulated at a later date. Midnight Software #05598 ✓

- Locates Duplicates—No other method exists.
- Dual Directory Path lists—Allows the directory paths of similar files to be viewed and compared side by side.
- Continuous Scan—Allows rapid insertion of floppy disks.

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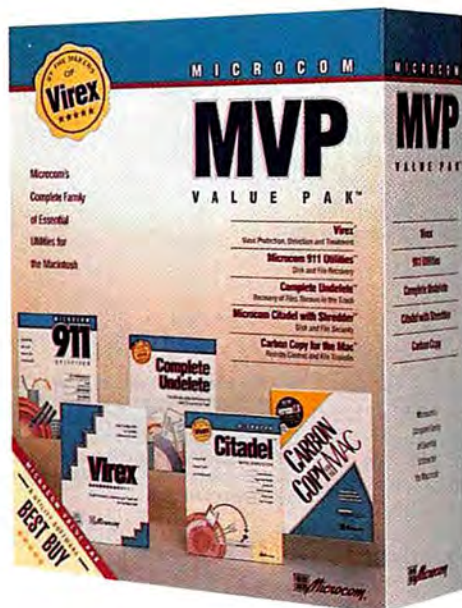
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ALDUS FREEHAND	3.1	1MB/6.0.5	6/92	*
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ALDUS PERSUASION	2.1	4MB/6.0.5	*	
ALDUS SUPER 3D	2.5	2MB/6.0.5	*	
ALDUS SUPERCARD	1.6	2MB/6.0.4		\$50
ALDUS SUPERPAINT	3.0	1MB/6.0.5	3/92	\$65
ALIAS SKETCH	1.0.2	8MB/6.0.5	8/92	FREE
ALLIANCE POWER TOOLS	2.42	1MB/6.0.4	*	
AMAZING PAINT	1.0.3	512KE/6.0.4		\$15
AME	2.03	1MB/6.0.2		\$49.95
ANTITOXIN	2.0	1MB/6.0		\$15
APPLESHARE FILE SERVER	3.0	512K/3.2	*	
ARCHICAD	4.03	5MB/6.0	6/92, 10% OF LIST	
ASHLAR VELLUM	2.10	4MB/6.0.2	*	
ASHLAR VELLUM 3D	2.10	4MB/6.0.2	*	
ATONCE	1.2	1MB/6.0.5	*	
AUDIOMEDIA	2.02	2MB/6.0.7		\$29
AURACAD	3.1	1MB/4.0		\$90
AUTHORWARE PRO	1.7	2MB/6.0.5	*	
AUTOCAD	12	5MB/6.0.5		\$500
AUTOSAVE II	2.0	512KE/4.2	*	
A/UX	3.0	4MB/6.0.5	*	

PRODUCT	V.	REQ.	*	\$
AZIMUTH	2.1	1MB/6.0.2		\$45
BACKMATIC	2.0	1MB/4.2	2/92	*
BILL-IT	4.0	1MB/6.0.3		\$29
BUSINESS SENSE	1.6	1MB/6.0.7		\$69
CA-CRICKET PRESENTS	2.0.1	1MB/6.0	*	
CALENDAR	1.1.2	512KE/6.0		FREE
CANOPENER	2.0	512K/3.0		\$29
CANVAS	3.0	1MB/6.0.2	1/92	*
CAPTURE	4.0	1MB/6.0		\$30
CARBON COPY MAC	2.0	1MB/6.0.5	4/92	*
CAT III	1.2	1MB/6.0	*	
CHECKLIST	2.0	1MB/6.0	2/92	*
CHECKMARK PAYROLL	4.6	512K/4.2		\$50
CINEMATION	1.0	4MB/6.0.7	7/92	NA
CLARIS CAD	2.0v3	2MB/6.0		\$79
CLARIS RESOLVE	1.1	1MB/6.0.5	1/92	\$20
CLARISWORKS	1.0	1MB/6.0.5	3/92	NA
CLICKCHANGE	1.05.2	1MB/6.0.4		\$5
CLICKPASTE	2.1	1MB/6.0		\$20
CMS UTILITIES	7.0	2MB/7.0		\$25
COLOR MACCHEESE	2.08	1MB/6.0.5		\$15
COLORSTUDIO	1.5	4MB/6.0.5	3/92	*
COMPUSERVE INFORMATION MANAGER	1.5.1	1MB/4.1	*	
COMPUSERVE NAVIGATOR	3.1	512K/4.1	*	
CONCERTWARE+	4.0	512KE/4.2		\$15
CONNECTIONS	2.1	2MB/6.0.5	4/92	FREE
CONTROL CLASSIC	1.1.3	4MB/6.0.5		FREE
CORRECT GRAMMAR	3.0	1MB/4.2	8/92	\$29.95
DATA CLUB CLASSIC	2.0	2MB/6.0	8/92	*
DATA SHAPER	1.2	1MB/6.0		\$40
DECK	1.03	2MB/6.0.7		FREE
DELTA GRAPH PROFESSIONAL	2.0	2MB/6.0.5	5/92	\$69.95
DELUXEMUSIC CONSTRUCTION SET	2.5	512K/6.0.2	*	
DESCARTES	1.04	2MB/6.0.3		FREE
D.E.S. DOCUMENT EXCHANGE SYSTEM	4.1	1MB/6.0	*	
DESIGNCAD	3.0	2MB/6.0.5	*	
DESIGNCAD 2D/3D	3.0	2MB/6.0.5		\$50
DESIGNSTUDIO	2.0	1MB/6.0	11/91	*
DESKPAINT	3.07	1MB/6.0.5		\$19.95
DIGITAL DARKROOM	2.0	1MB/6.0.4		\$80
DISK DOUBLER	3.7	1MB/6.0.2		\$15
DISKEXPRESS II	2.10	1MB/6.0		FREE

continues

V. = version #. Req. = min. RAM and system software required. * = last time (in the past year) this or an earlier version was reviewed. \$ = cost of update to registered owners. NA = first version, not applicable. * = contact your dealer for update policy. Blue = new version. Yellow = reviewed product.

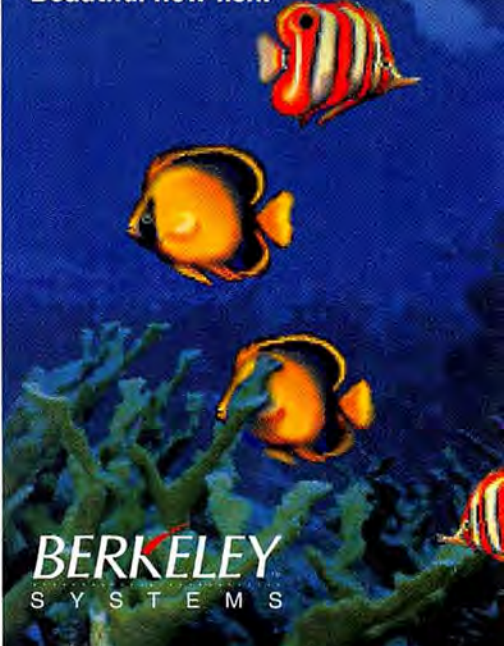
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DISKTOP	4.0.2	1MB/6.0	*	
DISPLAY ADBUILDER	1.1	1MB/6.0.3	*	
DOLLARS & SENSE	5.0	512KE/3.2	*	
DOUBLE HELIX	3.5	1MB/6.0	\$99	
DREAMS	1.1	1MB/6.0.2	*	
DYNAPERSPECTIVE	2.3	2MB/6.0.5	\$149	
DYNODEX	2.0	1MB/6.0	2/92	\$25
EASY COLOR PAINT	2.02	1MB/6.0.2	*	
EHFEP	2.0	1MB/4.1	\$445	
EMPOWER II	4.0.7	2MB/4.2	*	
ENCORE	2.5	2MB/6.0.2	*	
ENHANCE	2.0	2MB/6.0.3	11/91	\$100
EVOLVE	1.1	2MB/5.3	\$25	
EXODUS	4.0	2MB/6.0.3	\$75	
EZ VISION	1.0	1MB/6.0.3	NA	
FASTBACK PLUS	2.6	1MB/6.0	4/92	*
FAST FORMS	2.0	1MB/6.0	\$25	
FASTLABEL	3.1	1MB/6.0	\$10	
FASTTRACK	1.5	512KE/5.5	\$20	
FILEGUARD	2.7	1MB/4.2	\$18	
FILEMAKER PRO	2.0	1MB/6.0	\$89	
FILEVISION V	1.1	1MB/6.0.2	*	
FILMMAKER	2.5	5MB/6.0.3	*	
FINALE	2.6	1MB/6.0.2	FREE	
FLEXICAD	2.20	5MB/6.0.4	*	
FONTMONGER	1.0.5	2MB/6.0.2	FREE	
FONTGRAPHER	3.5	1MB/4.2	*	
FONTSHARE	2.2	1MB/6.0	FREE	
FONTSTUDIO	2.0	1MB/6.0.5	*	
FORM Z	2.0	2MB/6.0	*	

PRODUCT	V.	REQ.	*	\$
FOXBASE+/MAC	2.01	1MB/6.0	FREE	
FRAMEMAKER	3.0	1MB/6.0	3/92	*
FREEDOM OF PRESS LIGHT	3.0.3	2MB/6.0.3	\$25	
FREEDOM OF PRESS PROFESSIONAL	3.0.2A	4MB/6.0.3	\$250	
FULL IMPACT	2.0	1MB/6.0	\$50	
FULLWRITE PROFESSIONAL	1.5	2MB/6.0.2	*	
GENERIC CADD	2.0	2MB/6.0.5	\$100	
GEOQUERY	3.02	1MB/6.0	*	
GOFER	2.0	1MB/4.1	6/92	\$25
GQL	3.0	2MB/5.0	\$75	
GRACELAN	2.0	1MB/6.0.5	*	
GRACELAN UPDATE MANAGER	1.0	2MB/6.0.5	NA	
GRADE MACHINE	5.0	1MB/6.0.5	50% OF LIST	
GRAMMATIK MAC	2.05	1MB/6.0	\$15	
GREAT GANTT	1.4	1MB/6.0	*	
GREAT PLAINS ACCOUNTING SERIES	6.0	1MB/4.2	*	
GREATWORKS	1.0	1MB/6.0.2	1/92	NA
GUIDE	2.0	512K/4.1	\$50	
HAND-OFF II	2.2.5	2MB/6.0.2	FREE	
HELP	1.0.1	1MB/6.0	2/92	FREE
HYPERCARD	2.1	1MB/6.0.3	\$49	
HYPERDA	2.1	1MB/6.0	\$29	
ICON-IT	2.1	1MB/6.0.2	*	
IF-X FORMS DESIGNER	1.1	1MB/6.0	FREE	
IMAGE GRABBER	3.0	1MB/6.0	2/92	\$18
IMAGESTUDIO	1.7	1MB/6.0	\$99	
INFINI-D	2.0	4MB/6.0.4	*	
INFOLOGIC ENVELOPE	1.1C	512KE/4.0	\$5	
INITPICKER	2.02	1MB/6.0	\$10	

PRODUCT	V.	REQ.	*	\$
INSIDE OUT	II	1MB/6.0.2	*	
INSIGHT EXPERT ACCOUNTS PAYABLE	2.1.1	1MB/6.0	*	
INSIGHT EXPERT ACCOUNTS RECEIVABLE	2.2	1MB/6.0.2	*	
INSIGHT EXPERT GENERAL LEDGER	2.2	1MB/4.2	\$99	
INSPIRATION	3.0.1	1MB/4.2	12/91	*
INSTANT-EXPERT PLUS	2.0	1MB/5.0	FREE	
INTOUCH	1.1.7	512KE/4.2	3/92	FREE
ITHINK	2.0	2MB/6.0.2	\$149	
KALEIDAGRAPH	2.1	2MB/6.0.5	\$20	
KIWIENVELOPES	3.1	512KE/4.1	*	
LABVIEW	2.2	4MB/6.0.5	*	
LANGUAGE SYSTEMS FORTRAN	3.0	2MB/6.0.4	\$100	
LAPLINK MAC III	3.2	512K/2.0	FREE	
LAPLINK MAC PLUS III	3.0	512K/2.0	*	
LASERPAINT COLOR II	1.02	1MB/6.0.3	FREE	
LETRASTUDIO	2.0	2MB/6.0	10/92	*
LIGHTSPEED COLOR LAYOUT SYSTEM	2.5	1MB/6.0.5	*	
MACANALYST	3.1	2MB/6.0	*	
MACARCHITRION	5.5	2MB/6.0.3	*	
MACBRAIN	3.0	1MB/6.0.5	\$295	
MACDRAFT	2.1	1MB/6.0.2	*	
MACDRAW II	1.1	1MB/6.0	*	
MACDRAW PRO	1.5	2MB/6.0.5	11/91	*
MACENVELOPE	5.1	1MB/4.2	\$29.95	
MACENVELOPE PLUS	2.0	512KE/3.2	\$50	
MACFLOW	3.7	1MB/6.0	\$30	
MACFORTRAN II	3.1	4MB/6.0.3	\$99	



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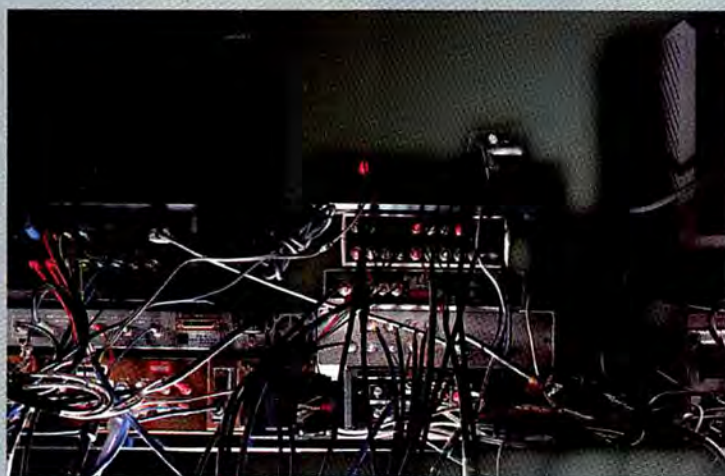
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MACLABELPRO	1.5	1MB/6.0.3		\$19.95
MACLINKPLUS/PC	6.0	1MB/6.0.3	3/92	*
MACMONEY	3.5	512K/4.0		\$12
MACPAINT	2.0	512K/3.2		\$25
MACPALETTE II	2.2	1MB/6.0.5	9/92	*
MACPHONEBOOK	3.0	1MB/6.0		*
MACPLOT PROFESSIONAL	4.0	1MB/6.0.5		*
MACPLOT STANDARD	4.0	1MB/6.0.5		*
MACPROJECT II	2.51	1MB/6.0		\$99
MACRECORDER	2.03	512K/3.2		*
MACRENDERMAN	1.1	5MB/6.0.5		\$75
MACROMIND DIRECTOR	3.1	2MB/6.0.5		\$149
MACSCHEDULE	2.5	1MB/6.0		\$30
MACSCHEDULE PLUS	1.0.5	1MB/6.0		FREE
MACSPIN	3.01	512K/4.3	3/92	*
MACTERMINAL	3.0	512K/3.2		\$65
MACTOOLS	2.0	2MB/6.0	10/92	\$55
MACTOPS	3.1	1MB/6.0.5		*
MACVISION	4.1	2MB/6.0.4		*
MACWRITE II	1.1v2	1MB/6.0		FREE
MANAGING YOUR MONEY	4.0	1MB/6.0.3		*
MANAPRO GENERAL LEDGER	3.1	1MB/6.0		NA
MAPLE V		2MB/6.0.7	5/92	*
MARCOPOLO	1.1	1MB/6.0		FREE
MARKET ANALYZER PLUS	2.0	2MB/6.0.2		\$99
MARKETMASTER	3.5	1MB/6.0.3		*
MARKUP	2.0	1MB/6.0		\$30
MASTERFINDER	1.1	1MB/6.0.5		*
MASTERJUGGLER	1.57	512K/6.0		\$15
MASTERPLAN	1.03	512K/6.0.5		FREE

PRODUCT	V.	REQ.	*	\$
MASTER TRACKS PRO	5.0	1MB/4.1		\$45
MATHCAD	2.06	1MB/6.0.2		FREE
MATHEMATICA	2.0	1MB/6.0		*
MATHTYPE	2.1.1	512K/6.0.2		*
MATHWRITER	2.0	2MB/6.0.5		*
MATLAB	4.0	1MB/3.0		*
MEDIATRACKS	1.01	1MB/6.0.2		FREE
MENUFONTS	4.01	1MB/6.0.5	5/92	\$20
METAPICT	2.0	512K/4.5		\$69
MICHAEL'S DRAW	1.0	1MB/6.0.5	12/91	NA
MICROPHONE II	4.0	2MB/6.0	7/92	*
MICRO PLANNER MANAGER	1.0	2MB/6.0		*
MICROSOFT EXCEL	4.0	1MB/6.0.2	10/92	*
MICROSOFT FILE	2.0	512K/3.2		*
MICROSOFT MAIL	3.0	1MB/6.0.2		*
THE MICROSOFT OFFICE	1.5	1MB/6.0.2		\$129
MICROSOFT POWERPOINT	2.01	1MB/6.0		FREE
MICROSOFT PROJECT	3.0	2MB/6.0.4	11/91	\$149
MICROSOFT WORD	5.0	512K/3.2	4/92	\$129
MICROSOFT WORKS	3.0	1MB/6.0.5		\$79
MINDLINK	2.0	1MB/6.0		*
MINDWRITE	2.1	512K/4.2		*
MINICAD+	4.0	1MB/6.0		*
MOCKPACKAGE PLUS UTILITIES	4.4	512K/3.2		\$15
MODELSHOP II	1.1	1MB/6.0.2	3/92	FREE
MORE	3.1	1MB/4.1		*
MR. FILE	1.1.1	1MB/4.2		FREE
MULTI-AD CREATOR	3.5	2MB/6.0.3		\$149
MULTILEDGER	2.0	512K/3.2		\$75
MUSICPROSE	2.1	1MB/6.0		FREE
MUSIC PUBLISHER	2.5.2	1MB/6.0	12/91	\$15

PRODUCT	V.	REQ.	*	\$
MYADVANCEDMAILLIST	3.0	512K/4.1		*
MYDISKLABELER III	3.0.4	1MB/6.0		*
M.Y.O.B.	3.0	1MB/6.0		\$79
MYTIMEMANAGER	4.0	1MB/6.0.3		*
NETMINDER ETHERNET	2.1	2MB/6.0		\$100
NETWORK BUNDLE FOR THE MAC	3.0	512K/3.2		*
NETWORK SUPERVISOR	2.0	2.5MB/6.0.3	8/92	*
NISUS	3.06	1MB/6.0.2	8/92	*
NORTON UTILITIES FOR MACINTOSH	2.0	1MB/6.0.4	10/92	\$39
NOW UTILITIES	3.0.1	1MB/6.0.4	2/92	\$49
NUBASE PRO	1.5	1MB/4.1	9/92	FREE
OMNIPAGE	3.0	4MB/6.0		\$25
OMNIPAGE PROFESSIONAL	1.0	5MB/7.0		*
OMNIS SEVEN		2MB/6.0		*
ONCUE II	2.0	512K/6.0.2		\$34.95
ON LOCATION	2.0	1MB/6.0.5	6/92	\$25
ON SCHEDULE	2.0	1MB/3.0		*
PANORAMA	2.03	1MB/6.0	5/92	*
PERFORMER	3.61	2MB/6.0.2		*
PERSONAL PRESS	2.0	1MB/6.0.3		\$39.99
PHONENET LIAISON	3.0	1MB/4.2		\$75
PHOTOMAC	1.5	2MB/6.0.3		\$75
PICKTURE	1.0	512K/6.0		NA
PICTUREBOOK+	1.0	1MB/6.0	2/92	*
PICTUREPRESS	2.0	2MB/6.0.4		*
PIXELPAINT	2.1	2MB/4.1		*
PIXELPAINT PROFESSIONAL	2.01	4MB/6.0.5		\$125
PLAINS & SIMPLE	1.06	1MB/3.2		*

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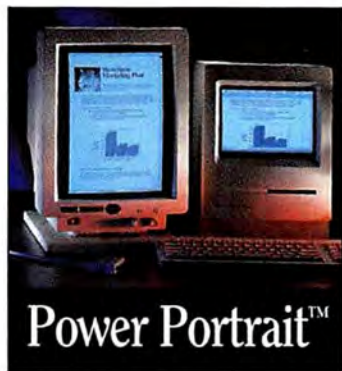
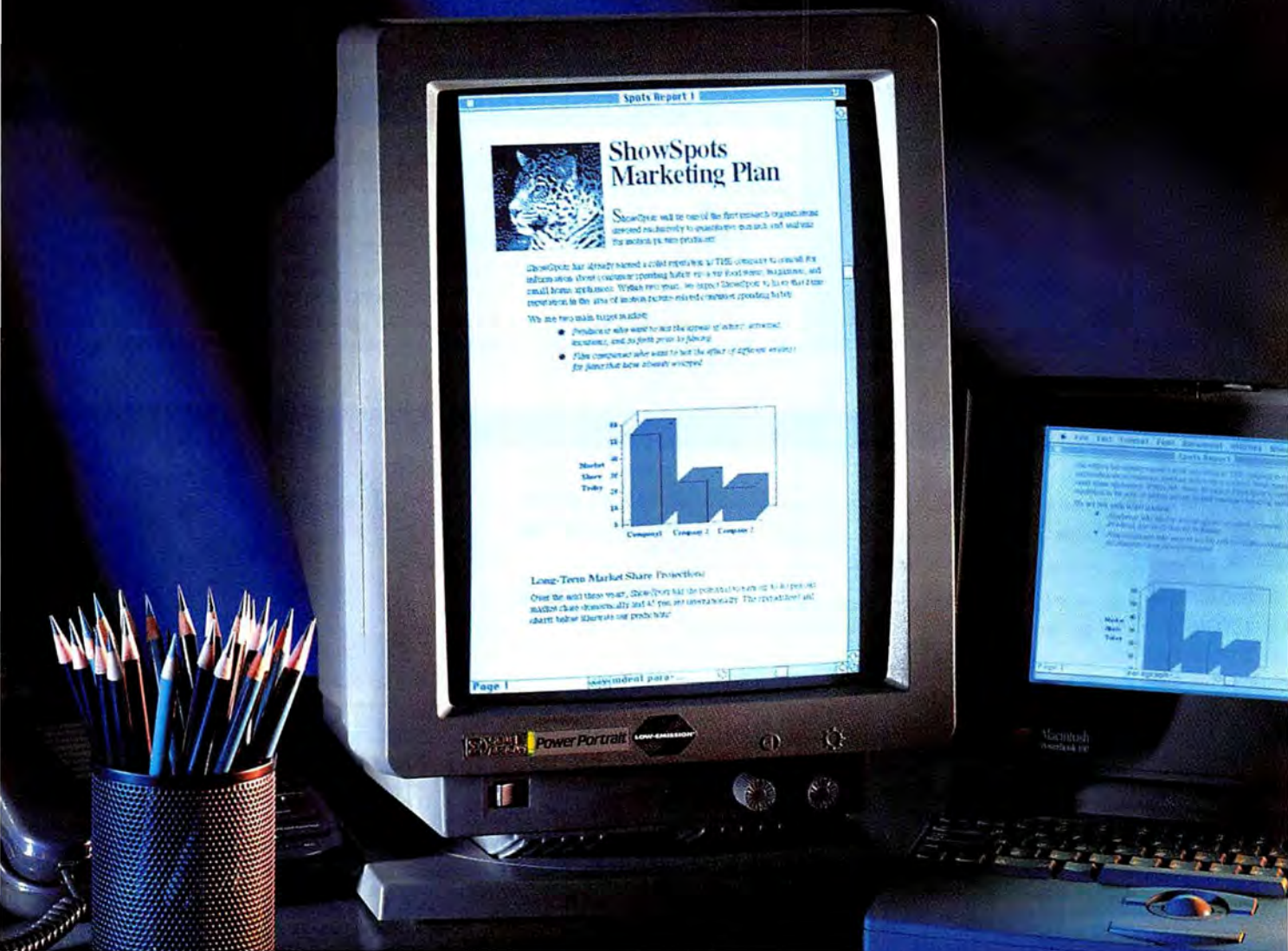
Circle 128 on reader service card

PRODUCT	V.	REQ.	+	\$
PLANISOFT	1.3	512K/4.2		\$48
POSTERWORKS	2.1	2MB/6.0.3	*	
POWERDRAW	3.0	1MB/6.0	*	
POWERSTATION	2.5.5	512K/4.1	*	
POWERTRAX	1.1	1MB/6.0.5		FREE
PRACTICA MUSICA	2.2	512K/3.2	*	
PRESENTER PROFESSIONAL	1.0	5MB/6.0.5		NA
PRO-CITE	2.0	1MB/6.0.2	6/92	\$95
PRODIGY	3.1	1MB/6.0		FREE
PROFESSIONAL COMPOSER	2.3	1MB/6.0.3		FREE
PROGRAPH	2.5	2MB/6.0	6/92	\$49.99
PROTOTYPYER	3.0	1MB/4.1		\$99
PUBLISH IT	2.0	1MB/6.0	*	
PUBLISH IT EASY	2.5	1MB/4.2		\$49.95
PYRO	4.0.1	512K/4.1		\$15
QUARKXPRESS	3.1	2MB/6.0.5	7/92	*
QUICKDEX II	2.3	1MB/6.0.5	*	
QUICKEN	3.0	1MB/6.0.5	12/91	*
QUICKKEYS	2.1.2	1MB/6.0.2	*	
QUICKLETTER	1.1.5	1MB/6.0		\$25
QUICKMAIL	2.5.1	512KE/3.2	*	
QUICKSHARE	2.0	512KE/3.2	*	
QUICKSHOT	2.1	1MB/4.2		\$5
RAGTIME 3	3.1	2MB/6.0		\$150
RAY DREAM DESIGNER	2.2	4MB/6.0.5	9/92	*
READ-IT OCR PERSONAL	3.0.A	2MB/6.0.5		\$49
READ-IT OCR PROFESSIONAL	3.0	2MB/6.0.3	*	
READYSETGO	4.5	1MB/6.0	*	
RETROSPECT REMOTE	1.3	1MB/6.0	*	
RIGHTWRITER	3.2	512K/3.0		\$9.95
RIVAL	1.19v	1MB/6.0		FREE
RUNPC	3.1.2	512K/6.0.4		NA
SAM	3.0	1MB/6.0		\$29
SCHEDULEMAKER	3.01	1MB/6.0		\$25
SCSI PROBE	3.4	2MB/6.0		FREE
SCULPT 3D	2.1	8MB/6.0.5		FREE
SCULPT 4D	2.1	8MB/6.0.5		\$1000
SEND EXPRESS	2.1	1MB/6.0.2	*	
SENSIBLE GRAMMAR	2.1	1MB/5.0		\$30
SHADOWWRITER	2.0	2MB/6.0.3		\$20
SILVERLINING	5.31	1MB/6.0	*	
SMALL BUSINESS ACCOUNTING SYSTEM	2.1	512K/4.1		FREE
SMART ALARMS	3.07	1MB/6.0.2		\$28
SMARTCOM II FOR THE MAC	3.3	1MB/6.0.5	*	
SMARTFORM DESIGNER	1.1	1MB/6.0		FREE
SMARTSCRAP & THE CLIPPER	2.1	1MB/6.0.3		\$40
SNAP	3.2	1MB/3.0	2/92	*
SOUND DESIGNER II	2.2	2MB/6.0.5	*	
SPELLING COACH PROFESSIONAL	3.1	512KE/4.2	*	
SPELLSWELL	2.3	512K/3.2		\$20
SPINNAKER PLUS	2.0	2MB/6.0		\$45
STATISTICA/MAC	2.0	1MB/6.0.5		FREE
STATUS MAC	3.0	1MB/6.0	5/92	*
STEPPING OUT II	2.02	1MB/4.1		FREE
STICKYBUSINESS	1.4	512KE/6.0.3	*	
STRATAVISION 3D	2.5	2MB/6.0.3		\$99
STUDIO/8	2.0	2MB/6.0.5		\$30
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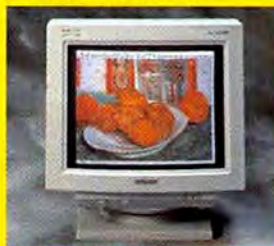
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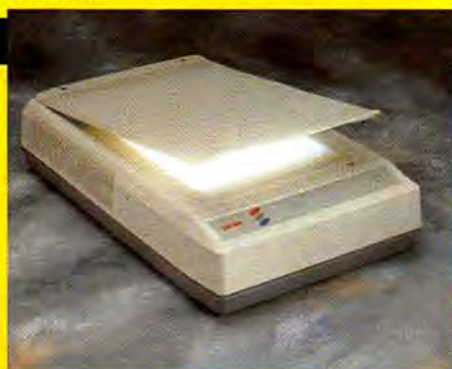
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Lab Notes

Pushing Scanners to the Limit

BY MARK HURLOW

AS WE DISCOVERED DURING OUR LAB testing of slide scanners for this month's feature "Seeing Through Slide Scanners," fine-tuning a scanner to produce the best output in the least amount of time can be a tricky endeavor. For most of our testing, we focused mainly on three areas: speed, scanning resolution versus output resolution, and gamma correction.

Using a Mac IIfx with 8MB of RAM and Adobe Photoshop 2.0, we began by testing scanners that enable you to scan images at different speeds (including the Tamarack/Artix Technologies ArtiScan 600S, the MicroTek ScanMaker 1850S, and the XRS OmniMedia 6cx) to find the fastest setting that could produce a high-quality image. While scanning in the slowest mode usually produces a far better image, it may take considerably longer. For example, at the fastest velocity setting (1), the ArtiScan was able to scan a test slide in 36 seconds, but at the slowest velocity setting (15), the ArtiScan took more than twice that time—85 seconds—to scan the same image. The downside was that the images scanned in 36 seconds suffered severe streaking and flaring. However, the ScanMaker and XRS's OmniMedia showed virtually no difference in quality or speed between the fastest and slowest scan speeds.

By changing a scanner's velocity setting, you actually adjust the speed of the scanning mechanism. However, if the Mac can't receive the data as quickly as the scanner can send it, the scanner must halt and wait for the computer to digest the information before starting again, thus negating the advantage of a higher speed setting. This sudden stopping and starting is what sometimes causes streaked images.

Prescanning Wisely

OUR NEXT TEST FOCUSED ON HOW quickly each scanner can perform a prescan, which you use to select the part of the image you want to scan and to adjust scan settings. To minimize the prescan time, we limited the prescan to an area just big enough to cover the slide and its mount (about 3 inches). Another way to save time during the prescan phase, if you're using a flatbed scanner with a transparency adapter, is to build a frame from stiff black cardboard; this makes

it easier to scan a small area consistently and also helps block unwanted ambient light that might cause loss of color or contrast.

As we expected, prescanning in color mode takes a lot longer than prescanning in black-and-white mode or gray-scale—especially with scanners using a three-pass scheme (a gray-scale scan requires only one pass, whereas most color slide scanners require one pass for each primary color). For example, the ScanMaker took 112 seconds to complete a color prescan, about three times as long as a gray-scale prescan (40 seconds)—and we found no difference in quality between the two.

Scanning Time-Savers

JUDICIOUSLY CROPPING THE PRE-scanned image before doing the final scan can also save a tremendous amount of time. For example, scanning an entire slide, including the mount (40mm by 40mm), on a Leaf Systems LeafScan 35 took 368 seconds, 55 percent more time than the 237 seconds required for the cropped image minus the mount (36mm by 24mm). The reason is obvious: scanning a full-size slide at 1000-dpi resolution

continues



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tion requires 7.1MB of memory, compared with only 3.8MB for a 36mm-by-24mm slide. Generally, the amount of RAM should be equal to three times the image size plus 4MB for running Photoshop. And don't depend on virtual memory. Physical RAM provides much faster performance, especially when the maximum amount of memory is allocated to Photoshop.

Surprisingly, we found that hue intensity can affect scanning speed; that is, some scanners can scan a brighter image faster than a darker image. A test trial on the Barneyscan CIS 3515 showed that a low-density (light) image can be scanned as much as 80 percent faster than a high-density (dark) image. Why? When a scanner makes an automatic exposure on a prescan image, it calculates the exposure time for each color. Because rich saturations and high-density colors take longer to expose, they slow the scanning process.

The scanners with a top-to-bottom orientation—the LeafScan 35, the Nikon LS-3510AF, and the ScanMaker 1850S—performed much faster when we rotated the slides 90 degrees. For example, by rotating a slide on the Nikon scanner, we were able to complete the test scan in 174 seconds. The same image took 250 seconds to scan in normal orientation—more than 40 percent longer. When the Nikon performs a scan, it sends the Mac data in columns. Since Photoshop (and scanning software) reads data from left to right, data from a scan must be assembled and sorted into rows, a time-consuming operation, especially at high resolutions. However, if you set the scan orientation to Tall rather than Wide and then rotate the slide 90 degrees before scanning it, the Mac reads the data in rows rather than columns. Once the data is gathered, the scanning software simply rotates it back to the original position.

The Right Resolution

ONE OF THE MOST IMPORTANT FACTORS in choosing a scanner is its resolution. We considered testing each scanner's maximum resolution, which ranged from 300 dpi to 1200 dpi for flatbeds and from 1000 dpi to 4000 dpi for slide scanners. However, we soon realized that scanning at the highest resolutions would be likely to produce more detail than we needed, and would eat up more time as well as disk space. To standardize our tests and provide fairer comparisons between scanners, we decided to use one resolution for slide scanners (1000 dpi) and two (600 dpi and 300 dpi) for flatbeds. Unless your final output will be larger than 5 by 7 inches, a lower resolution will probably suffice anyway. And a 3000-dpi scan won't give you

any better output than a 1000-dpi scan if you plan to use a low-resolution (85-lines-per-inch) printer.

Gamma Correction

PERHAPS THE TRICKIEST ISSUE AND the hardest to understand is gamma setting. Before you can understand gamma correction, you need to know how data is obtained and interpreted by scanners.

A scanner contains CCDs (charge-coupled devices) that read data in a linear fashion. For example, if one color in a scanned image is twice as bright as another color, the CCDs read the brighter color's pixel value as double that of the darker one. A human eye, with its non-linear response to light, sees much less intensity difference between the two. To counteract this disparity—and get realistic-looking scans—you must apply an output gamma correction curve to the scanned data, adjusting its brightness and contrast to more closely parallel the human eye's perception of the image.

There are two types of gamma correction: output gamma mapping, which affects the scanned image itself; and monitor gamma correction, which corrects the appearance of the image on screen, so that the screen image more closely approximates the final output. But because it's easy to confuse monitor gamma correction with image gamma correction, you may think you've altered the real image when only the screen version has changed.

The LeafScan 35 and the ScanMaker 1850S let you customize your own gamma curve with a freehand tool. Where the gamma curve is adjusted upward, the pixels are brightened; where it's adjusted downward, they're darkened.

Without gamma correction, the image will lack shadow detail but be rich in highlight detail. We found that, depending on the intensity of the image, a gamma setting of 1.4 (the typical default setting) to 1.8 usually yields good results.

By experimenting with the output gamma setting in conjunction with brightness and contrast settings, we changed the brightness and contrast to produce screen images that retained all shadow and highlight details. Then we sent each scanned image to an output bureau for color balancing plus hue and saturation correction to match the original slide. We checked the output for good color matching, and for maximum highlight and shadow detail.

By the time we were through, we had coaxed some excellent output from most of the scanners. But be prepared to invest some time and effort experimenting with speed settings, resolutions, and gamma corrections—as we did—before you get the results you want. **m**

FULL-MOTION VIDEO, CRISP DIGITAL SOUND.

VideoSpigot Turns Your Mac Into A Movie Studio!

REVIEWER'S NOTEBOOK: Capture video from a camcorder, VCR or videodisc player and convert it to QuickTime™ format to play on your Mac. VideoSpigot™ delivers high-quality, 24-bit color digital-video movies, sequences, and clips. Smooth, lifelike video running at 30 frames per second — it's motion-picture quality! VideoSpigot opens the door to a world of possibilities. Audio and video are automatically synchronized for tight sound. Presentations, storyboards, training, education, and promotional materials explode off the screen! And because this is full digital video, you get unbelievably crisp detail and rich, luscious color.

Put a video clip in a word-processing document to describe a procedure or explain a policy. Include video clips in your desktop presentations to add customer testimonials, video sidebars, building sites, and other additional information.

Add outdoor/location shots in presentations, create commercial "roughs," animated simulations, and other video productions. Include a "Message from the President" in your presentations. You can even put a video clip into a document — store it on an ordinary 1.4 MB disk — and send it off to a friend. Sight and sound made simple — with VideoSpigot and the power of your Mac — and your imagination.



**FREE WITH
VIDEOSPIGOT**

Adobe Premiere™ \$695.00
Apple® QuickTime \$169.00

**A \$864 Value FREE!
With Every VideoSpigot**

Make Movies On Your Mac! VideoSpigot is easy to use... installs in seconds. In effect, you simply "pour" digital video into your Mac. Then cut, copy, and paste just like any Mac file.

In addition, your video productions can be seen over a network. Distribute movies over a LocalTalk®, Ethernet, or Token Ring network.

It's an incredible piece of technology, designed to maximize QuickTime's video capabilities. In fact, VideoSpigot and Tiger include QuickTime FREE. Tiger also includes Adobe Premiere, the industry's hot new video editing program — it's also FREE! Together, they create the perfect QuickTime starter package.

An Historic Leap: Apple QuickTime. Everyone's talking about QuickTime, the new way to communicate ideas. By adding QuickTime's capabilities to your Mac, you can capture videos (using VideoSpigot) with crisp, digital sound, and mix them with other clips and add them to documents like ordinary text files! Cut, copy, paste, and share video clips and movies easily with any application that supports QuickTime.

With Adobe Premiere, you mix audio and video together with sleek, graphical controls, ready for QuickTime to play in a window on your screen. Just gather the various clips together and quickly arrange them in the order you'd like them to play. You can combine anything: video footage, audio recordings, live sound, animation, still pictures, and graphic designs. Adobe Premiere enables you to add transitions, dissolves, page turns, spins, and more. Superimpose images in background clips and work with a palette of fascinating special effects. Create anything from a formal address to a music video. Use tints, filters, gradations, and more...

Present your best ideas — with motion and sound — right on your Mac.

Quickly cut and paste audio just like text, record edit and mix music, voices and effects. Modify sounds with echo, reverb, filtering and backwards. MacRecorder Sound System Pro is like having a professional recording studio in your Mac.

ADDITIONAL BONUS!

With Pro Bundle — SuperMac Tool Kit
The SuperMac Tool Kit contains an exciting, interactive video demonstration of one of the hottest developments in the Macintosh market today — QuickTime moviemaking with the VideoSpigot.



Capture video from your VHS or camcorder.

THE TIGER VIDEOSPIGOT PRO BUNDLE



VideoSpigot™ NuBus	\$699.00
Adobe Premiere™	\$695.00
Apple® QuickTime	\$169.00
MacRecorder®	\$349.00
Personna Micro Speakers	\$80.00
SuperMac CD Tool Kit	\$29.00

**A Complete Package Worth \$1,992!
NOW JUST \$699⁰⁰**

The Pro Studio Bundle includes MacRecorder® Sound System Pro and a pair of booming Personna Speakers, over \$1,990 in pro-quality audio/video hardware and software for just \$699!

MacRecorder® Sound System Pro enables you to record, edit, and playback live or recorded sound on your Mac. Includes built-in microphone and external microphone jack. Add soundtracks, special effects, and voice-overs to your presentations. The right effect, well-placed, can make the difference! Record and produce your own radio commercials... An unbelievable value!

VIDEOSPIGOT

BCJ2478A Mac IIx Model	\$449.90
BCJ2478B Mac LC Model	\$379.90
BCJ2478F Mac II Family & Quadra™ (NuBus)	\$449.90
BCJ2991 The Pro Bundle	\$699.90

Includes the Complete Bundle Described Above.

*VideoSpigot is a trademark of SuperMac, Inc.
QuickTime is a trademark of Apple Computer Corp.
Premiere is a registered trademark of Adobe.
MacRecorder is a registered trademark of Macromedia.*



Publish-It's Desktop Publishing Challenge: Try It For Just \$99⁹⁰

REVIEWER'S NOTEBOOK: If you're about to enter the world of Macintosh desktop publishing, or if you're an experienced user who wants fast, pro-quality results without dredging through hundred-page-manuals, Publish-It! Easy is the award-winning, System-7 Savvy product that MacWorld magazine calls "...the Swiss Army Knife of desktop publishers". Now for a limited time, you'll be able to switch or upgrade to this 4-and-a-half mice rated package for only \$99.90 — if you currently own a desktop publisher or word processing program. This is a \$150 savings off the suggested retail price of \$249.95. Simply send us the title page of the DTP or word processing manual you are currently using, and you'll own Publish-It! Easy Version 2.1 for only

\$99.90. Publish-It! Easy is also available in the new Corporate Network File Server Version.

The printed page. It can be an adversary or a joy. If you've got new Publish-It! Easy loaded on your Mac, you'll enjoy the process of laying out a page — and produce handsome newsletters, brochures, catalogs, reports, bulletins, advertisements, flyers, coupons and more! With the toolbox of advanced, easy-to-use features such as The Slide Show (complete with dozens of features and effects, outperforming some stand alone packages!), instant thumbnails (view and edit up to 100 pages), built-in database and mail merge, spell checker and thesaurus, your ideas will look extraordinary on paper as well as on-screen. Draw, paint, edit text, add graphics instantly and use a host of other state-of-the-art publishing tools with sleek controls. In fact, this one program eliminates the need and expense of having separate drawing, painting, word processing mail merge and presentation software — that's how incredibly full featured this package is! And don't worry — Publish-It! Easy doesn't punish you for mistakes or experimentation — it provides 5 levels of Undo to get you right back to the beginning, so you can explore other creative avenues. Print your quality pages on any Chooser-selectable printer.

Graphics From Scratch... You can also create your own graphics from scratch with 65 pen sizes, then paint them using an assortment of 32 brush sizes and an airbrush. For typographer-quality text effects, Publish-It! Easy allows you to mix typesizes, sizes and styles in any combination you like — even print grayscale or textured type to create an endless variety of unique effects. Of course, you get precise con-

trol of the kerning, leading, stretching, condensing and rotating of your type (in one-degree increments). Pop in a graphic image, and Publish-It! Easy automatically wraps text around it.

Includes FREE File-It Database... File-It is an incredibly useful database and merge program built right in to Publish-It! Easy. Now you can integrate customized information (names, addresses, phone numbers, personal notes, even entire paragraphs) into form letters you create in Publish-It! Easy. It includes three sample databases, seven professionally designed templates and an assortment of mailing label formats, so all you have to do is drop in your data and create a form letter in seconds! Preview your information before you print and retain all of the desktop publishing features (stylized fonts, rotated type, mixed text and graphics) when you create your customized documents. A powerful database takes care of all the details for you, like math, logical "if-then" functions, multiple sort levels and more. A great accessory to Publish-It! Easy that you won't find in other packages.

Corporate Network & CD-ROM Version Available!

PUBLISH-IT! EASY 2.1

BCJ2470 Publish-It! Easy 2.1	
(Try It) Full Retail Special	\$99.90
BCJ2470 Publish-It! Easy 2.1 Upgrade	\$99.90
BCJ2712 Publish-It! Easy 2.5 Network Pack (One	
Network File Server, One-Node Lan Pack, plus	
another One-Node Lan Pack FREE)	\$299.90
BCJ2719 Publish-It! CD	\$149.90
Any Macintosh running System 6.0 or later with 1MB RAM.	



Now anyone can publish flyers, newsletters, invitations and more with incredible simplicity. This really lives up to its name: Publish-It! Easy.

The Radius Rockets Make Your MacII Faster Than A Quadra!

REVIEWER'S NOTEBOOK: Radius has always been on the lips of art directors, designers and studio producers who use Macs. For years, the creative community has turned to Radius to speed their work and enhance their creativity. As an authorized Radius dealer, Tiger presents The Rockets: advanced Motorola 68040 processing power at a new lower price.

The Radius Rocket Accelerators provide lightning quick speed for Mac page layout and publishing applications. The Rocket 25 straps on 25MHz processing capabilities and includes a math co-processor. The Rocket 25i is a more affordable accelerator, but without a math co-processor. Then there's the Rocket 33 — featuring the fiery rage of Motorola's 33MHz 68040 processor.

The Rocket 33 clocks in at over 32% faster than the Quadra 700 upgrade's 25MHz "040." (COMPARE VALUE! The Rocket 33 is over 32% faster than the Quadra 700 upgrade and is hundreds of dollars less!) The Rocket 33 is the right board for 3-D modeling, popular animation applications, publishing and image processing programs.

RADIUS ROCKETS

BCJ2780 Rocket 25	
Accelerator	\$1799.00
BCJ2781 Rocket 25i	
Accelerator	\$1349.00
BCJ2782 Rocket 33	
Accelerator	\$2199.00

Buy A Color Pivot, Get A \$599 Color Display Card Free!

REVIEWER'S NOTEBOOK: The revolutionary Radius Color Pivot Display is the only monitor that works the way you do — in both portrait and landscape modes. See a full page without scrolling. A spectacular value! And for a limited time, Tiger will throw in the Color Pivot video interface card, a \$599 value — FREE!

The immortal Radius Color Pivot. The only monitor in the world that can display a full page in color and pivot to display a full page landscape too! Ask a pro how much easier that makes his life. Now your Mac can have this freedom.

The Color Pivot is perfect for design professionals and advanced desktop publishers, but it's also an ideal upgrade for everyday use, especially if you're "in and out" of a variety of applications. Just pivot to see as much of the screen as you need. And it is an excellent value. Consider this — the only other way to see a full page in actual size without scrolling would be to buy a 19" or larger display — many hundreds of dollars more than the Color Pivot!

Team the Color Pivot up with a Radius video interface and you get an unbeatable duo. 256 vibrant colors on any Mac LC, SE/30, IIsi and all NuBus Macs.

So, if you need a color display solution, you can spend \$2298 on a landscape display system from Apple. Or for only \$879,



buy the Color Pivot, and get both a portrait and landscape display in one for about \$1419 less. How's that for value?

RADIUS COLOR PIVOT

BCJ2784A Color Pivot LE	
Monitor	\$879.00
BCJ2784B Display Card for SE/30	
Models (\$599 Value)	FREE
BCJ2784C Display Card for Si	
Models (\$599 Value)	FREE
BCJ2784D Display Card for Mac II Family	
& Quadra (NuBus)	FREE
BCJ2784E Display Card for LC	
Models	FREE

Your Color Pivot LE includes a FREE interface card. Please specify your Macintosh model when placing your order so we may ship you the appropriate interface card.

Returns for exchange only.

Link PowerBooks To Large Color Displays!

REVIEWER'S NOTEBOOK: For PowerBook users who want a clean, crisp connection to external color displays, the Radius PowerView is the perfect instrument. Lightweight, small and built to survive an airport cargo crew, the PowerView displays up to 256 colors and plugs into your SCSI port.

A must for PowerBook users on the run. PowerView is an external color display interface for 140 and 170 Books. Just plug it into the PowerBook's SCSI and you're ready to go.

RADIUS POWERVIEW

BCJ2783 PowerView	
Interface	\$535.00

Returns for exchange only.

High-Quality Video Directly From Your Mac!

REVIEWER'S NOTEBOOK: This one amazing board add a new dimension to multimedia. This new technological leap turns your Mac into a video editing workstation. Full-motion video in from any VCR — full-motion video out. Integrate high-quality audio, video and graphics and output them to videotape, playable on any VCR — with absolutely NO flicker!

RADIUS VIDEOVISION

BCJ2921 VideoVision	\$2219.00
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Adobe Illustrator, Streamline And ATM: Just \$399.

ADOBE ILLUSTRATOR: A slew of impressive industry awards grace the Illustrator box, a clue to the amazing capabilities you'll discover inside. Indeed, Adobe Illustrator is the most powerful drawing, page design and production tool in the world today, ideal for designers with a desire to elevate their work to a new vista of speed and creativity. It's the only system capable of precise illustrations, extensive text handling, fully automatic graphing and color separations. You can work from existing images if you like — just scan it and you're ready to begin. Or draw from scratch using Illustrator's magnificent set of drawing tools, the envy of the industry. It's as simple as moving the mouse.

Professional pages depend on the ability to handle text in a variety of ways. (This package includes free Adobe Type Manager and 13 type faces). Nothing allows more creative opportunities than Adobe Illustrator when it comes to integrating text with your designs, illustrations, line art, images and photos. Just enter your text on screen, or quickly import it from your word processor.

Create tight wraps around shapes (or any path, like circular type) and images, viewing your alterations on your screen as you work. Flow text between columns, add unlimited numbers of characters and styles from any PostScript Type 1 font (including the entire Adobe Type Library). You can even convert the type to outline images and then edit them.

Creating charts is a snap with Illustrator. Just type in your data, select a chart type and it's done. Customize your charts with your palette of creativity and revise them in just a few seconds. You'll create top-notch ads, brochures and more, from concept to final production and color separations. In fact, the Adobe Illustrator box was completely created using the product. Color capabilities include smooth 24-bit screen reproduction (8-bit is supported for B&W).

ADOBE STREAMLINE. Producing high-quality PostScript artwork on a Macintosh has never been easier — provided you have the right tools. Adobe Streamline software is one of those tools. In fact, it's the easiest way to guarantee you'll always have PostScript quality, no matter how you start.

The Adobe Streamline software is a computer graphics tool that literally streamlines the production process by converting high-resolution bitmapped images (from existing files, scanned black and white line art, or continuous-tone images) into Encapsulated PostScript, PICT, DXF or Adobe Illustrator files. You can convert one image at a time, or quickly convert an entire folder of images in batch mode.

Once you've converted the images, you may use them as-is, export them to your favorite page layout program, or modify them in a drawing program such as Adobe Illustrator — saving you hours of tracing and

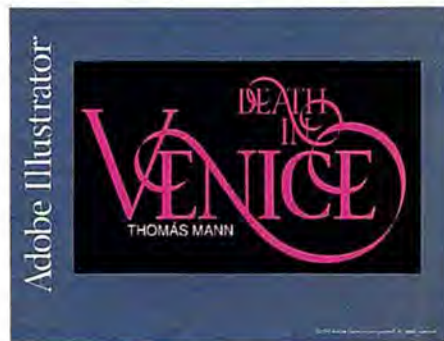
copying by hand. That's why Adobe Streamline is the perfect tool for technical illustrators, desktop publishers and graphic artists.

ADOBE EXCLUSIVE BUNDLE

ILLUSTRATOR TYPE MANAGER AND STREAMLINE 2.0



Great illustrations with precise details.



Incredible typographic illustrations are fast...

HERE'S WHAT YOU GET ADOBE EXCLUSIVE BUNDLE

Illustrator	\$595.00
Streamline 2.0	\$195.00
Type Manager	\$99.00

**A GRAPHICS BUNDLE WORTH \$889
For Just \$399**

ADOBE

BCJ2960 Illustrator with
Streamline 2.0 and Type Manager . . . **\$399.00**
Mac with hard disk; minimum 2MB RAM for System 6.0.5 or
greater — 4MB RAM for System 7.



ADOBE PREMIERE 2.0! UPGRADE NOW FOR: JUST \$149

REVIEWER'S NOTEBOOK: In addition to the two industry standards reviewed on this page: Adobe Illustrator and Adobe Streamline, TigerSoftware is proud to be among the first to offer new Adobe Premiere Version 2.0, an incredible new title that allows you to combine video footage, audio, animation, still images and graphics to produce digital movies on your Mac. Uses Apple's QuickTime media-integration technology, so multi-unit production hardware isn't required. Adobe Premiere is fast, fun and yields high-quality results. Interactive presentations, television ad concepts and roughs, video databases, merchandising sequences and training sessions are just a few of the wide-ranging uses for this hot new title.

Become a movie maker — with the help of your Mac — and new Adobe Premiere. It's the newest creative tool from the leaders in precision graphics and photo manipulation. It's fast, easy and fun to

use — just gather your clips and arrange them in the order you want them to play and Premiere handles the rest with blazing speed.

Premiere utilizes the Apple QuickTime extensions to store and import your video and audio files. You can arrange your clips to appear in progression with simple cuts, or overlap them to create dramatic transitions like dissolves, page turns and spins. You can isolate areas of your moving video or still images and superimpose them onto other clips to create a wide range of special effects that will grab your audience like nothing else they've ever seen.

You can use plug-in filters (including Adobe Photoshop-compatible filters) to produce tints, distortions and replications. Using Apple's QuickTime extensions, you get the enormous capabilities of true media integration — and now, you can produce digital movies at an affordable price, for a variety of uses. And with QuickTime, you can store video footage and accompanying audio on an ordinary disk drive.

Premiere acts as the control

room for your movie studio. From its intuitive interface, you'll see the tracks of your movie in "filmstrip" style. And if you need to make a change, multiple windows provide you with fast access to any editing function. Want to add an effect? Just click any one of

the animated icons to select great digital effects. The video windows on your screen also enable a quick preview of source material, digital effects and assembled video. There's even a Timeline display with zoom-in and single-frame viewing. Quickly check your sequences with Premiere's push-button controls, move to any clip instantly.



FREE QUICKTIME INCLUDED—A \$169 VALUE

NEW ADOBE PREMIERE 2.0

BCJ2961 Premiere 2.0 Upgrade	\$149.00
BCJ2962 Premiere 2.0 Retail	\$499.00
Mac II family computer; 4MB RAM; high-capacity hard drive (80 MB or more); System 6.0.7 or greater; 32-bit QuickDraw 1.2 or greater.	
Restrictions apply to upgrade. Call for details. While supplies last.	

Call Us: **1-800-666-2562**

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Fax: 305-529-2990

WE SHIP FEDERAL EXPRESS

Circle 114 on reader service card

263 Display Typefaces And 100 EPS Borders: \$99⁹⁵

REVIEWER'S NOTEBOOK: What's wrong here? Was that a typo in the headline or has Tiger Software lost their minds? No typo. No mind loss. Just a great value on a complete (and we mean complete!) library of 250 Type 1 or TrueType display faces for use with any application that supports PostScript or TrueType — and that means just about every Mac application known. Includes screen fonts as well as printer fonts. Why pay more for foundry-quality type? Especially when you get these great collections of Ed Benguiat headlines and EPS borders free?

Display typefaces — designed to attract attention to whatever you have to say. Take advantage of FontBank's staggering array of quality fonts at down-to-earth prices. 263 display typefaces and 100 EPS borders for just \$99.95!

You'll create attention grabbing documents and eye stabbing graphic elements for any graphics program and desktop publishers. With such a

wide variety of faces available to you, creating incredible headlines is fact, fun and amazingly professional. The headline is the face of good advertisements. Wimpy headlines are usually ignored, while bold headlines attract the reader, and if your message is important, the casual reader becomes curious — and persuaded. Remember, though, that headlines must be legible. If you'd like to know more about working with display faces and creating winning headlines, call TigerSoftware and ask for a free copy of a 24-page book that we've prepared entitled "A Short Course On Working With Type." It has been prepared by the typographers at Tiger and we'd be happy to get one in the mail to you.

FontBank has assembled a vast array of looks and feels in their type library. 250 different faces, each with its own distinct character. Some you may never have seen before.

Combining FontBank's 250 faces with the capabilities of these programs offers the opportunity for an unlimited number of special effects. And FontBank display faces are compatible with all major page layout applications like QuarkXpress, PageMaker, Illustrator, FreeHand and ATM.

Regardless of what the design assignment, from flyers, posters, ads, coupons and greeting cards, to presentations, notices, memos and packaging, FontBank display typefaces give you the typographic tools you need to look your creative best. And, when converted to editable outlines using Illustrator, FreeHand or PageMaker 3.0, these faces can be used to produce special text and design effects to create stunning documents.

How long have you been using the same tired



typefaces? Chances are, you use what you have because finding the right typefaces, installing them and learning to use them is more trouble than it's worth. So you compromise the overall look of your document by compromising on the one critical factor: the type. That's why FontBank is such an exciting product, easy to install, a pleasure to use — and a low cost way to improve the quality of everything you print.

Borders Complete Your Layout. Often the only thing between you and an attention getting layout is the lack of some visual ornament to pull it all together. Usually the answer is a border. But how many of us have the time to draw a border as the clock moves ever closer to the deadline hour?

Recognizing that need, FontBank has introduced BorderBank, a collection of 100 imaginative, attention-arresting borders in EPS (Encapsulated PostScript) format.

It's yours free when you order the FontBank Type Companion.

Designed by DTP guru T. Craig Smith, the BorderBank collection is an ideally quick and simple way to add a border to your ad, coupon, sidebar or just to pull your whole layout together.

The designs run the gamut from the traditional to cutting-edge contemporary. And using them is as simple as placing any graphic within your page layout or drawing program. Since they're EPS graphics, they proportion perfectly to whatever area you assign them to.

And they're yours free when you purchase the FontBank type Companion.

Total Design Power. There you have it. For \$99.95, you can buy the FontBank Type Companion with its 250 display typefaces — and get 100 EPS borders designed by T. Craig Smith FREE! And with a little imagination you'll be creating layouts that make people do what you want them to do.

FREE!
100 EPS BORDERS
\$149
VALUE

No question about it: borders add excitement to your layouts. Order the FontBank Type Companion and get the collection of 100 EPS borders designed by DTP guru T. Craig Smith FREE! They are compatible with all page layout and most drawing programs.

Tiger Special Offer

FREE! Send in your FontBank registration card and get these 13 Photo-Lettering, Inc. Faces FREE! Chosen and edited by world renowned type designer Ed Benguiat. Also available separately for \$9.95.

FONTBANK

BCJ2425 FontBank MAC
With Free BorderBank \$99.95
Call for details.

MOUSEMAN/KIDZ MOUSE

Logitech MouseMan is not just another mouse. It is the most sophisticated pointing device in the industry today, featuring three fully programmable buttons, sleek ergonomic design and the highest quality craftsmanship. MouseMan's 400 dpi hardware resolution makes the most efficient use of your desk space and it plugs right into your mouse port.

Logitech has been concentrating on creating the perfect desktop mouse since 1984, and today they're the largest manufacturer of pointing devices and scanners in the business. If you think all mice are the same — you haven't seen a Logitech MouseMan. MouseMan comes complete with enhanced MouseWare software utilities provide powerful menuing capabilities, assignable hot keys.



LOGITECH MOUSEMAN

BCJ2200 MouseMan for Mac . . . \$79.90
BCJ2589 Kidz Mouse \$49.90

TRACKMAN

The Stationary Mouse of the 21st Century! The most advanced design, the most precise movement — perfect for limited-space desktops. The ultra-ergonomic shape comfortably accommodates your hand for sleek, swift movement. It's from Logitech.

Perfectly engineered for your hand, TrackMan allows your fingers to rest on the buttons as your thumb controls the ball. Highly precise, extremely comfortable — and smart as a whip.

If you work with graphics and page layout software, TrackMan is the ideal instrument; it lets you get right in there and tweak pixels, clean up photos and artwork, perform detailed stripping and color manipulation. TrackMan eliminates the "shifting" that occurs in other instruments.



LOGITECH TRACKMAN

BCJ2210 TrackMan for Mac . . . \$89.90

FOTOMAN COMPUTER CAMERA

What is it?

In short, it's a portable, digital camera — for your computer. Logitech FotoMan takes great pictures with a m a z i n g clarity and 256 grayscale richness — then allows you to instantly download them to your Mac. It includes a slew of image editing tools that open a world of creative opportunity, and is compatible with virtually all desktop publishing programs. The applications for this new technology are enormous. Insurance and real estate professionals are using it to expedite claims and transmit photographs of neighborhoods and homes. Manufacturers use FotoMan to quickly catalog products and parts, while law enforcement officials are using it to photograph suspects, crime scenes and evidence — without the time and expense of film, processing and prints. Digital images are instantly captured and merged into documents, or stored as a permanent record. Up to 32 images can be shot and stored on the FotoMan's RAM chip, then transferred via serial port to FotoTouch or previewed on your screen.



One of the hottest new ideas in computing: the digital photograph — taken by a small, portable and easy to use camera that allows instant transfer to your computer — without a buying any other hardware.

INCLUDED FREE!

DIGITAL DARKROOM 2.0

Perform amazing editing feats on scale images with Digital Darkroom 2.0. It now supports image, scanner, and printer calibration.

A \$395 Value FREE



LOGITECH FOTOMAN

BCJ2585 MAC FotoMan with Free
Aldus Digital Darkroom . . . \$649.00
Call for system requirements.

SCANMAN 32

WITH DIGITAL DARKROOM AND CATCHWORD PRO: ALL THREE JUST \$399

REVIEWER'S NOTEBOOK:

The ScanMan Bundle begins with the instrument itself: the Logitech ScanMan 32 grayscale scanner. It's a marvel, packed with technical innovations and crafted into a rugged, ergonomic housing. The scans? Crisp. Clean. Perfect...

We put the ScanMan 32 hand scanner through it's paces, performing over 50 scans of various black and white images — photos, line art, logos, type, illustrations — even poor-quality photos. The ScanMan 32 features 32 gray scale performance. Use scanned images in word processors, multi-media, desktop publishing, HyperCard, OCR and more.

The Science of Scanning. Logitech technology destroys the old barriers of scanning, increasing the speed and accuracy of anything you scan. Superior image quality, with the ability to produce halftones for reproduction. The set of output controls provide the best possible results on any printer or monitor screen. Its 4" wide scanning area allows full-page scans with just two quick passes.

The instrument itself is a masterpiece. From the genius of the respected industrial design firm, Frogde-

The ScanMan Bundle: Includes ScanMan 32, CatchWord Pro & Digital Darkroom.



SCANMAN 32

SCANNER INTERFACE

sign — also responsible for the new line of NEC monitors and other distinctive hardware products, the ScanMan 32 is magnificent.

CatchWord Pro Included FREE! CatchWord Pro delivers powerful Optical Character Recognition (OCR) software that captures printed, hard-copy data by scanning it, rather than typing it.



Incredible grayscale images right on your screen!

CatchWord Pro delivers an amazing 99% accuracy in OCR testing, used in tandem with the ScanMan 32. It's compatible with popular word processors, spreadsheets, databases and desktop publishers — so you can scan information directly into your application and use it immediately!

Digital Darkroom Included FREE! Digital Darkroom from Aldus is the most complete grayscale image processing software for retouching, enhancing, composing, and modifying scanned photographs and other bitmapped graphics on the Macintosh.

THE SCANMAN 32 BUNDLE

ScanMan 32 with
CatchWord Pro \$599.00
Aldus Digital Darkroom \$395.00

**A Scanner Package Worth \$994.00
FOR JUST \$399**

BCJ2977 ScanMan 32 Bundle with
FREE CatchWord Pro &
Digital Darkroom \$399.00

Call for system requirements.

The WriteNow Hot-Pack!

REVIEWER'S NOTEBOOK: WriteNow is the word processor Mac aficionados swear by — it's fast, compact (requires just 325K), reliable, and brimming with great new features that give every document that you create an absolutely stunning look. NEW! Paragraph and character style sheets help you create a clean, consistent look. NEW! An incredible print preview that displays thumbnails and facing pages — optimized for your particular screen's size. NEW! Color text and graphics, along with new styles and graphics capabilities. NEW! One-step default document creation — just throw in the text and out comes a masterpiece.

If you're a Word user, just try WriteNow 3.0 and see what you're missing. From page layout and design, graphics and document management to printing, System 7 support and great style sheets. It just feels so nice. The columns snap to attention as you enter text, the headers and footers pop into exact po-



WriteNow is perfect for everyday letters, memos and reports. Easy-to-understand menus are the key.

ALL THIS FOR \$99.90 — The sleekest word processor, best-selling Grammar, Checker, Accounting, Data Manager & Fax Software!



Built Around The Best-Selling WriteNow 3.0!

sition, the formatting and style sheets are crisp and professional — and WriteNow contains a giant 1.4 million-entry thesaurus, a 135,000 word spelling dictionary with ultra-convenient Auto-Find and Auto-Guess spell checking. WriteNow is compatible with other leading applications such as Microsoft Word, Works, MacWrite and WordPerfect (For DOS). There's more new stuff: lightning-fast scrolling for easy movement throughout your documents, unlimited paragraph and graphic sizes, triple-click paragraph selection, style sheet design templates, virus alert and more.

The Lean and Mean Word Processor. WriteNow has swept the industry, collecting Editor's Choice awards and other top honors. Known for its incredibly swift performance and compact size. But despite the lack of size, WriteNow contains a complete set of state-of-the-art features. Everything you need is here — with powerful new page design features (that you'll actually use) to create great looking letters, memos, reports, presentation handouts and more. The print quality is excellent.

Great Looking Print Preview! The print preview is remarkable, featuring optimized thumbnails, multiple page viewing, facing pages (reader spreads), and speedy magnification.

ONLY FROM TIGER!

THE WriteNow "HOT-PACK" Bundle!

Only Tiger can assemble a sizzling offer like this! Award-winning WriteNow 3.0 is joined by four great software titles — each best-sellers in their own right. First, you get Fax Mania — it includes scores of high-quality, professionally designed fax cover sheet templates. There's one for every mood, event, occasion and situation. From formal to freaked-out! — it's a \$39.95 value. Then there's Grammatik, the trusted grammar and style checker that gives your writing clarity and power. Easy to learn and use, you'll notice an improvement the first time you use it — a \$99 value.

Record Holder Plus is the sleek, simple-to-use data manager that enables you to organize, store, retrieve and report information. It's a snap to put your information to work; let Record Holder Plus take care of it — a \$145 value. To round out the Hot-Pack Bundle, we've included MacMoney, the fast, easy — yet extremely powerful accounting program specifically designed for the needs of home and small business. Point-and-click operation makes organizing your finances a breeze. Includes excellent reporting features and zippy data entry.

The WriteNow Upgrade

HOT-PACK BUNDLE

WriteNow 3.0	\$249.00
Mac Money	\$119.95
Record Holder Plus	\$145.00
FaxMania	\$39.95
Grammatik Mac	\$99.00

A Software Bundle Worth \$652.90!

NOW JUST \$99.90

WRITENOW

BCJ2966 WriteNow 3.0 Upgrade "Hot-Pack" Bundle	\$99.90
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THE NEW 256K SHARP WIZARD!

REVIEWER'S NOTEBOOK: Imagine a 256K device the size of an ordinary checkbook. The new Sharp Wizard packs a powerful whallop, enabling you to organize more information faster and easier with the help of its amazing built-in functions.

It wasn't so long ago when 256K was the accepted memory standard in the computer industry. Now you can slip it into your briefcase...

Only Sharp could have brought such an impressive technological achievement to the world. The Wizard OZ-8600 features an extra large, high-contrast display that measures a whopping 40 characters wide by 8 lines deep. There are 10 built-in functions (all superbly integrated): A Scheduler (with alarm), a To-Do List, 3 different Calendar Views, 3 Phone/Address Books, a Business Card File, Memo Pad, Outliner, Home and World Time Clocks and Calculator with paperless printer.

The OZ-8600 also features helpful on-screen instructions and can easily store over 5,500 names and numbers or over 3,800 scheduled appointments!



With more than 25 optional software cards available, the OZ-8600 becomes everything from a travel planner to a financial assistant to an arcade. With the optional interface and transfer cable, this tiny hellcat will exchange information with your desktop applications. Communicate with Macs or send faxes with the optional modem.

All of which makes the new Sharp 256K Wizard the perfect partner.

Organizer Accessories There's an optional modem, printer, fax and a slew of software cards that turn the Wizard into a fully functioning office.

Expand The Sharp's Mind When you add software and memory cards to your Wizard, you put all kinds of possibilities at your fingertips.

Time Expense Management A must software add-on for the Wizard. The powerful way to manage and prioritize your schedule, track your expenses and

deadlines, and account for time spent on projects or client meetings.

Spreadsheet Create fully functional, Lotus 1-2-3 file compatible, 26-column-by-999-row spreadsheets on your Wizard, or download a spreadsheet from your Mac! This card will hold 64K of data! Built-in features include: 10 templates, complete formatting, sorting and "freezing pane" functions, and financial calculations, spreadsheet-linking capabilities, cut & paste.

NEW Spanish/English Dictionary Just Released! The fast, handy Spanish/English translation software for use with your Wizard.

SHARP WIZARD

BCJ6310 ZO-5200 Sharp Organizer	\$179.00
BCJ6306 OZ-7620 Sharp Wizard	\$229.90
BCJ6312 OZ-8000 Sharp Wizard 64K	\$279.00
BCJ6309 OZ-8200 Sharp Wizard	\$339.00
BCJ6307 OZ-8600 Sharp Wizard	\$449.00
BCJ6313 Organizer Modem	\$139.00
BCJ6314 Organizer Talker (7000 Series Only)	\$85.00
BCJ6315 Organizer Fax Modem	\$389.00
BCJ6320 Time Expense Management	\$89.00
BCJ6321 Dictionary/Thesaurus	\$99.00
BCJ6355 American Heritage Dictionary	\$156.00
BCJ6322 8 Language Translator	\$75.00
BCJ6323 Money Planner	\$75.00
BCJ6324 Spreadsheet	\$139.00
BCJ6330 Box Jockey	\$39.00
BCJ6331 Organizer Chess	\$85.00
BCJ6332 Tetris Game (7000 Series Only)	\$39.00
BCJ6333 Organizer Bible	\$117.00
BCJ6340 Portfolio Card	\$99.00
BCJ6341 32K RAM Card	\$59.00
BCJ6342 64K RAM Card	\$99.00
BCJ6345 128K RAM Card	\$99.00
7000-8000 Series Only	\$119.00
BCJ6347 IBM Organizer Link II	\$99.00
BCJ6348 NEW Macintosh Organizer Link II	\$85.00
BCJ6352 Battery Pack (for 8000 Series)	\$26.00
BCJ6353 Printer	\$119.00
BCJ6354 Dubbing Cable	\$24.95
BCJ6356 NEW Spanish/English Dictionary	\$99.00
BCJ6357 Backgammon	\$69.99
BCJ6358 Hattris	\$49.99

Returns for exchange only.



LEARN TO PLAY THE PIANO IN 30 DAYS!

REVIEWER'S NOTEBOOK: It seems like everyone is talking about the Miracle Piano Teaching System. It's been featured on "Good Morning America," "The Today Show" and "The Arsenio Hall Show." It's been written about in Newsweek and The New York Times. It's become popular because it really works — anyone, at any age — can learn to play piano and achieve musical literacy in just a very short time. More importantly, they can learn at their own speed, without formal lessons — by connecting the Miracle to their Mac.

So how does it work? It's actually very simple. The Miracle software contains game-like exercises that make learning fun. Like the shooting range that knocks off ducks when you hit the right notes. You'll learn to play chords as parachutists jump out of a plane and learn melodies by repeating back what the Miracle plays. It's so much fun that you'll actually forget that you're learning. The next



thing you know, you'll be playing your favorite songs. The Miracle provides instant feedback as you go, recognizing problem areas and bringing up specific drills to help you get it right. If you're struggling in a certain area, The Miracle continues to provide arcade-like lessons in that area until you get it right. It's not boring, tedious labor — it's actually fun. And that means faster learning and visible progress.

When you've mastered a specific skill, The Miracle quickly moves on to the next level, with new games, vivid new screens and new musical concepts.

If you love music, and always wanted to play the piano — here's your chance. And it's never too late to learn with The Miracle, adults learn as quickly as children because they work at their own speed, building on skills quickly — on their own schedule. It's the power of your computer at work in an important role: learning.

TigerSoftware sweetens The Miracle's charms with a bundle that's simply unbeatable. You get the Miracle keyboard, software — plus the Miracle Song Collection so you can play along with your favorites from The Beatles, Michael Jackson, Buddy Holly, Lionel Richie, George Michael and more. We'll also include the Miracle Keyboard stand, stereo headphones and a copy of TRAX, the advanced MIDI recording software that transforms your computer into a multi-track recording studio. With TRAX, you

can record and mix multiple tracks, add additional instruments and effects, add vocals, change the tempo — and do it all from your keyboard. Record up to 64 tracks with a host of tape recorder-like controls. Compose and edit your own tunes by just cutting and pasting notes on your screen. TRAX is simple to use and delivers professional results.

It's everything we could possibly think of to complement the Miracle's amazing capabilities. And it's all free from Tiger with The Miracle all for just \$379.00.

The joy of making music... now you can experience that thrill with the Miracle Piano Teaching System, the world's most advanced multimedia training system.

The Only Self-Teaching Piano. The Miracle Piano Teaching System can teach anyone — child or adult — to play the piano with a series of progressive, customized lessons. The Miracle quickly connects to a Macintosh and includes software cartridge that combines an advanced MIDI keyboard with full-stereo sound and brilliant on-screen graphics. In no time at all, students of all ages will learn and perform left and right handed melodies — while having a lot of fun!

There are exercises, musical pieces and drills (cleverly disguised as games), that teach hand positions, notes, fingering, rhythm, scales and more. The Miracle can be quickly set up for any age or expertise, and customizes itself to move the user along at a comfortable pace.

Unlike conventional piano lessons, The Miracle eliminates boring, repetitive routines. The super-creative, artificially intelligent software quickly teaches the basics and builds on them in very entertaining ways. And that makes all the difference.

The Keyboard. Dazzling music! Spectacular effects! Booming orchestras — all created by you and the Miracle keyboard. As a stand alone instrument, The Miracle rivals the music industry's most sophisticated MIDI consoles. The 49 full-size keys are velocity sensitive, so you can learn to play utilizing true piano expression. You also get a foot pedal, which controls the length of time each note is sustained and stereo earphones.

Here's What You Get Free With The Miracle — Only From TigerSoftware. When you buy a Miracle from

TigerSoftware, we'll throw in everything you need to create your own recording studio. We'll start with the Miracle Song Collection Volume 1, containing dozens of popular songs from the Beatles, to Michael Jackson. Play along with your favorite songs, or break out into your own solo. These song collections are a great value and are yours free only from Tiger.

Then we add a copy of TRAX, the MIDI recording software that allows you to create your own smash hits. Change the tempo,



As Seen On
"Good Morning
America," "Today
Show" and
Arsenio Hall!

mix different instruments, add your own vocals, sound effects and more — controlling it all from your keyboard. The TRAX interface is simple and fast, enabling you to lay down tracks using your Miracle to create your own arrangements.

But That's Not All. You also get the Miracle keyboard stand. With all this, you'll be ready to create your own live performance or cut your own record.

With The Miracle, you or your child can learn to play without the boring drills and monotonous practice that music usually requires.

So not only do you enjoy the benefits of the world's most exciting piano teaching system, with The Miracle Song Collection, you get an educational jukebox with 40 more ways to play to learn instead of just learning to play.

Song Collection Volume 1. All Night Long (Lionel Richie); Another Part of Me (Michael Jackson); Bad (Michael Jackson); Billie Jean (Michael Jackson); Born to Be Wild (Mars Bonfire); Careless Whisper (Andrew Ridgeley, George Michael); Celebration (Kool and the Gang); Could It Be I'm Falling In Love (Melvin Steals, Mervin Steals); Do You Want To Dance (Gene McFadden, John Whitehead); Dreams (Stevie Nicks); Everyday People (Sylvester Stewart); Forty-Second Street (Al Dubin, Harry Warren), and more...

THE TIGER MIRACLE PIANO SUPER BUNDLE

Miracle Piano Teaching System	\$347.00
Miracle Stand Shown Above	\$35.00
Miracle Song Collection	\$49.95
Trax MIDI Studio Software	\$100.00
Trax Song Collection	\$29.00

**A Music Package Worth \$560!
NOW JUST \$379.00**

Tiger's Miracle Piano Super Bundle

BCJ2778 Tiger's Miracle Piano Super Bundle	\$379.00
Includes Miracle Piano Teaching System Worth	\$347.00
Miracle Stand Shown Above Worth	\$35.00
Miracle Song Collection Worth	\$49.95
Trax MIDI Studio Software Worth	\$100.00
Trax Song Collection Worth	\$29.00

Total Value \$560 On Special For Only \$379

The Miracle Piano Teaching System

BCJ2970 Miracle Piano Teaching System	\$347.00
BCJ3781 K-5 Carrying Case	\$39.95
BCJ2792 Song Collection 2	\$39.95

Available for Macintosh, Nintendo, and DOS.
Call For Other Models.



THE CD-ROM SHOWCASE

Make a grand entrance into the amazing world of Wayzata CD-ROMs — or expand your library with selections from Tiger's collection of best-selling current releases. Dozens of new packages are available each week, so call us for late-breaking CD titles.

Quick Art Deluxe. Look out! Here comes a truckload of professionally drawn, top-quality images! Over 3000 in all, with 300 dpi crispness and available in TIFF format. Great desktop publishing companion — the only art library you'll ever need, on one CD-ROM! Includes a paper catalog to identify images. You get (in addition to topics listed above in Quick Art Lite) birds, buildings, education, fish, gardening, medicine, music, mystery, weather and thousands more!

EPS Professional Vol. 1. The definitive collection of CD-ROM graphic design. Includes an incredible 800 fully resizable, Encapsulated PostScript images. From the graphic design studios of Christopher Marshall Designs (CMD) and LasArt, EPS Professional contains design elements for T-shirts, alphabetic designs, four-color pieces, covers and backgrounds. Supports PostScript laser printers, imagesetters and other high-end output devices.

Space Time & Art. 300 fascinating 24-bit color images on the subject of space. Great disc — hours of explor-

ing is in store for you — see NASA views of space and photos from Voyager missions along with a collection of astonishing original images by Josepha Haveman.

Font Fun House. Hundreds of fonts, ready to use! Shareware and freeware fonts that capture any mood or make any statement. Go crazy with all kinds of faces from elegant to outrageous! Also includes screen font libraries from AGFA and Adobe. This is a great collection, and a must-disc for desktop publishers. If you can't get enough fonts, then Font Fun House is for you.

Ocean In Motion. A fascinating collection of enchanting coastal clips in QuickTime from artist/photographer Josepha Haveman. Over 200 QuickTime movie sequences of the thunderous beauty of the place where the ocean meets the land. Includes 60 still clips for fast, easy editing. Use these movie clips for backgrounds, presentations, intermissions or just savor the power of the sea on your screen.

MACnificent 7 Education & Games. Brimming with over 280 megabytes of System 7 games and educational shareware! Contains unique "Librarian" which provides instant information about what's in those 280 megabytes. Includes over 800 games, over 400 educational programs, over 50 free demos, over 1500 games support files, over 150 sounds & sound stacks — over 5000 files in all! The best bet for children...

Winning Elections. Interested in political office? This is the perfect source for everything you'll need to know to get elected. Assembled from a number of reference works on the subject of political campaigns, Winning Elections also provides insight into the our process of government, how campaigns are funded and more.

It's an intriguing disc even if you're not shooting for the White House, the State

House or a County Seat.

Wayzata World Fact Book 1991. The world almanac of the Federal government, based on the CIA World Fact Book produced annually by the CIA. Covers territories, countries, protectorates and disputed land claims worldwide. All kinds of information is included: socioeconomic, geo-political, demographics and more. Includes data from the Bureau of Census, Defense Intelligence Agency, Defense Nuclear Agency, Department of State, Department of Interior and US Coast Guard.

The Front Page News. Includes a year's reporting of world events — by the top news organizations — on a single CD. Over 300,000 articles, transcripts, government and business reports. Includes over 2220 Gulf War stories, 3194 on the environment, 207 on acid-rain, 490 on the FBI and over 1400 on AIDS. Updated quarterly, subscriptions available. Also contains global wire services: TASS, Business Wire, The French News Agency, Latin American News Agency, OPEC, News USA, Reuters and many more.

BBS In A Box, Vol. VI. The latest release! Another monster collection of goodies from The Arizona Macintosh User's Group and MacWizards. Includes over 9,000 Mac files in compressed format with BBS directories for 24 topics including Art, Business, DA's, Games, Gifs, Fonts, Adobe Screen Fonts, Newsletter Articles, HyperCard, Music, MIDI, Mac II, QuickTime, System 7 Tools, Telecommunications and more.

CD-ROM COLLECTION

BCJ9302 Quick Art Deluxe	\$175.00
BCJ9304 EPS Professional	\$179.00
BCJ9308 Space Time & Art	\$129.00
BCJ9327 Font Fun House	\$39.00
BCJ9324 Ocean in Motion	\$139.00
BCJ9311 MACnificent 7	\$49.00
BCJ9325 Winning Elections	\$89.00
BCJ9310 World Fact Book 1991 + Navigator	\$39.00
BCJ9315 Front Page News	\$99.00
BCJ9323 BBS in a Box Vol. VI	\$79.00

Additional titles added continuously.



DATA MODEM, FAX AND ANSWERING MACHINE IN ONE!

The Complete, Compact Communications System THAT USES ONE PHONE LINE.

REVIEWER'S NOTEBOOK: No better value for the savvy businessperson when it comes to communications — one machine that does the work of three! Turn your Mac into a data modem/fax machine/answering machine! Thanks to advanced line-switching techniques, phone calls are handled appropriately whether data, fax or voice, automatically. Send e-mail, receive messages while you're away and more. Prometheus crafts three technologically superior models: The Home Office, The Ultima Home Office and The 24/96 SR Minifax.

The compact Home Office (Tiger price just \$259!) is one of the hottest devices in the industry right now. A speedster at 9600 bps send and receive, with Group III compatibility and a full-featured 2400 bps data modem, it's all you'll ever need...

The Home Office is Hayes compatible and includes MacKnowledge and MaxFax software, and all necessary cables.

The Ultima Home Office delivers all the advantages of Home Office, and gives you the additional power of 14,400 bps data modem afterburners!

Quality crafted and super advanced, Prometheus gives you state-of-the-art performance at an affordable price.

The Home Office Digital Answering Machine. Simply connect your Home Office and you've instantly got a sophisticated voice messaging system. You can easily route incoming messages to any one of 999 mailboxes! Create your own personalized announcements for a specific caller or even custom messages that play on specific dates or times. Password-protect your playbacks, playback from a remote location and minimize toll-fees with Home Office's unique TollSaver feature.

Send And Receive Faxes. Exchange fax

documents with any Group III fax machine in the world. Create a letter on your Mac and zip it out in seconds — Home Office takes care of the details. With Home Office, you can receive faxes from any standalone fax machine or another fax/modem. And when you send or receive a fax, you can continue to work; the faxing takes place in the background, out of your way.

9600 BPS, Error-Free Data Transmission. The Home Office provides incredible throughput (with V.42bis/MNP) for error-free operation and world-class compression. By utilizing V.42bis and MNP technologies together, you can take full advantage of newer, high-speed modems.

The Home Office will automatically negotiate the highest possible setting with the modem you wish to call.

The Prometheus Ultima Home Office. An amazing instrument, packed with advanced technology, able to perform 14,400 bps, full duplex communications. A low-cost answer to the needs of high-speed transfers of large volumes, remote access computing and network bridging. The Ultima is compatible with a wide variety of communications packages and modems.

The 24/96 SR Minifax. It has the ability to exchange fax documents with Group III fax machines worldwide. Create a letter on your Mac and send it directly to another fax machine anywhere in the world. The 2496S/R Minifax will also allow you to receive fax transmissions from a standalone fax machine or even from another fax/modem. Sending or receiving a fax takes place in the background, so you can continue with your work until the transmission is completed.

PROMETHEUS

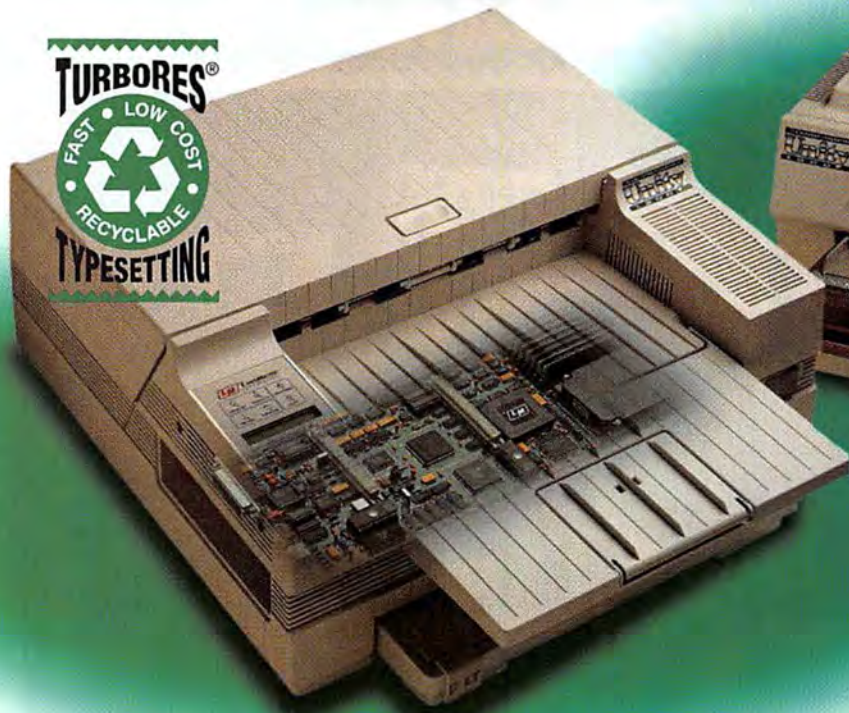
BCJ2930 Home Office	\$259.95
BCJ2931 Ultima Home Office	\$499.95
BCJ2932 24/96 SR Minifax	\$129.95

All modems come complete with software and cables.



A collection of multimedia products is displayed on a dark, perforated surface. In the center is a white CD-ROM player with a disc labeled "DESERT STORM" partially inserted. Surrounding the player are various educational and entertainment items: a "Speedy CD" box, a "PhotoDisc" box, a "WORLD ATLAS" box, a "U.S. HISTORY" box, a "The Family Doctor" box, a "BRITANNICA FAMILY CHOICE" box, a "FACT BOOK" box, a "TIME DESERT STORM" box, a "WORLD ATLAS ILLUSTRATED" box, and a "U.S. HISTORY" box. Several CD-ROMs are also visible, including "The Family Doctor", "WORLD FACT BOOK", "XIPHAS", "15", "DESERT STORM", "WORLD ATLAS", and "U.S. HISTORY". Two small, silver, rectangular speakers are positioned on either side of the CD-ROM player.

Circle 114 on reader service card

**Unity™ 1000**

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Multi-platform connectivity... 1000 dpi... Lots of fonts... Super-fast print speeds... When we introduced our Unity™ 1000, it seemed things couldn't get any better. But now they have.

Introducing the Unity 1200XL. It's got a host of great features like the Unity 1000. Plus, it handles up to 11" x 17" paper for all your oversized jobs! Just plug it in, and you get perfect, 1200 x 1200 TurboRes® output, from just about any computer out there.

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UNITY 1200XL FEATURES

- 1200 x 1200 TurboRes® output
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- 40K of fast-cache memory
- TurboGray™ halftone enhancement
- LocalTalk®, parallel, serial, and Ethernet® (optional) ports
- HotPorts™ automatic port switching
- SmartSense™ automatic emulation sensing
- Flexible paper handling up to 11" x 17" with up to 3 paper sources (optional)
- Expandable RAM
- Software-upgradable controller



And for the budget-minded...

The LaserMaster 1000/4 Personal Typesetter is the perfect alternative for budget-minded graphic arts professionals who do not need multi-platform capabilities. The low-cost, CPU-based controller of the LaserMaster 1000/4 produces 1000-dpi, camera-ready copy for just \$3,995, PC or Mac version.



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MAC WORLD

NEWS

THIS MONTH:

Apple's PowerBook
145 • MacProject Pro
• Radius VideoVision
• Lotus Notes • EDI
for the Mac

BY DAN LITTMAN AND TOM MORAN

Lotus Notes for Mac

Lotus is expanding its presence in the Mac market with Lotus Notes, which is best described as a groupware generator.

Lotus Notes users design forms and put them out on the network, where their colleagues access them for such tasks as carrying on a structured discussion, following up on client contacts, or simply distributing finished documents. Notes includes an E-mail system and remote-access capability. It can perform calculations; supports



FRONT END TO AN EXAMPLE OF A MULTIPURPOSE GROUPWARE APPLICATION ASSEMBLED USING LOTUS NOTES.

Object Linking and Embedding (OLE) under Windows (but not publish and subscribe on the Mac); and provides rout-

ing management and security features. A programming interface allows you to tie Notes applications to databases or other third-party software.

The Mac product, which will ship this winter with the 3.0 release of Notes, is a client and requires an OS/2 server. Pricing was not set at press time. Lotus, 617/577-8500.—D.L.



THE RASTEROPS/20T MULTISCAN COLOR DISPLAY WORKS WITH MACS, DOS MACHINES, AND SUN WORKSTATIONS.

RasterOps Multifrequency Monitors

RasterOps has introduced two 20-inch multifrequency color monitors that can work with Macs or DOS PCs. The RasterOps/20T MultiScan Color Display uses a Trinitron tube and is compatible with all display adapters from RasterOps and many adapters from other third-party vendors for the Mac, DOS machines, and Sun SPARCstation systems. It supports resolutions ranging from

640 by 480 pixels to 1280 by 1024 pixels and refresh rates ranging from 50Hz to 120Hz, inversely proportional to the selected resolution. The \$3499 monitor is shipping now.

The RasterOps/20 Multi-Scan Color Display contains a Hitachi tube and is compatible with all display adapters from RasterOps and with VGA adapters. Its resolutions range from 640 by 480 pixels to 1024 by 768 pixels, also at refresh rates from 50Hz to 120Hz. The Hitachi-based \$2499 monitor is also available now. RasterOps, 408/562-4200.—T.M.



APPLE'S POWERBOOK 145 OFFERS THE PERFORMANCE OF THE POWERBOOK 170 WITH A LESS-EXPENSIVE DISPLAY.

PowerBook 145 Replaces the 140

For those who want the performance of a PowerBook 170 but aren't willing to carry the hefty price tag, Apple has brought out the PowerBook 145, a

continues

TREND

The Next Best Thing

NEED TO LOOK SOMEONE in the eye while you discuss a project over the telephone? Take a look at Northern Telecom's new Visit Video.

Visit Video includes a black-and-white video camera and a digitizing board that digitizes your mug at 10 to 15 frames per second and shoots it down a switched 56 or ISDN line to a window on another computer. Visit Video's software offers file transfer and screen sharing, and has pencils, highlighters, and other tools for collaborating on on-screen documents.



TALKING HEADS. VISIT VIDEO ALLOWS PARTICIPANTS TO DRAW ON EACH OTHERS' SCREENS.

The Visit Video package costs from \$2900 to \$3500 per person and may not be compatible with all digital phone systems. Northern Telecom is also working on a color camera and board. Northern Telecom, 214/684-5930.—D.L.



⇒ Mac is Mac and Windows is Windows and WordPerfect® plays no favorites. ⇐ If Macintosh is your idea of what a computer should be, WordPerfect has a powerful, elegant System 7 word processor that only proves you right. ↵ If Windows is more to your liking, WordPerfect has a best-seller that makes the most of it. ✌ Yet surprisingly, WordPerfect for Mac documents are compatible with WordPerfect for Windows. Which means that an office divided against itself *can* stand, after all.

WordPerfect®

FOR INFORMATION CALL 1-800-526-5178

model that features the 170's oomph combined with the less-expensive backlit supertwist LCD screen used on the PowerBook 140. The PowerBook 145, which replaces the PowerBook 140, gets its muscle from a 25MHz 68030, the same processor used in the 170. The 145's system board is essentially the same as that of the 170. As a result, the 145's performance is about 35 percent higher than that of a PowerBook 140.

The new laptop ships with System 7 already installed and with a minimum of 4MB of RAM, expandable to 8MB. It weighs 6.8 pounds, the same as the 140 and 170. Apple will offer two models: the PowerBook 145 4/40 with a 40MB hard drive, and the PowerBook 145 4/80 with an 80MB hard drive. Apple describes the 4/40 as a "price point machine" at \$2399 list and positions the 4/80 to compete with Compaq's Contura 3/25 (with trackball and Windows added). Both models of the PowerBook 145 were available from Apple dealers at their introduction on August 3.—T.M.

DESKTOP LIBRARIAN

Books on QuarkXPress

This month we peruse three books on QuarkXPress.

- *The Official QuarkXPress 3.0 Handbook*, by Diane Burns and Sharyn Venit (1990, \$24.95). Billed as a complete reference, this book is organized in three parts: using QuarkXPress, advanced techniques, and case studies. The first section starts with an introduction to the Mac and basic QuarkXPress functions, then discusses document creation and printing. The section on advanced techniques covers shortcuts, troubleshooting, and project management. The seven case studies are about publications that converted from traditional methods to QuarkXPress. Bantam Computer Books, 212/492-9666.

- *The QuarkXPress Book*, by David Blatner and Keith Stimely (1991, \$24.95). This volume begins with an overview of the program, then moves through chapters on document construction, putting text and pictures on a page, modifying images, color, and printing. Each chapter contains a multitude of tips. The book also includes appendices on PostScript and additional resources. Peachpit Press, 415/527-8555.

- *QuarkXPress 3.1 by Example*, by Tim Meehan and Cynthia Williams (1992, \$26.95). Covers the Mac and QuarkXPress basics, then gives examples of how to create your first document, followed by chapters on word processing, typography, working with graphics, and color and trapping. The book ends with examples for page layout, case studies, and a chapter on printing. Includes a section in color and a glossary. M&T Books, 800/533-4372, or 800/356-2002 in California.—T.M.



THE OFFICIAL QUARKXPRESS 3.0 HANDBOOK, THE QUARKXPRESS BOOK, AND QUARKXPRESS 3.1 BY EXAMPLE.

BERNARD MARQUE

TREND

EDI for the Mac

MANY LARGE COMPANIES and government agencies require contractors and suppliers to use Electronic Data Interchange (EDI), a paperless system of exchanging purchase orders, invoices, shipping notices, and other standard business information. Digit Software's MacEDI provides EDI support for the Macintosh.

MacEDI translates EDI-format data from other computers into a format that Macs can read, and translates Macintosh data into EDI format for other computers. It also supports direct communication with other computers and many third-party EDI exchange systems.

MacEDI 2.1 is \$1950 and supports a new standard for exchanging engineering and technical information, called the X12 841 transaction. MacEDI Mapper, a companion product for relating fields in a database to EDI entities, is \$1500. Digit Software, 301/593-8952.—D.L.



TIM ABBOTT OF ABBOTT TRANSPORTATION IN SPARKS, NEVADA, IS AN EARLY ADOPTER OF EDI ON THE MAC.

GCC's Fast Optical Drive

The UltraDrive 120MO from GCC is a 3½-inch magneto-optical drive that has a 35ms average access time, which brings it into the speed domain

of hard drives. The drive's cartridges hold 120MB of data, and are compatible with the ISO standard incorporated in other vendors' 3½-inch erasable optical drives with about the same capacity.

The UltraDrive 120MO has a retail price of \$1899, including one cartridge, cables, GCC's DriveManager hard drive-management software, and Central Point Software's MacTools Deluxe utilities package. Additional cartridges retail for \$69, and GCC will include a second free cartridge with drives that are sold through September 15. The UltraDrive 120MO was slated to ship in August. GCC, 617/890-0880.—T.M.

Dataproducts' 600-dpi Printer

DATAPRODUCTS Corporation has announced the LZR 965, a PostScript Level 2 laser printer that produces 9 pages per minute at 600-by-600-dpi resolution. Based on a Sharp print engine, the device also includes a Weitek 8200 RISC chip for faster processing of complex images.

The printer comes with 8MB of RAM expandable to 16MB, and it has connectors for SCSI, LocalTalk, Centronics parallel,

News

Radius Ships VideoVision

Radius has officially introduced VideoVision, a digital video product based on technology purchased from Apple and previously announced under the code name Touchstone. Intended for low-cost desktop video publishing, VideoVision transfers integrated graphics, sound, and video back and forth between a NuBus Macintosh and television devices; eliminates flickering; and transfers digital output to standard VHS tapes. The output transferred to videotape can include digital graphics, sound files, and the like.

VideoVision is a 24-bit NuBus board intended to be used with video-editing applications such as Adobe Premiere and DiVA VideoShop. Radius began shipping VideoVision at the end of July. The product's list price will be \$1999, and for a limited time, that will include DiVA VideoShop and MacroMedia's Action presentation software. Radius, 408/434-1010.—T.M.



THE LZR 965 IS A POSTSCRIPT LEVEL 2 PRINTER THAT PRODUCES 9 PAGES PER MINUTE WITH HIGH RESOLUTION.

and RS-232C serial ports. The LZR 965 can sense which ports are receiving files.

Dataproducts expected to begin shipping the LZR 965 in mid-September at a list price of \$2995, including drivers for Windows and Macs. Dataproducts, 818/887-8000.—T.M.

Unlimited storage. Unbelievable price.

Introducing the Bernoulli® MacTransportable 90 PRO.



System 7. Quick-
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They eat storage.

And nothing handles storage
like the Bernoulli
MacTransportable 90 PRO
from Iomega®.

The best removable storage system you can buy.

Bernoulli is better than a
hard disk because it won't
fill up. You simply insert
another affordable 90MB disk.

It's better than conven-
tional removable storage
systems, too, because it was
built from the ground up to
be removable. No other
removable drive has
Bernoulli's 75,000-hour
Mean Time Between Failure

rate, Bernoulli's proven head-crash resistance,
and the industry's most rugged
disks—able to withstand an
eight-foot drop.

And it's better than
magneto-optical because
you get twice the perfor-
mance for half the price.

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The latest entry in our com-
plete line of products for the Mac, the new
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an interface kit and 90MB disk. Advanced



Transportable, dual drive, and Quadra Insider
versions are also available.

Hard-disk performance.

Enhanced 90 PRO drives have a fast 18-msec
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The most recommended drive.

Bernoulli is the only removable drive to receive
the Macworld World Class Award the last two
years. And it has also won the Publish Reader's
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desktop publishing. We have a 99% customer
satisfaction rate. And we're the only computer
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unlimited storage is at
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VIRUS WATCH

CURRENT VIRUSES, TROJAN HORSES, AND WORMS

© T4-A, T4-B

TYPE: Virus
FIRST LISTED IN VIRUS WATCH: 10/92
INFO: Initially discovered in a game called GoMoku
IMPACT: Both versions of T4 damage system files and applications

© ChinaTalk

TYPE: Trojan Horse
FIRST LISTED IN VIRUS WATCH: 10/92
INFO: ChinaTalk is an INIT that comes with a read-me file that claims it provides a female voice for MacinTalk
IMPACT: Deletes the contents of disk drive on restart

© INIT 1984

TYPE: Virus
FIRST LISTED IN VIRUS WATCH: 8/92
INFO: Infects INITs; becomes active only on Friday the 13ths
IMPACT: Destroys files and changes file and folder names and attributes to random garbage

Code 252

TYPE: Virus
FIRST LISTED IN VIRUS WATCH: 8/92
INFO: Displays a message telling user it is destroying contents of hard drive
IMPACT: After displaying message, it deletes itself without causing damage. Infected Macs may behave erratically

MBDF

TYPE: Virus
FIRST LISTED IN VIRUS WATCH: 6/92
INFO: Initially distributed via Trojan horse program called Tetricycle, but can spread like other viruses
IMPACT: Does not destroy data; may disable applications

Drafting a Ballet

The San Francisco Ballet's upcoming season includes 18 ballets, from *Swan Lake* to *Rodeo*. That means a lot of scenery sliding in and out on the 68-foot-long battens that travel the width of the stage. It also means hundreds of changes in lights, backdrops, stage masking, and flying scenery. Production manager Michael Kane and stage manager Peter Butt begin each of these complex architectural productions by sketching out stage plans from all perspectives in Innovative Data Design's MacDraft, experimenting until they're sure the audience won't see lighting instruments, scenery won't take up too much dancing space, and flying scenery won't collide. Final plans go into an Excel spreadsheet for the carpenters, electricians, and flymen (who control flying scenery) to plan their tasks.—ANN GARRISON

Electronic Chamber Orchestra

COMPOSER GUY GARNETT is planning to conduct an unusual chamber orchestra: human flutist Priscilla Call and a Yamaha TG77 synthesizer, which will play piano and harp-like parts. In one hand, Garnett will wield a conducting baton that sends an infrared signal to control the synthesizer's tempo and phrasing. From Garnett's other hand, an electronic glove will send signals to a Mac running Op-



GUY GARNETT CONDUCTING FLUTIST PRISCILLA CALL WITH HIS RIGHT HAND AND A MAC WITH HIS LEFT HAND.

Code Systems' Maxnet software to control timbre, spatialization, and reverberation of both the flute and the synthesizer's sound. The orchestra will perform at the 18th Annual International Computer Music Conference, which runs October 14 to 18 at San Jose State University in San Jose, California. For more information call 408/924-4675.—ANN GARRISON

Games Computers Play

How well can CB Sim, an artificially intelligent "agent," play the role of urban planner? During the next two years, University of Chicago computer scientists Kristian Hammond and Charles Martin will observe as CB Sim plays SimCity, the urban-planning-simulation game from Maxis. Hammond and Martin's AI software has two components: CB, an agent capable of "case-based reasoning," or reasoning from experience, and a database of cases. Thus, if asked to reduce crime in an industrial urban area, CB would consider past solutions to similar problems and might conclude that more housing would increase population, raise the

tax base, and make more police affordable.—ANN GARRISON



News

For Network Managers

TechWorks is expanding its position in the Mac networking market with TechWorks Net Utilities, a collection of management utilities that comes with real-time conferencing software. NodeWatch is a background spy that informs network managers when devices appear or disappear from the network; it can watch across multiple zones and routers. For debugging flaky nets or testing the impact of newly installed software, NetTimer can send echo packets and record response times. Other utilities provide information about laser printers and other devices on the network. MultiChat allows users on a network to exchange text, sounds, Clipboard contents, and files. Discussions are presented in chronological order and can be encrypted, but MultiChat provides no store-and-forward capability. TechWorks Net Utilities lists for \$129. TechWorks, 512/794-8533.—D.L.

TREND

Portable Floptical Drive

Mass Microsystems has joined the parade of peripheral vendors offering hybrid floppy-optical Floptical drives but with a small difference: the FloptiPak 21 weighs under 2 pounds and measures only 1 inch by 9 inches by 5 inches. The 21MB FloptiPak 21 achieves its small size in part because it gets its power from the Macintosh's floppy disk port and therefore does not need its own power supply.

Like other Floptical drives, the FloptiPak 21 is based on a mechanism made by Insite Peripherals that combines magnetic and optical recording on a disk the same size and shape as a 3.5-inch floppy disk. The drive can also read and write to 1.44MB Mac floppy disks. The FloptiPak 21 has a suggested retail price of \$699, and the disks retail for \$49. It began shipping in June. Mass Microsystems, 408/522-1200.—T.M.



MASS MICROSYSTEMS' FLOPTIPAK 21 IS A PORTABLE FLOPPY-OPTICAL DRIVE THAT CAN STORE UP TO 21MB OF DATA.

The Preferred Choice...

Featuring Sony Optical Technology



MicroNet's Rewritable Optical Systems Offer More Speed, Size, and Performance Options For Removable Data Storage.

Today's complex projects require forward-thinking storage solutions. That's why MicroNet has added a new 3.5" rewritable optical system to our Macintosh, PC, and workstation product lines. It's fast, reliable, and cost-effective. Store 128 MB on a shirt-pocket-size disk at a lower media cost than any other system. Access data in just 38 ms. And secure valuable files now, and far into the future with optical cartridges impervious to contamination and head crashes.

MicroNet also offers 5.25" optical storage options. Our 586 MB system is perfect for transporting or archiving large CAD, pre-press, or graphic files from work site to work site. And like our 3.5" system, it's ISO compatible, so media can be recognized in any ISO standard drive.

MicroNet's rewritable optical systems for the PC operating under NetWare, ship with our specialized driver for optimum performance. And systems on a PC network, when combined with Cheyenne's ARCserve or ARCserve/Solo, make archiving and retrieving Macintosh, OS/2, and DOS files fast and easy.

MicroNet's 3.5" and 5.25" drives are available in internal and external configurations for most computer systems. They ship ready to install with software, connectors, cables, and brackets as needed.

Find out why MicroNet's systems are the preferred choice in rewritable optical storage. Call the MicroNet Sales Department today for the name of a Reseller near you. 1-714-837-6033.



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Circle 113 on reader service card



CAMILLE GERACE

TIM REY (LEFT) AND CHEMIST JOSEPH RIBINSKY OF ESSEX SPECIALTY PRODUCTS WITH THE RESULTS OF AN EXPERIMENT.

Getting the Jump on Experiments

TIM REY IS A statistician at Dow Chemical Company's Central Research and Development facility in Midland, Michigan, where 600 chemists and chemical engineers design new plastics, ceramics, and other chemicals and chemical processes. To save money and time, Rey's group helps the chemists weed out unnecessary experiments using a statistical process called Design of Experiments.

Rey is beta-testing SAS Institute's JMP Design, which he describes as "very deep in terms of rigor, but quick to get the design [you need]." JMP Design is a stand-alone tool; results can be moved into JMP itself for further analysis.

JMP 2.0 lists for \$695; JMP Design (including D-Optim, a special JMP add-on) lists for \$295. SAS, 919/677-8000.—D.L.

Virtual Dance World

An artist, an architect, and a dancer are combining virtual reality tools with dance in Dancing with the Virtual Derivish. This fall Diane Gromala, Marcos Novak, and Yakov Sharir will transmit live video of their dance over telephone lines from the Banff Centre for the Arts to sites in Banff, Alberta, Canada; Austin, Texas; and Santa Monica, California. Video monitors at each site will show a dancer in goggles and gloves side by side with the virtual world that the dancer sees in the goggles. Audiences will manipulate the objects in that

ANALYSIS

Mac-Using Travel Agents

Macintoshes are just beginning to appear on the desks of travel agents, reflecting a sea change in the travel industry.

New Department of Transportation regulations will require computer reservation systems (CRSs) like American Airlines-owned Sabre to let travel agencies use third-party hardware and software, and agencies will be able to store clients' information on their own computers, instead of on the CRS mainframe, to use for business and marketing purposes.

Third-party suppliers are popping up. MicroAge, a big integrated-systems vendor, is selling Mac-to-Sabre systems that use hardware and software from Innosys. Travelogix is developing agency-management software that will provide everything from a CRS interface to an accounting system. MicroAge, 405/272-9655; Innosys, 510/769-7717; Travelogix, 512/794-5990.—D.L.



DOROTHY CARICO SMITH



A VIRTUAL STAGE WHERE DANCERS PERFORM TO AN AUDIENCE THAT REARRANGES THE PROPS DURING THE PERFORMANCE.

world and then see not only the dancer's reaction, but also changes in the dancer's virtual world. For more information, call Banff Centre's Art and Virtual Environments Project at 403/762-6651.—ANN GARRISON

Connecting Macs to Color Copiers

HA TELECOM Corporation has created Color Connect and Color Connect Scan, software products that let a Macintosh II-series system use a Canon Color Laser Copier as a printer or a scanner, respectively. The Color Connect setup supports most applications for 32-bit QuickDraw version 1.2, and it can print in either Japanese or English. It has an added antialiasing feature, supports ATM outline fonts and TrueType fonts, and prints on a wide variety of paper sizes at resolutions ranging from 72 dpi to 400 dpi.

Color Connect Scan can also accept still video, NTSC or S-Video, RGB video, or film scanner input. Color Connect Scan permits scanning in color, gray scale, and black and white, at the same range of resolutions as with Color Connect, and with a film scanner at higher resolutions, from 600 to 3353 dpi. Both software products work with TIFF and PICT files.

The Macintosh II connects to the Color Laser Copier via the SCSI port. The products require at least 8MB of RAM, and a 24-bit display system is recommended. The products are available now, bundled together at a list price of \$3500. In the U.S., contact HATNET, 408/725-2800.—T.M.

News

Flying Logos

Pixar is developing Typestry, a utility for creating 3-D text, adding all kinds of special effects, and animating it.

In Typestry you can enter text using TrueType or Type 1 fonts, or import text created or modified with such tools as Ares Software's FontMonger, Altsys's Fontographer, or Letraset's FontStudio. Once in Typestry, you can extrude text into three dimensions, bevel the edges, rotate it, place a back-drop behind the image, and set up a key-frame animation. Typestry provides RenderMan shaders for creating special effects such as making the text look like metal or stone. Typestry will list for \$299. Pixar, 510/215-3469.—D.L.



SETTING UP LIGHTING AND ASSIGNING SPECIAL EFFECTS (WHICH PIXAR CALLS LOOKS) IN TYPESTRY.



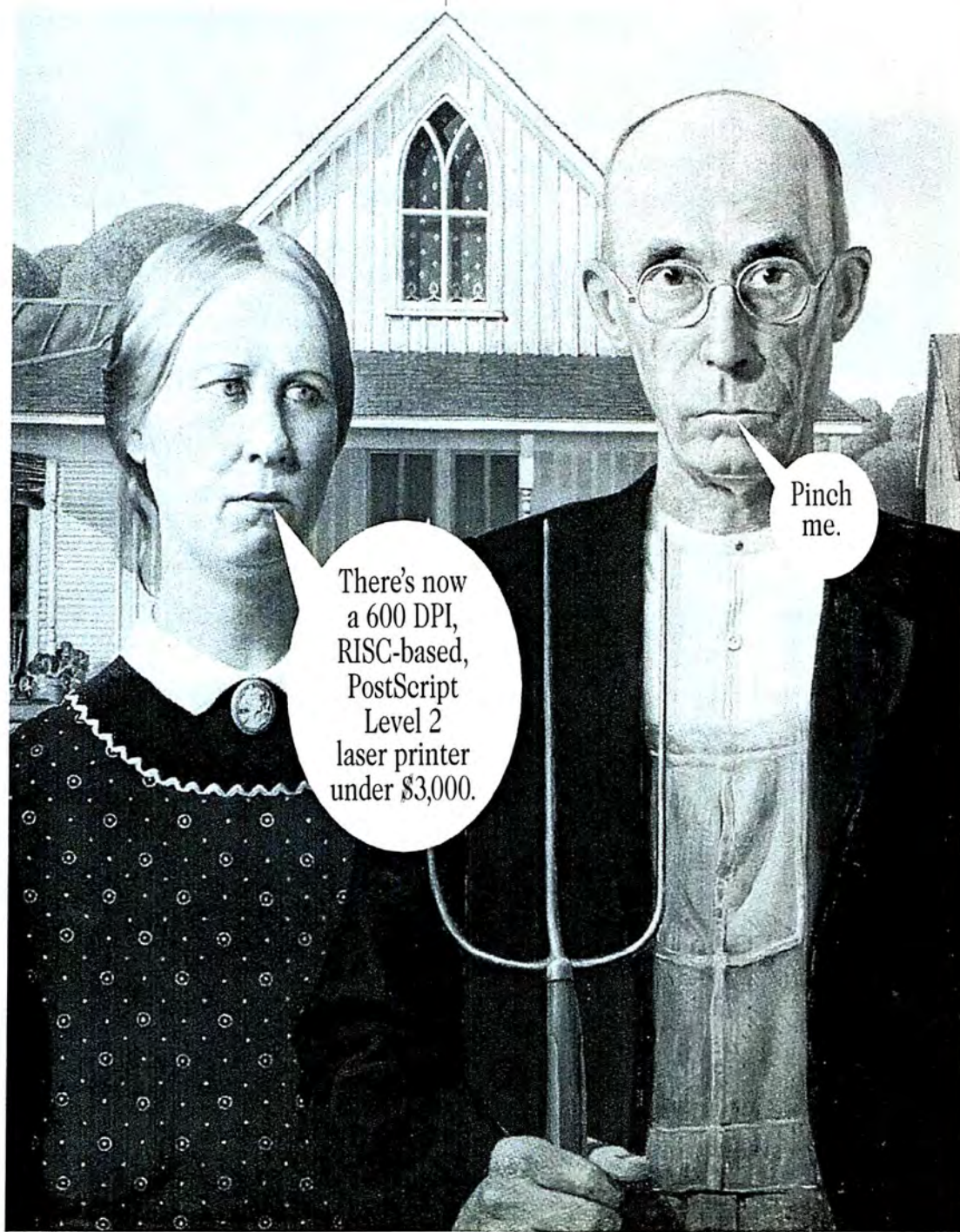
TURKEY SHOOT

DESIGN FLAWS NOTED

Sensible Grammar and Grammatik Mac If you run a French- or Spanish-language document through either of these grammar checkers, they'll zip right through without realizing they're not looking at English. They find no mistakes and generate readability scores, and Sensible Grammar even scores the documents for how interesting they are.

AppleLink and Internet Hey, privacy fans, here's a good one. Question: When are blind carbon copies of your E-mail delivered not-blind? Answer: When you send them from AppleLink to the Internet or from the Internet to AppleLink.

Macworld will send you a Turkey Shoot T-shirt if we shoot your turkey in this column. See *How to Contact Macworld*.



The new LZR 965 from Dataproducts gives you everything you want from a laser printer at a price that may startle you. This true 600 x 600 dpi, Adobe® PostScript® Level 2 laser printer gives you greatly enhanced gray scale capabilities for optimum detail in graphics and photographic images. Even 4-point type is made clean and easy to read. And since the RISC-based processor can provide fast, flawless delivery of higher resolution images your output can look like a masterpiece every time. In no time.

	List Price	PPM	RISC Processor	Postscript Level 2	Resolution 600x600	Warranty
LZR 965	\$2,995	9	Yes	Yes	Yes	2 years
IBM 4029-10A	\$3,995	10	No	No	Yes	1 year
Apple LaserWriter IIg	\$4,999	8	No	Yes	No	1 year
QMS PSS15MR	\$5,495	8	No	No	Yes	1 year

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Combine Mac and PC system compatibility and superior paper handling with a very small footprint and you'll begin to experience the whole picture.

You don't need a trained eye to see that the extraordinary image quality and technologically advanced features will make this printer a classic for years to come. Add the fact that it's easy to use and inexpensive to own and you'll know why the LZR 965 has everybody talking. For finer details, contact the Dataproducts dealer nearest you or call 800-334-3174.

 Dataproducts.
The high performance printer people.™





BUG REPORT

Outbound Notebook Computers If you put an Outbound to sleep with a floppy disk in the drive, it will corrupt the disk. Outbound says version 1.3 of the Outbound software will fix this bug and will be sent free to all Outbound owners.

QuickKeys 2.12 May corrupt the universal key set. CE Software says it has sent bug fix 2.12a to all registered users. Version 2.12 reportedly sometimes loses the connection between keys in sequences; version 2.12a does not solve this problem.

WordScan Plus WordScan makes all three passes with some Microtek color scanners, even though it needs only a black-and-white image to recognize the text (this problem may also occur with other color scanners). Calera says it is working on a bug fix.

MACWORLD WILL SEND YOU A BUG REPORT T-SHIRT IF YOU ARE THE FIRST PERSON TO INFORM US OF A SERIOUS, REPRODUCIBLE BUG THAT WE REPORT IN THIS COLUMN. SEE HOW TO CONTACT MACWORLD.

MacProject Revised

FOLLOWING Microsoft's big upgrade to Project (see *News*, *Macworld*, September 1992), Claris is revising MacProject to Pro status.

MacProject Pro fills some big gaps in the earlier version and adds new features. In the gaps-plugged department are a full suite of dependency constraints for task starts and finishes; an outliner (that doubles as a table) for entering tasks; automatic generation of breakdown-structure codes—hierarchical numbering of tasks and subtasks—for tasks (though not resources); a customizable Gantt-chart view; and much improved resource leveling.

In the new features category are support for publish and subscribe as well as Apple events; user-designed multiwindow reports that work as templates with other projects; unlimited



A GANTT CHART WINDOW STACKED ABOVE A TABLE VIEW THAT DOUBLES AS AN OUTLINE IN MACPROJECT PRO.

tasks and resources (each can have its own calendar); and notes attached to charts or tasks. MacProject Pro lists for \$599. Claris, 408/727-8227.—D.L.



WORLD BANK PROJECT IN ANGOLA USES MAP II TO MAP UNPLANNED SETTLEMENTS LIKE THIS ONE NEAR LOBITO.

MAP II: New Dots

In Angola, as in many countries ravaged by war, large migrations, or rapid population growth, there are few accurate maps. When the World Bank began helping the Angolan government to plan taxation, water and sewage services, and so on, urban planners used MAP II to convert Spot satellite images into maps showing structures, population density, and other factors. MAP II, from ThinkSpace, is a raster-based geographic information system—raster systems are more appropriate for land-use analysis, hydrography, and environmental issues than are point-, line-, and polygon-based systems (see "MapInfo's New World," *News*, *Macworld*, Sep-

Automatic Haystack

TMS'S INNERVIEW is a tool for putting large amounts of information, such as technical documentation and legal reference material, into a form that is easily distributed on a CD ROM. With TMS's ViewDirector, InnerView applications can also include illustrations.

An application can have a table of contents and hypertext links; users can add notes and leave bookmarks; and the database can be expanded with new information stored on a hard drive. InnerView supports Boolean operators and proximity and complex searches.

Preparing data for a TMS system requires a DOS machine and involves developing special filters to structure the raw information (TMS provides consulting services to help first-timers). Pricing depends on application. TMS, 405/377-0880.—D.L.

tember 1992). MAP II can perform such analyses and transformations as averaging values of several map layers (say, crop production over five years) and computing drainage based on terrain and precipitation.

MAP II 1.5 lists for \$345. In the works: MapFactory, which will include a scripting language, closer links to non-spatial databases, and annotation and layout features. ThinkSpace, 519/661-4006.—D.L.

News



IN EXPLORE MISSOURI STREAMS, YOU GET A LOOK AT THE MISSOURI RIVER SYSTEM FROM A FISH'S-EYE VIEW.

Missouri White Water

Have you ever wanted to be a smallmouth bass swimming up a stream in the Ozarks? No? How about a naturalist exploring the bass's habits and habitats? At the Saint Louis Zoo in Missouri, you can experience life as the bass and the naturalist, and hear from a biologist and other experts, in the interactive Mac-based exhibit *Explore Missouri Streams*. The exhibit includes 60 minutes of video and a graphic, online atlas of 74 streams. It was produced by Monterey, California-based Sea Studios and programmed by Jeff Reynolds. Saint Louis Zoo, 314/781-0900, ext. 316.—ANN GARRISON

TREND

Photo CD Drive

The Micro/CD-ROM series of CD ROM drives from MicroNet Technology can read several formats, including Kodak's Photo CD photographic-image discs. The drives also support the ISO 9660 and High Sierra formats. The Micro/CD-ROM is an external device, and the company is also offering the Q9i-CD, an internal version for the Quadra 900 and 950. The drives transfer data at a sustained rate of 150K per second and have an average access time of 350ms, according to MicroNet.

Both drives come with a utility that mounts all data and photographic CDs and with a control panel for playing audio CDs. The Micro/CD-ROM lists for \$995, while the Q9i-CD lists for \$895. Both are available now. MicroNet, 714/837-6033.—T.M.



MICRONET'S MICRO/CD-ROM DRIVE CAN READ KODAK'S PHOTO CD FORMAT FOR STORING PHOTOGRAPHS ON COMPACT DISCS.

TOM GIBSON

Now there's a Doubler for every single Mac.

Data compression is an essential tool for Macintosh®. But different users need different functions. That's why Salient offers a choice.

Whether you want hard disk compression that's completely automatic, or a hands-on utility with a variety of functions—or both—Salient has the "Doubler" for you.

AutoDoubler™, the fast, automatic, hard disk maximizer.



AutoDoubler is the effortless way to save hard disk space. You just double click to install and AutoDoubler does the rest. It compresses everything you want compressed, increasing disk space up to 100% or more.

AutoDoubler won't interrupt your work. It compresses only when your system is idle. It's compatible with other utilities. And it's so fast, you'll hardly notice it's there—just click on a file and it opens, pronto.

AutoDoubler, the solution to your hard disk space problems, is now available in a 10-pack.

.....
"The true beauty of AutoDoubler is its complete invisibility."

— Publish magazine, 2/92
.....



DiskDoubler™, the hands-on compression tool.

DiskDoubler makes it easy to copy large files to diskette, speed modem transmission, archive data, or simply free disk space.

DiskDoubler shrinks files an average of 50%, so it saves you time and money when sending via modem. It also creates self-expanding archives, so files can be opened without DiskDoubler. "Split" and "combine" functions give you extra flexibility in archiving and copying.

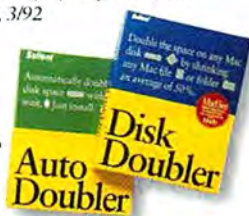
DiskDoubler is fast and easy—use it for all your hands-on compression needs.

.....
"Not only is it [DiskDoubler] among the top speed and efficiency performers, but it's utterly safe for your data."

— David Pogue, MacWorld, 3/92
.....

Two Doublers are better than one.

For complete flexibility, use AutoDoubler and DiskDoubler together. They're 100% compatible, 100% safe.



The compression company has expanded!

Salient is now a part of Fifth Generation Systems. That means our customers will enjoy the backing of a world leader, including a one year money back guarantee and 24-hour, 7-days-a-week, toll-free telephone support.

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Circle 39 on reader service card

Low-Power Macs

Apple and a number of other personal computer makers have agreed to redesign their desktop systems and peripherals to use less power, causing less damage to the environment. Under the terms of an Environmental Protection Agency-sponsored program called Energy Star Computers, Apple and the other hardware vendors will add features such as automatic shut-down when not in use, and low-power mode when idle. The energy savings may be 60 percent or more, according to EPA studies.

Products that meet the new EPA guidelines will be permitted to display an Energy Star logo that will be released to the vendors in about a year. IBM, Hewlett-Packard, DEC, Compaq Computer Corporation, and NCR Corporation have also signed up for the Energy Star program.—T.M.

Voice-Recognition Software

ARTICULATE SYSTEMS, a pioneer in Mac voice-recognition systems, has introduced a software-only version of its Voice Navigator voice-driven interface. The software, called Voice Navigator SW, works in Macs with a built-in microphone: the Classic II, LC and LC II, IIsi, Quadras, and PowerBook 140 and 170. Owners of other Mac systems can still purchase the Voice Navigator II hardware for \$699; Voice Navigator SW (the software-only ver-

How to Make a Virtual Object

RARE ART AND ARTIFACTS are usually kept under glass and handled only by curators and preservation experts. Now Apple's Human Interface Group has prototyped a tool to make unique objects more accessible. The system has metal scaffolding with arms that hold a video camera, and a Mac cabled to both the camera and the camera arms. HyperCard scripts direct the camera to circle the object, shooting it from many angles. The still-video frames are then digitized into QuickTime format for random access. Dan O'Sullivan and Mike Mills designed the system, and Ian Small and Michael Chen wrote the software. The group may market the software as a tool kit, but has no plans for the hardware component.—ANN GARRISON



KODAK'S RFS 2035 FILM SCANNER CAN SCAN A SLIDE AT 24 BITS AND 2000 DPI IN LESS THAN 2 MINUTES.

Fast Kodak Film Scanner

Kodak has brought out the RFS 2035 professional film scanner, which can complete 24-bit color scans of 35mm negatives or slides at 2000 dpi in less than 2 minutes. The scanner also has several lower-resolution modes, including a black-and-white preview mode for selecting the area of the negative or slide to be scanned in color. The device

sion) lists for \$399.

The Voice Navigator technology enables users to control the Mac and its applications by speaking, after training the system to recognize the user's voice and entering digitized versions of the most common commands. Articulate Systems, 617/935-5656.—T.M.

is compatible with Macs and with DOS machines that have SCSI adapters installed.

Other features include automatic exposure-setting, focusing, and color-balancing, and fixed and adjustable film channels. The scanner can accept four slides or six negatives inserted in a horizontal strip fed through the fixed film gate. Plug-in image-acquisition modules for Photoshop and PhotoStyler come with the scanner, which lists for \$7995 and began shipping in July. Kodak, 800/465-6325.—T.M.



ALDUS'S FETCH AND PHOTODISC'S LIGHTBOX CAN ARCHIVE ENORMOUS AMOUNTS OF DIGITAL ART.

Artist's Attic

SOFTWARE TOOLS for dealing with enormous amounts of digital art are evolving.

Aldus recently took over publishing the art-archiving program Search from Multi-Ad Services and changed the program's name to Fetch, adding support for many new formats including QuickTime, Kodak's PhotoCD, JPEG, and the AIFF and SoundEdit sound formats. Windows can be resized, keywords can be batch-entered, and catalogs can be password-protected.

PhotoDisc, a company that publishes stock photography on CDs, is now marketing its

News

Mac Walks in Space?

At NASA's Johnson Space Center, a simple robot delivers mail to engineering offices by following a predesignated route, signaling at each door where it makes a drop-off. Meanwhile, NASA robotics engineers are using Mac Quadras to design circuit boards for future robots, whose advanced features may include vision systems and proximity sensors. Since the prototype robots use controller boards based on the Motorola 68000 chip that also drives the Mac, Macintosh compilers can be used to develop and debug robotics programs. The prototype robots can be controlled by Macs via wireless modems. The robots are primarily research projects for evaluating future requirements and designs and are not likely to be employed building the space station.—PHILIP CHIEN



LOUIS MCFADIN POSES WITH A ROBOT AT THE JOHNSON SPACE CENTER'S AUTOMATION AND ROBOTICS DIVISION.

archiving software as LightBox. LightBox supports Boolean searching on index terms and can save search criteria for reuse. It has a proprietary thumbnail format for resizable thumbnails, and a built-in slide show feature.

Pricing for both products was not set at press time. Aldus, 206/622-5500; PhotoDisc, 206/441-9355.—D.L.

JUST FOR FUN

Total Baseball

Have a friend who spouts baseball statistics at the mere mention of summer? I do, and I shudder to think of what will happen if he sees Creative Multimedia Corporation's Total Baseball, a CD ROM of baseball history that includes 2600 pages of statistics going back to 1871. Billed as the most comprehensive of baseball encyclopedias, Total Baseball contains stats on pitching, hitting, and fielding for major leaguers, as well as team standings and info on batting champions and other titans of the game. Covering more than 13,000 players up through the 1991 World Series, the CD ROM also offers images of historic ballparks, articles on baseball scandals and oddities, and sound clips from famous personalities. Total Baseball lists for \$69.95 and works with Macs and DOS machines. It is now shipping. Creative Multimedia, 503/241-4351.—T.M.

THE ONLY 8MM TAPE DRIVE THAT CAN MAKE CHANGE.



IT MAKES CENTS. Take the magazine you're reading. To fill a single 8mm tape, you could backup every issue of MACWORLD for the next two years. A single issue costs just about 33 cents to store. Consider that you're spending less time backing up more data, and you're no longer dealing with small change.

Using our high speed, high capacity 8mm tape drives will save you time and money in manhours, media, storage, and shipping costs. In fact, our drives give you the lowest cost per megabyte on the market. On lightweight, reliable media. That is fast becoming an industry standard.



AND IT MAKES SENSE. The menu driven software features a calendar for automatic operation. Schedule a backup to run at any time, day or night. Choose an incremental or complete backup. The software's directory will keep track of every file that you've saved. To restore a file, simply pull up the directory and click on the file you want; if you want to create space on the hard drive, just copy selected files into the archive.

Compatible with all Macintosh models including systems running A/UX, our drives give you between 2.5GB and 25GB of storage per tape. Features like a liquid crystal display, data compression, data encryption, and high speed search capability give our drives the flexibility to adapt to your changing needs. We can meet any site requirements with rack mounting options, hard disk configurations, and a variety of cable lengths. And we back every product in our line with a 12-month warranty and technical support.

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Circle 188 on reader service card

Basic Black

Fractal Design is working on Sketcher, a new gray-scale package that replaces ImageStudio and simulates artist's materials like Fractal Design's color paint package, Painter.

Sketcher's interface is similar to Painter's, and the same texture files work in either program. Individual tools can be pulled off the palette and arranged around the working surface (Sketcher's tools lack most of Painter's high-end controls). Sketcher can take advantage of pressure-sensitive tablets—for example, drawing a wider line when pressure on the stylus is increased—and provides ways for mouse users to get similar effects. Type can be converted to friskets, Fractal Design's term for masks. Sketcher can also record a series of strokes or other actions and play them back, for example, to apply the same changes to several images.

Sketcher will list for \$149. Fractal Design, 408/688-5300.—D.L.



IS IT SKETCHED—OR IS IT SKETCHER? FRACTAL DESIGN'S NEW PROGRAM SIMULATES BLACK-AND-WHITE DRAWING TOOLS.

Xerox's Paperless Documents

A XEROX-FUNDED START-UP called Documentum is developing a system of the same name for managing documents in almost any kind of computing environment.

Documentum doesn't incorporate the contents of documents in its own database, instead it maintains documents in their native format—for example, Word, FrameMaker, or Lotus 1-2-3. It manages document distribution, tracks revisions, and searches documents by attributes (such as who created a document or when) and by content. Documents can be linked hierarchically in complex groups—for example, from pages to chapters to volumes.

Documentum is client-server based and supports Macs as well as Unix and Windows machines. Documentum will develop versions that work with all major database systems and networks, and also plans to produce an end-user, shrink-wrap version. Price depends on configuration. Documentum, 510/460-4120.—D.L.

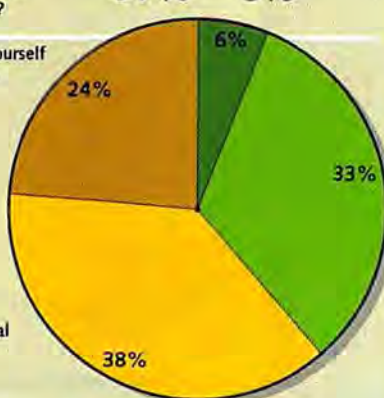
Survey: Computer Ability

Do you currently use a Macintosh computer, either at work, home, or elsewhere?

Yes 97% No 3%

How would you classify yourself in terms of your personal-computer abilities?

Beginner
Intermediate user
Advanced user
Computer professional



Figures are based on 596 respondents to a 1992 Macworld mail-in subscriber News survey. Multiple responses were allowed.

Faster 882MB

Optical Drive

MICRONET Technology has begun shipping the SB-TMO-1000, a second-generation erasable optical drive with an average access time of 35ms. The 5¼-inch drive uses 1GB cartridges with a formatted capacity of 882MB. It has a data-transfer rate of higher than 900K per second over SCSI, MicroNet said.

Based on the Tahiti II drive mechanism made by Maxoptix, the SB-TMO-1000 is designed to be backward-compatible with the more common ANSI/ISO 650MB erasable optical drives from a number of companies. The retail price of the SB-TMO-1000 is \$5345. MicroNet, 714/837-6033.—T.M.



DOROTHY CARICO SMITH

Where the Time Goes

Timeslips Corporation, which publishes the time-billing package Timeslips, is developing LapTrack for analyzing how you use your time.

LapTrack sports some features designed for PowerBook-toting business travelers—in particular, its ability to upload, to a server back at headquarters, details on how you spend your time on the road. Managers can slice and dice the database to create graphs and reports showing budgeted versus actual expenses, who is racking up the highest percentage of billable hours, which types of clients are the most profitable, and so on. It can read data from a Sharp Wizard or CE Software's Alarming Events (Timeslips plans to add other filters later).

LapTrack will probably list for about \$80 for one user. Timeslips, 508/768-6100.—D.L.

News

Asanté's Serverless Messaging

PersonToPerson from Asanté Technologies is network communications software that, among other things, supports the exchange of voice messages and text files without requiring a dedicated server. Intended to be used by departments and workgroups, the software includes an in/out board, monthly and daily calendars, and a customizable screen saver.

PersonToPerson has begun shipping at suggested retail prices of \$149 for a two-user package, \$399 for a ten-user package, and \$699 for a package that supports a network zone. Asanté, 408/752-8388.—T.M.



BETA WAIT

Long-awaited products

ACIUS's 4D Server

Shown publicly January 1991. Current ship date projected: end of summer 1992.

FoxPro/Mac

Discussed publicly winter 1990/91; not in beta as of May 1992. Fox says will ship in 1992.

Interleaf 5

Discussed publicly October 1990. No ship date projected.

AEC's FilePower

Announced August 1991; planned to ship winter 1991/92. Ship date not set; may be ready to show August 1992.

CA-Cricket Graph 2.0

Announced in January 1992. Current ship date projected: August 1992.

Clarix's MacWrite Pro

Announced spring 1991. Current ship date projected: late summer 1992.

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The Norton Utilities for Macintosh 2.0

The Norton Utilities for Macintosh 2.0 combines and enhances the features from two award winning products: SUM II and Norton Utilities. The combination of these two products results in the first Macintosh utility software package to offer fully integrated advanced disk repair & recovery, automatic backup, data security, productivity tools and system enhancements in one informative, easy-to-use product. This unbeatable combination allows you to protect valuable data and make day-to-day functions a breeze. Whether working on your Macintosh at home or while networked into a corporate-wide system...if you own a hard drive, the Norton Utilities for Macintosh 2.0 is the product for you.

Publisher: Symantec UT10151

\$95

OPTIMA™ 96 or OPTIMA™ 24*

OPTIMA™ 96 or OPTIMA™ 24 for the Macintosh - Low-cost, high-performance 9600 and 2400 bps modems provide the latest error-control and data compression technology for maximum data throughput. In addition to V.32/9600 bps transmissions, OPTIMA 96 provides 38,400 bps throughput and OPTIMA 24 provides 9600 bps throughput. OPTIMA modems practically operate without you! Automatic Feature Negotiation creates the most efficient combination of speed, error-control, and compression

every time. OPTIMA 96 and OPTIMA 24: More modem for your money. Manufacturer: Hayes OPTIMA 96 MOD0077 \$399.

OPTIMA 24 MOD0096

\$149*



FontBank PostScript Display Typefaces

The FontBank PostScript Display Typefaces give you a library of 250 Type 1 postscript display typefaces. Build a versatile type library with designs ranging from the simple sans serif to the extreme ultra serif. Use them to create attention-getting headlines, sub-headings, titles, logos and special text effects. Included in the package are traditional, decorative, novelty, script, brush and calligraphic faces. Use these faces as a counterpoint to regular text or with design programs. FontBank allows you to obtain a large library of high-quality Type 1 PostScript display faces, which are compatible with all Mac applications. With FontBank fonts, you get full-featured screen and printer fonts at an affordable price. Publisher: FontBank FON0438

\$95

NEW

Hard Disk ToolKit® Personal Edition

Improve performance and make any drive System 7 compatible. Powerful, easy to use, affordable version of FWB's acclaimed utilities that format and partition all popular SCSI hard drives, removable and optical drives. Password protection secures your files and extensive

diagnostic testing ensures data integrity. Allows high performance driver updates on most devices without reformatting (Ideal for company-wide standardization). Publisher: FWB, Inc. UT10299

\$49

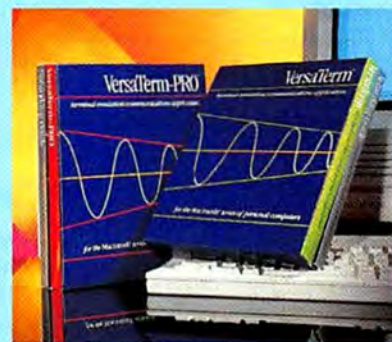


NEW

Capitalist Pig

New! Animated business simulation game challenges you to build and run your own business under authentic economic conditions. Experience the challenge of business, scandals, fires, terrorists, and more, as you battle for billions—or bankruptcy. Make crucial business decisions every minute, and enjoy the results—or suffer the consequences. Packed with sound, animation, and fun, it draws rave reviews from would-be entrepreneurs of all ages. Capitalist Pig is the must-have "Game of the Year". You never knew business could be so stimulating! Publisher: Pluma Software ENT0447

\$35



VersaTerm-PRO 3.6 or VersaTerm 4.6*

VersaTerm-PRO 3.6 and VersaTerm 4.6 emulate the following terminals: DEC VT220 and VT100, DG D210 and D211, plus Tektronix 4014 and (with Pro only) Tektronix 4105. They support multiple-sessions via the Apple Comm Toolbox, and come with a complete set of tools and INITs: MacTCP (TCP/IP), Telnet and FTP (Client & Server), SLIP (Serial Line Internet Protocol), LAT (DEC VMS Ethernet), ADSP (AppleTalk Data Stream Protocol), plus serial and modem tools. File transfer capability includes: FTP, XModem, YModem, and Kermit. Both products support System 7.0, and work over LocalTalk, Ethernet or serial connections. Publisher: Synergy Software VersaTerm Pro 3.6 COM0003 \$177.

VersaTerm 4.6 COM0002

\$90*

WindoWatch

Track the hours you spend on a project with WindoWatch. It's a must for professionals who bill their services by the hour (or minute). WindoWatch operates in the background, automatically generating a timesheet as you work. Use WindoWatch to collect and merge timesheets from team members over the network or export timesheet information to a spreadsheet. Don't miss any opportunity to accurately bill your clients. After all, time is money.

Publisher: ASD Software UT10264

\$89



NEW

Stuffit Deluxe 3.0 or Stuffit SpaceSaver*

Stuffit Deluxe 3.0 is the "Complete Compression solution". Only Stuffit Deluxe 3.0 can solve all your compression needs from archiving to transparent compression and includes Stuffit SpaceSaver. Stuffit Deluxe 3.0 is the fastest most efficient compression product available. Our new Add Match intelligently stuffs only the files that meet the criteria that you specify. UT10302 \$69.

Stuffit SpaceSaver

Unlike other compression products, Stuffit SpaceSaver increases disk space (with lightning speed) without effort on your part. Have it work while your Mac is idle or when you say "Compress this for me." SpaceSaver provides complete on-the-fly compression in one package. SpaceSaver is also one of the least expensive, most productive and easiest to use compression products available.

Publisher: Aladdin Systems, Inc. UT10303

\$35*



FREE!

POWER USER'S TOOL KIT 9.0

Power User's Tool Kit 9.0 is full of useful productivity enhancers and software to protect your data from viruses. A powerful collection of 6 programs, the Tool Kit 9.0 includes 2 programs designed to take advantage of System 7*. Here's what awaits you...

Carpetbag makes resources, (fonts, sounds, FKEYS, keyboard layouts), available on your Mac without having them installed in your System file.

The Complete Delete overwrites space on a disk where a deleted file was and makes any sort of snooping in your deleted files impossible.

Disinfectant 2.8 can prevent, find and eradicate all of the newly discovered Mac viruses.

Ram Preserves automatically and consistently loads any Mac RAM disk with selected files each time you start up.

Alias Director is the most powerful System 7 alias management tool available.

TrashMan automatically deletes files from your Trashcan after they have aged as long as you specify.



The Power User's Tool Kit 9.0 is **FREE** when you order from MacWAREHOUSE. You pay only \$1.50 for shipping and handling. If you would like the disk, please ask for Item #AAA0022.

* All Software works with System 7, two programs are designed to take advantage of its new features.

Some of the programs are Shareware, so you can try them free of charge. To continue using them, some authors ask that you pay a small fee (\$5-\$10). Two of the programs are absolutely FREE! The details are explained on the disk, which is yours to keep, with our compliments.



Wallpaper

Put some pizzazz on your monitor and watch it come to life. With the prize winning Wallpaper decorator program for your desktop, you can jazz up your screen with large patterns (up to 128x128 pixels square) in up to 256 colors per pattern, grayscale or black and white. Includes hundreds of desktop patterns, or create your own with Wallpaper's expanded tools. Just drag and drop patterns into place and try creation after creation. You can set Wallpaper to change patterns among your favorites and can create new patterns from any format. It's fun!



Publisher: Thought I Could
GRA0302

\$37

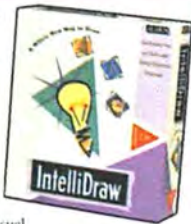
NEW

IntelliDraw

Aldus IntelliDraw defines an exciting new category of drawing program, with intelligent features that give you an easy new way to visually experiment, refine, and draw your ideas. Innovative smart tools link graphics in your drawing so they respond to changes automatically. Create visual "what-if" scenarios with features like intelligent clip art & templates, automatic symmetrical objects, and dimension lines. Auto-alignment, shape blending, powerful text handling capabilities, unlimited layers, color gradients, standard draw tools and more.

Publisher: Aldus
GRA0354

\$199



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PowerUsers™	
CHP0066 2MB PowerBook 100/140/170 Upgrade	149
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CHP0068 6MB PowerBook 140/170 Upgrade Kit	359

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Global Village	
MOD0086 TelePort/Full FAX 2.0	219
Hayes	
MOD0065 Bundle 9600 ULTRA SmartModem	699
MOD0077 OPTIMA 96 for the Mac	399
MOD0096 OPTIMA 24 Bundle	149
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MOD0082 24.96 Mini Send/Receive Fax Modem	199
MOD0043 2400 Mini Modem	99
MOD0071 9600 bps/V.32S 42bs Modem	399
MOD0070 2400 bps/V.42bis Mini Modem	149
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MOD0084 Home Office 24/96	259
MOD0085 Ultimate Home Office 24/96	489

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UTI0251 Help 1.02	89
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Caere	
UTI0202 OmniPage Professional	649
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SPU018 Sensible Grammar 2.1	55
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SPL0030 American Heritage Electronic Dictionary	55
SPL0028 Correct Grammar 3.0	49

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DiskTop goes System 7!

Find faster, launch lots and manage more with DiskTop, the System 7-compatible file management utility from CE Software! Find files faster, as you can search based on file name (or part), size, type, creator, when created or modified. If DiskTop can't find it, it ain't there! Once you've found what you're looking for, use the powerful copy, move, delete or rename functions to keep everything organized and up-to-date. All done in one window and without leaving your current application! And, when it's time to launch another program, don't quit or go to the finder-launch any application from your DA menu with DT Launch (included free with DiskTop). If you have a hard drive, DiskTop is a must! UT10048

\$63

From QuickKeys™ and DiskTop™ adding power to your desktop, to QuickMail™, helping you to communicate regardless of platform. We can help you do whatever you do, better. How do we know this? Simple.

Improving your environment is our business™.

Publisher:



CE SOFTWARE



PowerPad

On the road or at your desk, PowerPad™ turns your PowerBook into a numeric powerhouse. With advanced ergonomics for comfortable and accurate entry. Function keys at a touch. Customizable keys to match your way of working. And a hard cover that opens to support the pad for easy use. A new desk accessory, 10Key Tape, gives a paper tape work record. There's an extra ADB port for adding a mouse or other device. And a 24" removable cable. It's the number cruncher's dream - PowerPad. PowerPad is also available with QuickKeys2, the popular macro utility program.

Manufacturer: Sophisticated Circuits
PowerPad with QuickKeys2 INP0233 \$119.

PowerPad INP0232

\$79



Business Plan Toolkit 4.0

Use Business Plan Toolkit to build plans you'll be proud to present to banker, buyer, or boss. It's complete with prompted textwriter, and good estimates of cash flow, P&L, ratios, sales, personnel plan, fully-linked financials, and business charts all clearly

explained in a manual that MacUser called, "excellent". Business Plan Toolkit takes you step-by-step with your own words. Supports Microsoft Excel, Works, WingZ, Resolve, and most Mac word processors. System 7.0 compatible. Rated 4 1/2 mice by MacUser. Publisher: Palo Alto Software FIN0116



\$99

TouchBase 2.0 or DateBook

TouchBase 2.0 stores information about personal and business contacts. Automatically capitalizes words and formats phone numbers. It has fields for storing alternative phone numbers, and you can customize the fields. TouchBase prints envelopes and mailing labels, including postalbar codes, plus many other useful forms. DAT0076



DateBook is the ultimate personal time manager for Macintosh. Instant access and advanced scheduling keeps you on top of your appointments and things to do. DateBook makes it easy to plan your life. It shows your schedule in multiple formats including test, Gantt chart and time bar. DateBook's views enable you to see your schedule in as much detail as you like as quickly as possible. TouchBase and Datebook Bundle BUS0253 \$129. Publisher: After Hours Software

Datebook
BUS0222

\$79 ea.

After Dark/More After Dark Bundle*

After Dark 2.0 displays over 35 screen savers including the classics, such as Flying Toasters and Fish! Also features sound, password protection, MultiModule, logo and message display. UT10119 \$29.

It's M.A.D.! It's More After Dark - Over 25 incredible displays for After Dark, the Ultimate Screen Saver. Features contest winners: Movin' Man, Tunnel, GraphStat, many beautiful new Fish!, Kittens, Art Museum, and Lunatic Fringe: game module help save you screen form phosphor burn-in. (Requires After Dark.) Publisher: Berkeley Systems UT10230 \$25.

More After Dark Bundle

Buy both and save.
UT10231

\$45*



FileGuard

"It's about as much software-based security as you can get in one package." MacUser, March 1992.

Protect your hard drive from unauthorized access (including security bypass with a system diskette), copying and erasure; applications and file/folders (including System folder) from unauthorized access, deletion, and/or illegal copying; desktop from alterations by unauthorized users. Keep an eye on System usage with FileGuard's Users Log which continuously tracks user/group activity. System 7.0 Compatible. Publisher: ASD Software Single UT10135



\$139

Bridge 6.0 or Grail Quest*

Bridge 6.0

Now you can play a rubber of Bridge 6.0 with the Mac's three players. Bid with either the Stayman or Blackwood conventions. Bridge 6.0 handles all the bookkeeping and tactfully informs you of any mistakes in bidding or play. ENT0303 \$29.

Grail Quest

Uses the Mac's sounds and graphics to put you inside the world of King Arthur's England. Best of all, its well-crafted plot and authentic settings are based on authentic tales of time by Geoffrey of Monmouth and Sir Thomas Malory. Publisher: Artworx ENT0262

\$19*

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MacEKG 2.0

MacEKG can warn you of computer failure BEFORE it happens. EKG monitors over 250 aspects of your system logging and comparing results each time you reboot. EKG features advanced chip-level tests that were only available to Authorized Apple Technicians until now. Using EKG's Reactivator to continuously reboot simulates several days of heavy use to quickly diagnose intermittent failures. EKG can automatically run at startup or shutdown making sure you are the first to know if your computer has failed a test or slowed down.

Publisher: MicroMat UT10285

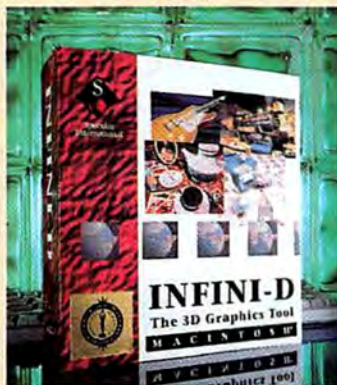


\$99

Infini-D 2.0

Create dazzling images with the power of Infini-D's Three-dimensional environment. The easy-to-use Infini-D, now in an awesome second generation! Infini-D 1.0 was the package that brought 3D graphics to the rest of us. Infini-D 2.0 combines this friendly interface with sizzling 3D power. Infini-D's incredible new shader and raytracer now can render scenes up to 500% faster! Instant conversion of EPS files into 3D objects, Infini-D's awesome metamorphosis capabilities, precise PICT mapping control, and extensive QuickTime support make Infini-D 2.0 the 3D package of choice for graphic arts and multimedia professionals.

Publisher: Specular International GRA0303



\$645

MacPrint 1.3

Use a Macintosh with non-Apple printers. Print Mac applications on HP Laserjet, Deskjet or compatible printers including all Series IIs, IIsx and the Deskjet 500. Prints text and graphics at the printer's maximum resolution.

Does not require PostScript.
Cable is included. Publisher: Insight Development UT10098



\$95

AccuText 3.0



Enhanced accuracy through Verification. AccuText 3.0 is Intelligent Character Recognition (ICR) software that allows scanned documents to be recognized and captured to electronic files. AccuText's interactive Verifier increases speed and accuracy by inviting user interaction before processing. AccuText features include System 7 compatibility, format retention, automatic halftone removal, on-screen zoning, support for ten languages, and compatibility with most popular scanners and software applications. Publisher: Xerox Imaging Systems DTP0039

\$639

Kaboom!

Add more than 150 wild and wacky sounds to your Macintosh with Kaboom! Each sound can be played every time you start up your computer, insert a disk, empty the trash, and more! Amaze your friends with the sounds of traffic jams, screams, and ringing phones—even famous dialogue from "Twilight Zone," "I Love Lucy," Ronald Reagan, and more! With Kaboom! you'll never have to settle for a simple "beep" again! Publisher: Nova Development Corporation UT10281



\$29

Complete Lottery Tracker and Wheeler 4.0



The most comprehensive lottery software package and NOW works with the new "Powerball" games and Pick-5, Pick-6, and Pick-7 lotto games. Choose up to 80 numbers, analyze and choose numbers from past drawings, create tickets through wheeling, record bets to check for later winners, and print charts—all to help you beat the odds. Comes with the FREE audio cassette, Lottery Winning Strategies and a FREE lottery database of the last 12 months winning numbers from the state of your choice when sending in an enclosed card.

Publisher: Triad Publishing, Ltd. ENT0401

\$29

Crossword Creator or CasinoMaster

Crossword Creator
Create crossword puzzles quickly and easily on your computer. Just type in the words and Crossword Creator will instantly generate the puzzle. Build your own dictionaries and use them for future puzzles. Includes Roger's II, The New Thesaurus, with wild card search features. Save options include desktop publishing files. ENT0440 \$39.

CasinoMaster
CasinoMaster offers all the fun of playing the odds in Las Vegas, without the risks. This integrated package realistically simulates the five most popular casino games: Blackjack, Craps, Roulette, Poker, and Baccarat.

Publisher: Centron Software ENT0277

\$39



eXodus

eXodus™ 4.0

eXodus™ 4.0 window display software package enhances the friendly Macintosh environment by giving full X server capabilities to users running either Mac OS or A/UX. It runs on all Macs with at least 2MB of RAM-Classic to Quadra-System 7 and Multifinder compatible. Comes complete with all networking software required for DECnet, TCP/IP, and AppleTalk connections and provides built-in FTP file transfer support. It fully supports the I/OCCM standards, allowing users to copy and paste text and graphics between the Macintosh and X environments, and offers a variety of printing options. Monochrome as well as color X screens are supported with three window management options: Rooted (remote), and Rootless (Macintosh or MOTIF). All you need beyond eXodus is a Macintosh with a network connection!

Publisher: White Pine Software COM0118

\$189



WristSaver/WristSaver MousePad or WristSaver Mini-MousePad*

WristSaver/WristSaver Mousepad
The WristSaver cradles your wrist with a contoured neoprene rubber pad and a washable nylon covering. It's ergonomically designed to support your wrist at the proper angle to help avoid the pain associated with Carpal Tunnel Syndrome. The WristSaver Mousepad provides a comfortable rest for your wrist, plus a conventional mouse pad. Four colors to choose from. **WristSaver Mousepad \$15ea. WristSaver \$15ea. WristSaver Bundle \$25**

WristSaver Mini-Mousepad*
The WristSaver Mousepad's success prompted the WristSaver Mini-Mousepad. At only 5" wide x 8.5" long it is 3" smaller than the original. Your precious desk space is saved and your wrists will thank you.

Manufacturer: LB Innovators

Navy: ACC0757 or
Red: ACC0758 or
Black: ACC0759 or
Gray: ACC0760

\$12*

POWER USER SIMMS ONLY

\$39*

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STEP-BY-STEP
VIDEO
INSTRUCTIONS**



A Power User Memory Expansion Kit will dramatically increase the power of your Mac. And our fast, reliable overnight service will have your Kit in your hands tomorrow!

MORE BRAIN POWER FOR YOUR MAC

Never again will you have to quit your word processor just to answer a question about a spreadsheet. Install extra memory and you can leave a letter open while you refer to last month's sales figures.

You can edit those monstrous scanner files with advanced graphics applications or develop your own custom HyperCard stacks. More memory means more power at your fingertips.

PLUG IN INSTALLATION

Adding memory doesn't require technicians in lab coats. You'll find installation at home easy when you follow our FREE** step-by-step installation video instructions. Just open your Mac, slide out the main circuit board and plug in your SIMMs.

WHAT DO I NEED?

Our helpful sales and technical staff is standing by to answer any questions and take the mystery out of memory upgrades. Memory cards come with one megabyte on each card and are usually sold in pairs — (2 @ \$39 ea.)

The chart explains exactly what you need to achieve the desired level of performance.

To open your Mac Plus, SE, and Classics you'll need a specially designed tool — it's available from us as part of a handy tool kit for just \$9.

WHAT YOU NEED TO KNOW

Memory chips come factory-installed on plug-in cards, called SIMMs (Single Inline Memory Modules). Each one megabyte SIMMs card holds eight top quality,

To upgrade a 4-socket Mac Plus or SE to this amount of memory	Do this: (Install in multiples of two only) SIMMs must be 150ns or faster
2 MB	Remove all four existing 256k SIMMs, install two 1 MB SIMMs, leave two sockets for future expansion.
2-1/2 MB	Remove only two 256k SIMMs, install two 1 MB SIMMs.
4 MB	Replace all four 256k SIMMs with four 1 MB SIMMs.
To upgrade a 2-socket Mac Classic II or LC to this amount of memory	Do this: (Install in multiples of two only) SIMMs must be 100ns or faster
4 MB	Install two 1 MB SIMMs.
To upgrade a 2-socket Mac LC II to this amount of memory	Do this: (Install in multiples of two only) SIMMs must be 100ns or faster
6 MB	Install two 1 MB SIMMs.
To upgrade a 8-socket Mac II, IIx, IIcx, IIcx or SE/30 to this amount of memory	Do this: (Install in multiples of four only) SIMMs must be 120ns or faster
4 MB	Remove all four existing 256k SIMMs, install four 1 MB SIMMs, leave remaining sockets for future expansion.
5 MB	Keep existing 256k SIMMs, install four 1 MB in remaining sockets.
8 MB	Remove all four 256k SIMMs, install eight 1 MB SIMMs.
To upgrade a 4-socket Mac IIfx to this amount of memory	Do this: (Install in multiples of four only) SIMMs must be 100ns or faster
5 MB	Install four 1 MB SIMMs.
To upgrade a 4-socket Quadra 700 to this amount of memory	Do this: (Install in multiples of four only) SIMMs must be 80ns or faster
8 MB	Install four 1 MB SIMMs.
To upgrade a 16-socket Quadra 900 to this amount of memory	Do this: (Install in multiples of four only) SIMMs must be 80ns or faster
4 MB	Install four 1 MB SIMMs.
8 MB	Install eight 1 MB SIMMs.
12 MB	Install twelve 1 MB SIMMs.

memory chips. We carry chips by all the major manufacturers like Texas Instruments, Intel and Samsung.

Prices can vary a lot, based on quality, speed and demand. At press time our price for 1MB, 120ns SIMMs is \$39.

Please call for the very latest prices and availability. Our sales staff will tell you what you need and help you make your choice an easy one.

SPEED

Do you need 80, 100 or 120 Nanosecond (ns) chips? Nanoseconds are billionths of a second, so an 80 ns chip responds faster than a 100ns chip. The original Mac used relatively slow 150ns memory chips. The 68020 processor needs 120ns (or faster) chip, and the 68030 Macs like the speedier model.

OVERNIGHT DELIVERY

Install a MacWarehouse Expansion Kit and working with your Mac will never be the same! Call us now. We'll help you select just the right Memory Upgrade, and we'll ship it overnight for just \$3.

CHP 0012 120ns SIMMs.....\$39

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MACWAREHOUSE

30-DAY MONEY BACK GUARANTEE

If, for any reason, you are dissatisfied with your Power User Memory Kit, you may return it for a full refund within thirty days of purchase. All you have to do is call us for a return authorization number and return this product, postage paid, in its original condition, with the original packaging and documentation.

ONE YEAR WARRANTY.

MacWarehouse also guarantees its Memory Kits against manufacturer defects for one year from the date of purchase. We will repair the item or replace it at our discretion.

* SIMMs prices vary. Call for latest information.
** Limited Offer! Free video with purchase of 2 or more SIMMs.

MWK2P

7 GREAT REASONS

1 Finder 7

The new Finder 7 is worth the cost alone. Access, organize, and view your folders, documents and applications faster and easier with the new improved finder.

2 Balloon Help

Use the new Balloon Help for interactive help while you work. Turn this feature on and point to anything on your screen - a menu item, icon, or tool - and a "balloon" appears, telling you what it is and what it does.

3 File Sharing

With the new File Sharing features you can share hard drives, folders, and files, with others on your network; it has never been easier. You can even set passwords so that only specific individuals or groups can see your files and work with them.

4 Fonts in System 7

Apple's new advanced font technology gives you clear, crisp type on screen in any size plus the ability to print to many different kinds of printers. No more struggle with font compatibility.

5 Multitasking

With System 7 Multitasking is always optional. Now you can run multiple applications at the same time, and switch from one to another with a click of the mouse. System 7 also supports background processing, so that while you're working in your word processor, you can print a document and have your spreadsheet recalculating.

6 System Folder Simplicity

Apple has completely redesigned and improved the System Folder, making it much easier to organize. Predefined subfolders are created automatically, to reduce clutter. The new System Folder includes a Control Panel Folder, Extension Folder, Apple Menu Folder, Preference Folder and Startup Folder.

7 Publish and Subscribe

You can "publish" any part of your document (a graphic, chart or piece of text), to another document even in another application - which "subscribes" to the original. Any changes you make to the original document will automatically appear in the other, even across a network. Now that's live copy and paste!

Plus Your FREE System 7 Tutorial from MacWAREHOUSE!

Video, sound, and animation on your Macintosh

QuickTime Starter Kit

Play QuickTime movies right on your Mac! Pause, fast-forward, rewind, advance frame by frame. Copy video and animation clips and paste them together. Transform still images and information into a single movie. Use a video-capture card and sound digitizer to record movies with the touch of a button. QuickTime brings Multimedia to the Mac!

GRA0347

Publisher: Apple Computer, Inc.



\$169

Macintosh PC Exchange

Open PC files on 3.5" MS-DOS and Windows-formatted floppy disks. Read DOS files on your Mac desktop. Open, save, rename, move, copy and delete documents just as if they were Mac files! Customize the program for even faster access. Requires Apple SuperDrive or compatible.

COM0126

Publisher: Apple Computer, Inc.



\$69

EXCITING NEW APPLICATIONS THAT TAKE FULL

AccessPC 2.0

With AccessPC 2.0, your Macintosh can make MS-DOS files look just like Mac files, instantly. Pop any DOS floppy in your drive, and in a couple of clicks, the PC files are on your Mac desktop, looking and acting perfectly Mac-like. Edit, copy, save, print, play with the numbers, print again, and give the PC people back their diskette. It's that easy to use any PC file in any Mac application.

AccessPC is an easy-to-install control panel utility that's always been completely compatible with System 6 & 7.

Publisher: Insignia Solutions
UT10174



\$60

DiskFit Pro

Fast, efficient, easy backup. For Finder-readable backup to floppies, cartridge or other hard disks, get DiskFit Pro. DiskFit Pro copies files from a hard disk to a "SmartSet" of floppies, and then updates that "SmartSet" with each subsequent backup. By replacing only the obsolete files in the backup set, DiskFit Pro keeps your SmartSet from growing everytime you back up. Backups stay fast and backup sets compact. And since files stay in Finder format, retrievals are a breeze. Don't leave your data at risk, backup with DiskFit Pro. System 7 Savvy, System 6.x compatible.
Publisher: Dantz Development
UT10245



\$74



SAM 3.0 or NUM 2.0*

SAM 3.0 detects viruses by monitoring the suspicious activities that characterized them. Version 3.0 has enhanced update and repair capabilities, faster scanning, and more. The CDEV portion operates during normal Mac usage, and offers a number of options for checking disks and folders as you work. UT10214 \$55

NUM 2.0 combines and integrates two outstanding collections of Mac utilities: SUM 2.0/NUM 1.1 plus automatic backup, data security (both DES and FasCrypt), and many productivity enhancements. Other utilities recover lost or accidentally deleted files, restore crashed hard disks and more. Publisher: Symantec
UT10151

\$95*

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TO UPGRADE NOW!

System 7 brings dynamic new capabilities and ease of use to everyone who uses a Mac...

System 7 builds on the Mac basics you already love, and paves the way for a whole generation of powerful new software. A simple click of the mouse installs the software. Then advanced features take over, letting you work faster, easier, and more productively.

- Multitasking provides effortless switching between applications
- Finder 7 lets you customize your desktop to the way you work
- File Sharing allows access to any folder and its contents among workgroups
- Publish & Subscribe lets you update several documents by only changing one
- TrueType gives you crisp, clear type of any size

And that's just for starters! Now it's easier than ever to get System 7 up and running on your Mac, because you can get it right from MacWAREHOUSE! Join the generation of System 7 power users!

Order System 7 today!



\$79

**Limited Offer -- Not Available to Resellers.*

**System 7
Personal Upgrade Kit**
SYS0001
Publisher: Apple Computer, Inc.

**System 7
Group Upgrade Kit**
SYS0002 **\$279**
System requirements: 2MB RAM; hard disk drive.

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Make System 7 even easier with this **Personal Training Systems System 7 Tutorial!**

Get up and running with System 7 in a flash! This Personal Training Systems Tutorial is the fastest, easiest way to put all the power of System 7 right to work on your Macintosh desktop. And it's yours **FREE*** with your order for any product from MacWAREHOUSE! Just ask for item #AAA0021 when you place your order.

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ATM with four FREE fonts! Get the Adobe Type Manager program disk, userguide and registration card **FREE*** from MacWAREHOUSE when you order System 7. You'll also get as a bonus, four Adobe Garamond typefaces from the Adobe originals®. When you place your order for System 7 just ask for item #AAA0023.

**\$2.50 shipping and handling charge applies.*

Personal Upgrade Kit

QuickTime Starter Kit

Play QuickTime movies right on your Mac! Pause, fast-forward, rewind, advance frame by frame. Copy video and animation clips and paste them together. Transform still images and information into a single movie. Use a video-capture card and sound digitizer to record movies with the touch of a button.

QuickTime brings Multimedia to the Mac! **GRA0347** Publisher: Apple Computer, Inc. **\$169**

AppleTalk Remote Access

Gain direct access to information and resources from your AppleTalk network. Simple to set up and use. High performance is optimized for a broad range of modems. Provides multiple security levels, and requires only System 7 and a high-speed modem. No special hardware required.

COM0131 Publisher: Apple Computer, Inc. **\$175**

AppleShare 3.0

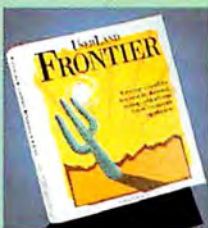
Connect up to 120 users using a variety of cabling choices. New version offers faster server start up, improved integrity and error handling, plus the ability to mount and unmount removable media while the server is running. **NET0250** Publisher: Apple Computer, Inc. **\$1059**

ADVANTAGE OF THE POWER OF SYSTEM 7!

UserLand Frontier

Frontier is the power user's scripting system for System 7. Write and run your own utilities to customize the Mac file system, networks and applications. Frontier has all the development tools you need to get your scripts running quickly, including a full script debugger and structured symbol tables you can watch and edit while your scripts are running. When your done, you can link scripts into Frontier's editable menu bar, or save them to the Finder desktop.

Publisher: UserLand Software
UT10272



\$189

AutoDoubler or DiskDoubler 3.7

AutoDoubler is the easiest way to increase hard disk capacity. It's lightning quick and completely transparent, so it won't interrupt your work. The new patent-pending technique lets your Macintosh use files and applications while they are still compressed! It's fully compatible with almost all applications, desk accessories, and system extensions. **UT10254** \$49.

DiskDoubler 3.7 gives you total control of file compression-archiving for modem transfer, compressed backups, self-expanding files, and fast copying of files. Combined they give you the ultimate in speed, convenience, and control. **System 7 Savvy!** Publisher: Salient
UT10179



\$49 ea.

Word 5.0 or Excel 4.0

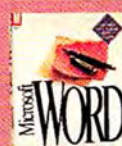
Microsoft Word 5.0 simplifies word processing, whether you need to dash off a quick memo or create a complex report. Its Ribbon control panel makes changes with a single mouse click. Includes a grammar checker, spelling checker and thesaurus. **WRD0050** \$295.



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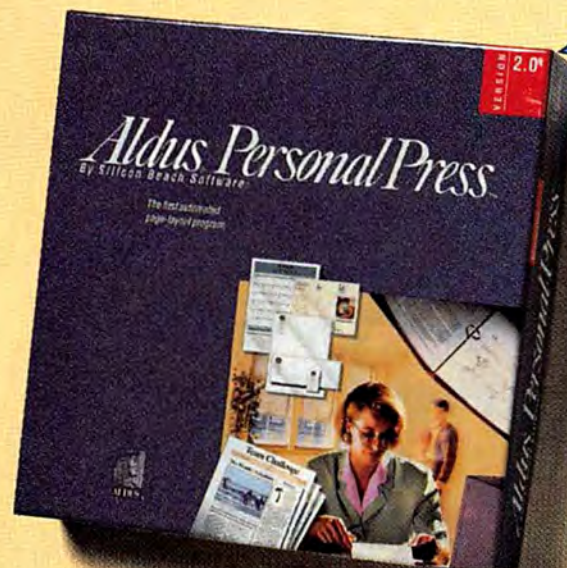
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MWK2S

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The phone rings. You pick it up without stopping to think. A computer doesn't have that luxury. Its "brains"—the central processor—must calculate every step needed for any action. People learn to perform complex actions without identifying the steps involved. By contrast, computers must string together a simple vocabulary consisting of two "words"—*on* and *off*—to handle complex actions. It comes down to intelligence versus brute force.

An Ever Smaller World As it sits on the computer's logic board, a processor looks rather dull—a dark gray block with a bit of gold for the wiring and black for the label. But if you peer under that drab cover, you glimpse what looks like a city seen from an airplane window. Thin strips of wire (called traces)—made of aluminum and so incredibly fine that you'd have to stack up 60 traces from a Motorola 68040 processor to equal the thickness of this page—crisscross the chip, connecting all of its many tiny parts.

Zoom in a little closer, and the processor takes on distinct patterns, one area looking as empty as a city's warehouse district, another as crowded as its downtown. Zoom in even further and you can see the individual regions—the processor's "buildings" that handle computations.

By zooming in closer yet, you can see the transistors—the basic components that do the processor's actual work. The

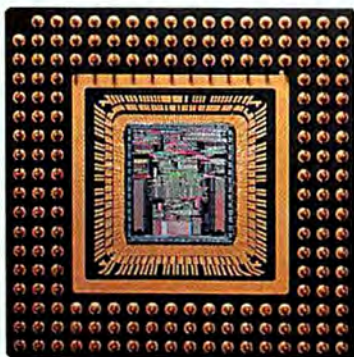
68000 processor, first introduced by Motorola in 1979 and still used today in the Macintosh Classic, has about 68,000 transistors (thus its name). The 68030 used in many Macintosh models has more than 300,000 transistors. There are more than 1.2 million transistors in the 68040 found in Apple's most powerful computers, the Quadras. And the next generation of processors may have tens of millions.

A World of Simple Choices Transistors do a very simple thing: turn on and off. Yet, they control everything that happens in the processor. It's as if stoplights controlled everything that goes on in a city.

A transistor either lets electricity flow (the *on* state) or prevents it from flowing (the *off* state). A series of transistors is called a *circuit*. Electricity flows through the circuit—the exact path that the electricity follows is determined by the on and off patterns formed by the transistors. The vast number of possible paths that electricity can take—each with its own meaning—coupled with the fast speed at which the transistor can move data along those paths lets the processor handle complex computations.

A transistor is made from silicon, which normally blocks electricity but can be forced to let electricity through (that's why silicon is called a *semiconductor*). In a transistor, an aluminum trace comes in at one side; a second trace comes out at the other. A strip of sili-

Inside the



A Motorola 68040 chip at the actual size.

SITE PHOTOGRAPHY BY STEVEN RUMPHREY/CHIP PHOTOGRAPHY BY ALEX VIANEY/TRANSISTOR PHOTOGRAPH BY JIM ODUM, MOTOROLA



Engineers at Motorola discuss a pathway of the 68040 chip's mask, which is a road map of its circuitry.

by Lon Poole

FIRST

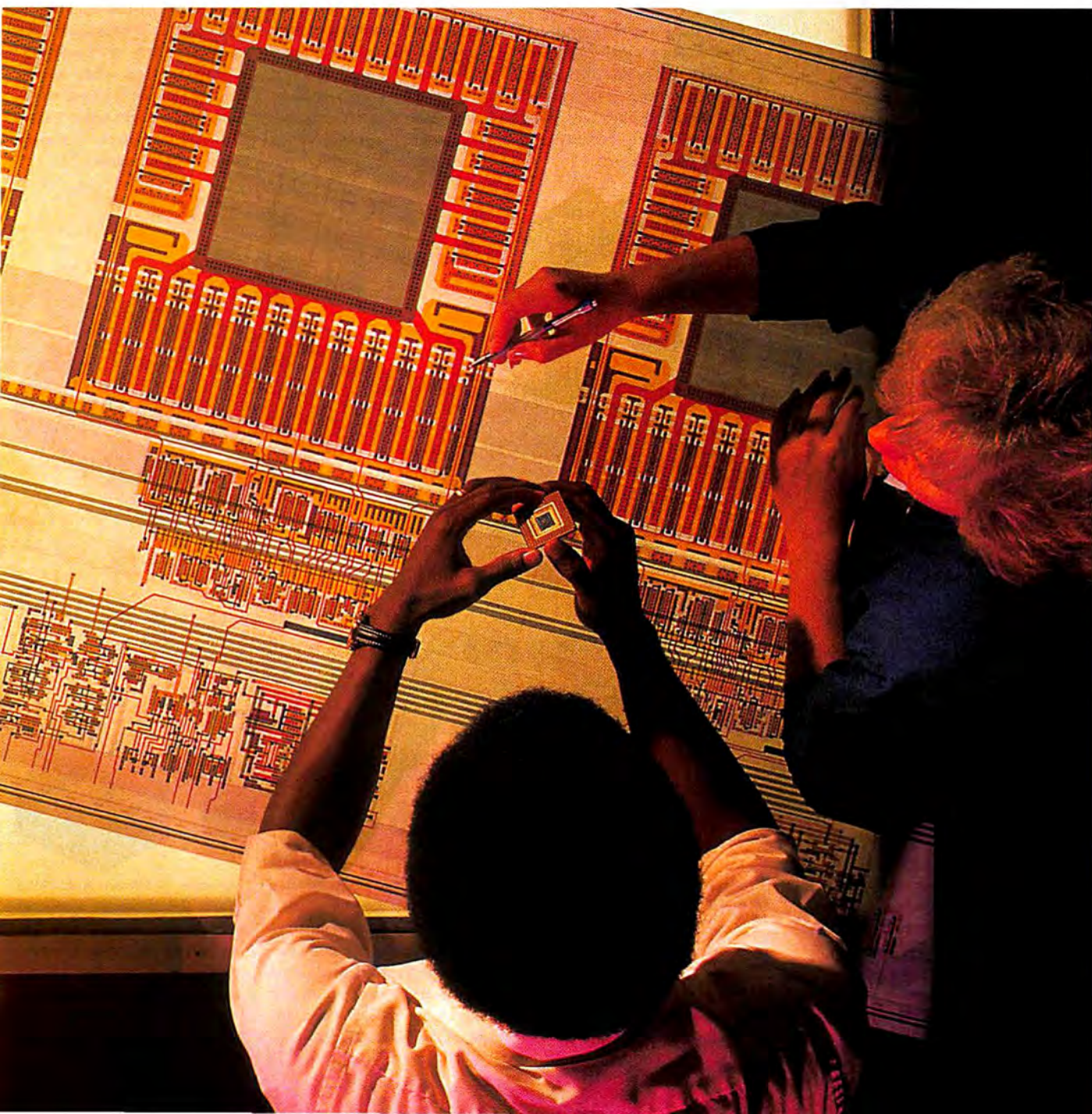
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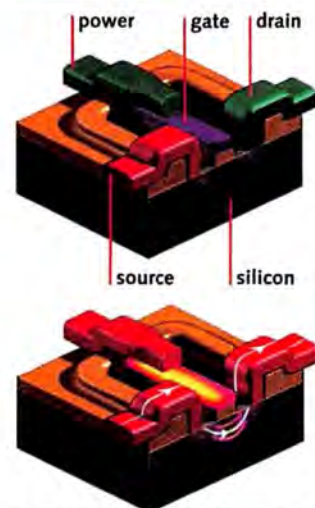
Processor



Making a Processor

Modern processors like the Motorola 68040 contain well over a million tiny transistors on a $\frac{1}{2}$ -inch square of silicon. Magnified slightly, it resembles a city viewed aerially, with transistors laid out by the thousands in neat districts, each district with a distinct function, and all connected by metal traces so thin that 70 side by side across would fit within the width of a single hair. Although their scale lets integrated circuits be complex, they consist of simple transistors that all work alike and can be fabricated en masse. Manufacturing a processor takes scores of meticulous steps, which are performed mostly by machine under human supervision. The incredibly intricate product of this effort, the processor, goes to work for you every time you turn on your computer.

HOW A TRANSISTOR WORKS



A transistor is an on/off switch. It conducts electricity when a separate electrical charge (red) on the gate (purple) attracts electrons to the silicon below it. Without the charge (green), the gate does not attract electrons to the silicon, so the transistor does not conduct.

PREPARING WAFERS



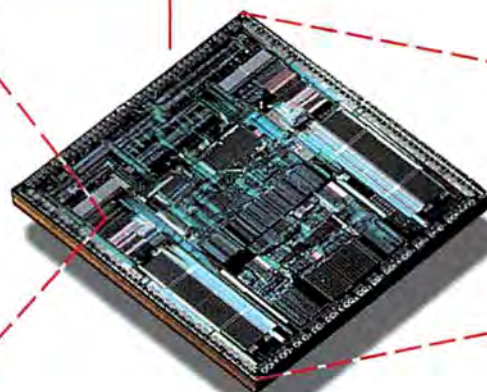
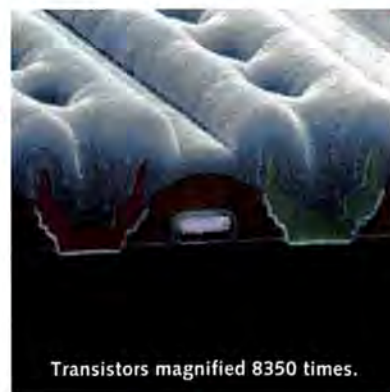
CREATING THE SILICON Silicon refined from quartz is grown at 1500°C into a 5-foot-long, cylindrical ingot 5 inches across. A diamond saw slices it into wafers that diamond abrasives grind credit card-thin (24 mils) and polish mirror-smooth.



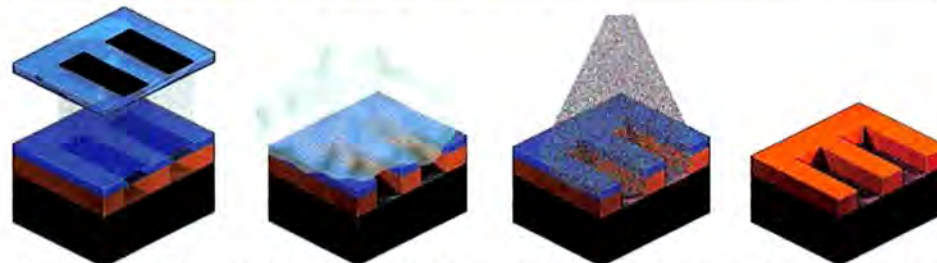
LAMINATING WAFERS In super-clean rooms (less than one sub-bacterial particle per cubic foot) workers operate machines that build transistor circuitry layer by layer on the wafer. A 5-inch-diameter wafer has dozens of 68040 circuits on it.



SLICING THE WAFER Spinning at 30,000 rpm, a diamond saw dices each wafer into individual processors, or *dies*. After clearing away the silicon sawdust, workers inspect each die through a microscope for defects and mark rejects with ink spots.



FABRICATING TRANSISTORS



LAYERING CIRCUITS Building each layer of a circuit takes several steps. Hot gases diffuse an insulating oxide film (the gold layer in the illustration) over the surface of the silicon wafer, or over subsequent layers. The wafer receives a coating of light-sensitive

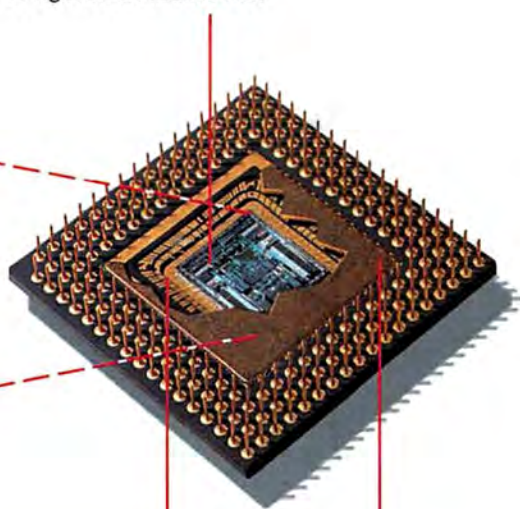
plastic (blue layer) called photoresist, which is photographically imprinted through a stencil-like mask with part of the circuit diagram. The exposed photoresist hardens, and more hot gases etch away the unexposed photoresist and the oxide beneath it, reveal-

ing areas of silicon. A machine shoots ions (charged atoms) at the wafer, where they become implanted in the spaces between the molecules of revealed silicon (gray layer) and create a conducting region. This etching is repeated for each successive layer.

ASSEMBLING CHIPS



MOUNTING THE DIE A robot picks up each good die in turn and places it squarely on a drop of adhesive in a waiting ceramic or plastic carrier. The robot's vision system sees the ink spots that mark defective dies and the robot ignores the marked dies.



ADDING LEADS



STITCHING WIRES A robot weaves spider-web-thin (1-mil) wires between contact pads on the die and the pin-encrusted carrier. The impact of the weaving, together with a high-frequency vibration, bonds the wire leads to the pads.

APPLYING THE COVER



SEALING THE CHIP A robot clamps a solder-rimmed lid to the carrier and sends it through a 330°C furnace. The solder melts and hermetically seals the die inside the carrier. The final chip is then packaged for sale.



YOUR COMPUTER REVEALED

Inside the Processor

con called a *gate* sits between the two traces. Normally the gate keeps the electricity from jumping from one trace to the other—thus blocking the electricity's path. The gate is connected to a trace of its own; if that trace gives the gate an electric charge, the conductivity of the silicon changes and electricity flows from the incoming trace to the outgoing trace—thus turning on the transistor and letting the electricity continue down the path.

Turning Simplicity into Complexity The states of on and off represent the digits 1 and 0, and those two digits in turn can represent any kind of information—numbers, text, graphics, and more. Unlike the decimal number system, which has ten digits (0 through 9), the binary system has only two digits (0 and 1), so you need a longer string of binary digits than decimal digits to denote a value greater than one (see "Representing Data"). For example, the binary system doesn't have the digit 2; it denotes the value two with the two-digit combination 10.

Just as each additional digit in the decimal system stands for a higher power of ten ($10 = 10^1$, $100 = 10^2$, and so on), each additional digit in the binary system stands for a higher power of two ($10 = 2^1$, $100 = 2^2$, and so on). Each binary digit is a *bit*; eight bits make a *byte*.

The more digits a processor can handle at one time, the faster it can work: raw processing power overcomes the binary system's inherent inefficiencies. That's why all Macs use 32-bit processors, not 16-bit processors. And by processing 32 bits at a time, the computer can handle more complex tasks than it can when processing 16 bits at a time. A 32-bit number can have a value between 0 and 4,294,967,295. Compare that to a 16-bit number's range of 0 to 65,535, and you see why calculations that involve lots of data—everything from tabulating a national census count to displaying the millions of color pixels in a photo-realistic image on a large screen—need 32-bit processors.

Digits inherently denote numbers, not text. So how does a processor handle nonnumeric data like letters, punctuation, and other symbols? By encoding the data as numbers. The most common encoding scheme for English, called ASCII (American Standard Code for Information Interchange), encodes A through Z and a through z, the numerals 0 through 9, and common symbols and punctuation marks with numbers between 0 and 127. Accented letters are not part of the ASCII code, but they and other symbols are often encoded with numbers between 128 and 255.

Numbers can also specify graphics. In the simplest case—a picture composed of black and white dots—a 1 represents a black dot and a 0 represents a white dot. More colors or shades of gray require more bits per dot—2 bits for 4 colors or grays, 4 bits for 16 colors or grays, 8 bits for 256 colors or grays, 16 bits for 32,767 colors, and 24 bits for the 16.8 million colors in a photo-realistic image.

Instead of dots, graphics can be composed of shapes or objects such as lines, curves, rectangles, and ovals. Each object in a picture is specified by a list of binary numbers. For example, four numbers specify a line—the horizontal and vertical coordinates for each of its two endpoints.

Thinking Digitally In combination with other simple electronic parts in the processor, transistors can process digital information—move it, compare it, add it, subtract it, and more. The key is having enough transistors in the circuit to do the job. For example, it takes a circuit with 16 transistors and 2 resistors (which help direct



the flow of electricity when more than one transistor path is open) to add two single-digit binary numbers (see “How a Processor Adds Binary Digits”).

Processors use both brawn and brains for other types of math. For example, a processor can repeat a series of additions to multiply—this works because 6×7 is the same as $6 + 6 + 6 + 6 + 6 + 6 + 6$. Or it can use the labor saving trick of shifting digits. Shifting a binary number to the left multiplies it by a power of 2 for each digit moved, one digit to the left multiplies by 2, two digits by 4, three digits by 8, and so on. For example, shifting the binary number 10 by one digit (making it 100) multiplies it by 2. (Shifting a decimal number to the left multiplies it by powers of ten: shifting the number 5 by one digit makes it 50, which is the same as multiplying it by 10.)

Tasks like subtraction and division—which remove data—are more complicated. To subtract, a processor must first use resistors and special gates to invert the number to be subtracted—the number's 1s change to 0s and its 0s to 1s. It adds the inverted number to the other number, and then adds 1 to the result. And you thought long division was hard! Division is a series of subtractions.

Still more circuitry lets the processor not only calculate data, but also evaluate it. For example, a processor can compare two binary values by subtracting them, seeing whether the difference is zero (meaning they are equal), negative (meaning the first value is less), or positive (meaning the first value is greater). The processor can also perform basic logic operations such as NOT, AND, and OR by comparing data bit by bit.

The NOT operation inverts a number so that the 1s become 0s and 0s become 1s (recall that this is part of subtraction). This is what the processor does when you choose a menu item and the normally black-on-white text becomes white-on-black.

The AND operation combines two or more numbers bit by bit. Combining a 1 and a 1 produces a 1; any other combination produces a 0. The AND operation is used when, for example, a program must find an exact match—like selecting all red in an image. The computer compares the binary digits for each color in an image against the digits that denote red. If the digits match, the result of the AND operation is a 1 (or “true”), which means the correct color matches red and is selected. If there is the slightest mismatch, the result is 0 (“false”), and the color is not selected, since it is not red.

The OR operation also combines two or more numbers bit by bit. But it outputs 1 if either bit is 1 (or both are); it outputs 0 only if both bits are 0. The OR operation is used, for example, when searching for text. By using OR operations, the processor can be told that whether the letters are uppercase or lowercase, the text still matches the search string.

Following Instructions While some circuits process information, other circuits control the processor itself. These control circuits follow instructions contained in a program, which is stored outside the processor in the computer's memory, such as ROM or RAM.

To make the computer a tool for word processing, drawing graphics, creating and evaluating spreadsheets, or playing a game, a person must create a program by arranging instructions in the appropriate sequence. Each task must be spelled out in fine detail. Imagine having to consciously control every muscle movement needed to write

Manipulating Data

REPRESENTING DATA

 $O_n = 1$

Off = 0

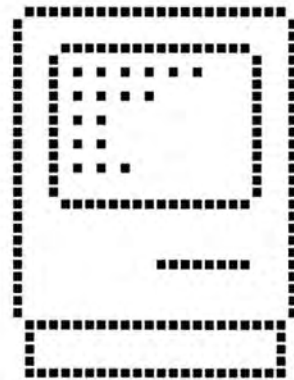
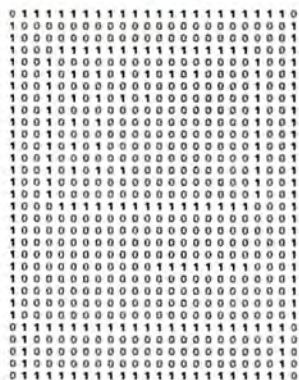
The transistors' states of on and off represent the numbers 1 and 0, which are the two digits of the binary number system that computers use.

NUMBERS

Binary	Decimal
0	0
1	1
10	2
11	3
100	4
101	5
110	6
111	7
1000	8
1001	9

Each binary digit can have the value 0 or 1. By comparison, each decimal digit can have the value 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9. It takes many more binary digits than ordinary digits to represent a value. A single binary digit is called a *bit*, eight bits make a *byte*, and two bytes make a *word*. The 68040 can process 32 bits at a time.

PICTURES



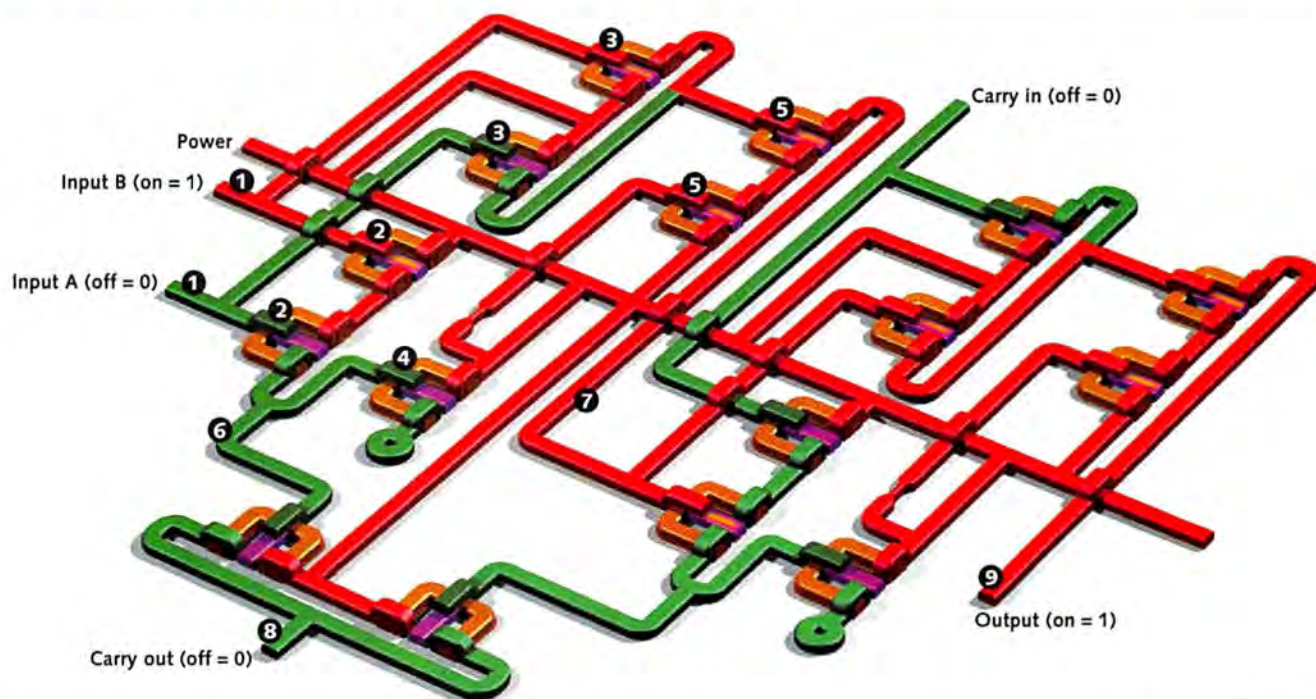
Binary digits (bits) can also represent pictures. In a black-and-white bitmap, for example, a 1 corresponds to a black spot and a 0 corresponds to a white spot.

TEXT

Character	ASCII code	Binary number
\$	36	00100100
.	46	00101110
1	49	00110001
2	50	00110010
A	65	00110000
B	66	00110001
y	121	01111001
z	122	01111010

The letters of the Roman alphabet, which most Western European languages use, together with the digits 0 through 9, punctuation marks, and other symbols, are coded as numbers between 0 and 255. The computer represents them with 8-digit binary numbers. The Mac uses codes based on the standard 128-character code called ASCII.

HOW A PROCESSOR ADDS BINARY DIGITS



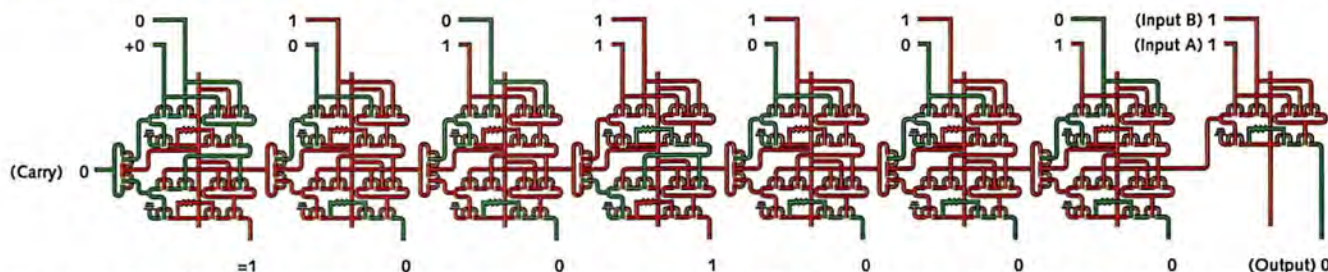
A circuit combining 16 transistors and 2 resistors (which resist electrical flow) can add two binary digits according to four simple logic rules.

The digits themselves are added as follows: (1) The two digits to be added are input as on or off signals to two pairs of transistors. Each pair of transistors combines the inputs and produces an output according to the logic rules. Here, Input A is 0, or off, and input B is 1, or on. (2) The first pair of transistors outputs 1 only if both input A and input B are 1; otherwise it outputs 0. Here, input A is 0 and input B is 1, so the output is 0. (3) The second pair of transistors does the reverse of the first pair: it outputs 1 if either input A or input B is 1; otherwise it outputs 0. Here input A is 0 and input B is 1, so the output is 1. (4) The output of the first pair of transistors is inverted by the combination of a transistor and a resistor. Here, a 0 is inverted to a 1. (5) The inverted output of the first pair of transistors and the output of

the second pair become the inputs for a third pair. This third pair combines its inputs according to the same rules as the first pair: the output is 1 only if both inputs are 1 (here, they are). The output of the third pair is the sum of the original two inputs. (6) The carry digit, if any, from adding the original inputs is the output of the first pair of transistors (in this case, there is no carry).

(7) The result of the addition is then moved to a second set of transistors in the addition circuit, which adds the result to a carry digit from a previous circuit's calculation. The second set works the same way as the first set (see steps 2 through 5). Here, the carry digit is 0 (which means there was no carry from the previous calculation). (8) The carries from both sets of circuits are merged and sent on to the next addition circuit. Here, neither set results in a carry, so the carry output is 0. If either or both carries were 1, a 1 would be passed on. (9) Thus, the output of the bit adder is the sum of three digits: inputs A and B (added in the first set of transistors) and the carry input.

ADDING BYTES TOGETHER

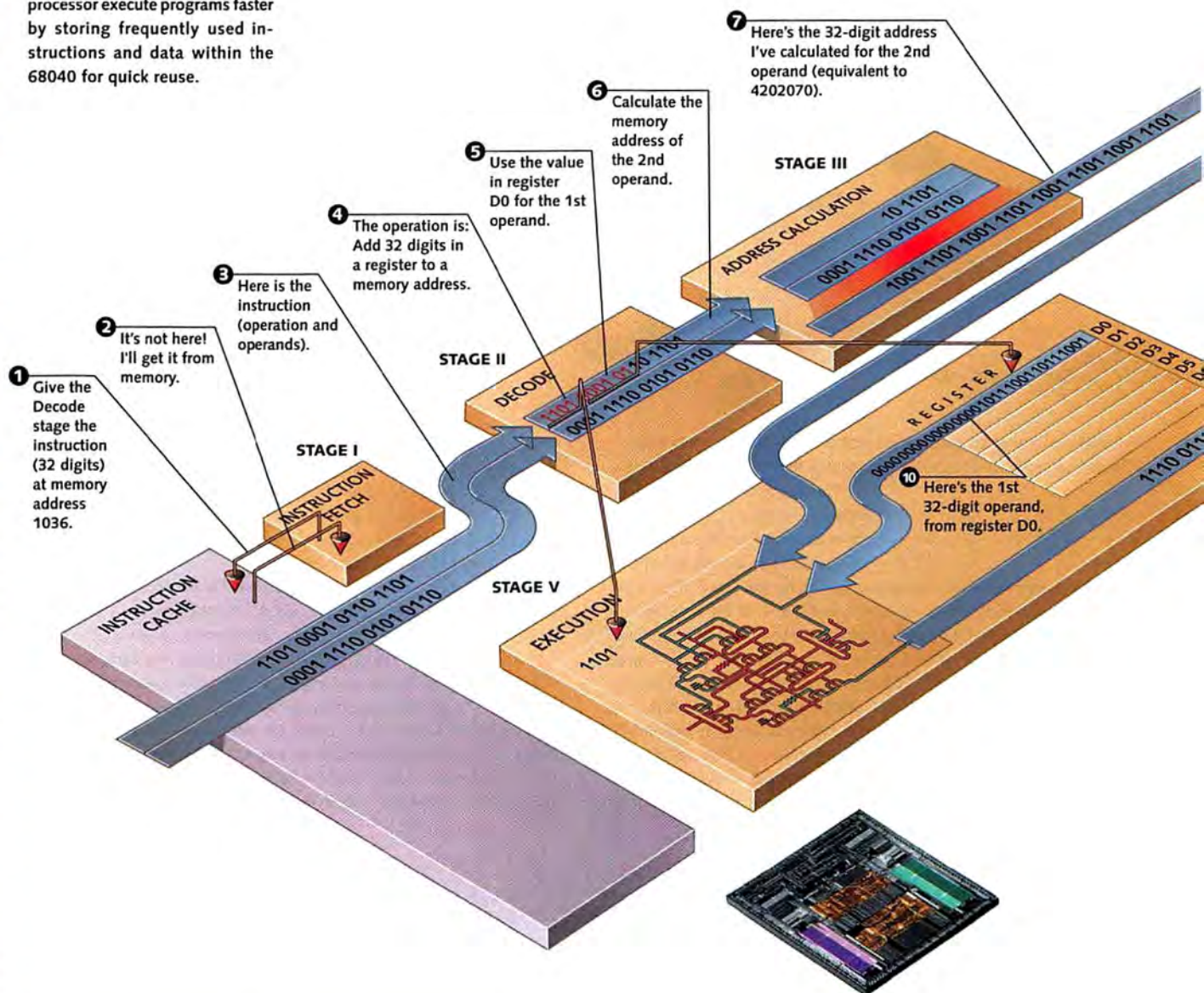


Several one-digit adders can be linked to add multiple digits. One adder handles the rightmost digits from each number, another adder handles the digits second from the right, and so on. The output of each one-digit adder is the sum of three digits: the two input digits and the carry

from adding the two previous digits. The carry output of each one-digit adder feeds into the carry input of the next one-digit adder to the left (the first adder has no carry coming in, and needs no transistor to handle one). To add two bytes requires eight adders, one for each set of bits.

Tracing a Calculation

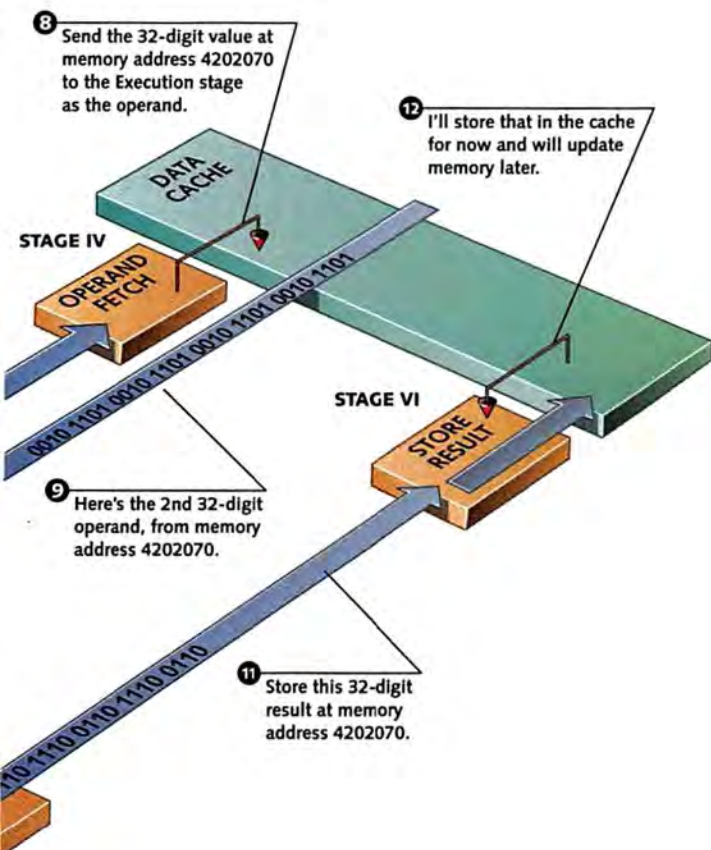
Discrete regions of the processor have specialized jobs. The Motorola 68040's integer unit, for example, does arithmetic and manipulates data in other ways by executing a program of instructions stored in the computer's memory. The instruction cache and data cache help the processor execute programs faster by storing frequently used instructions and data within the 68040 for quick reuse.



EXECUTING AN INSTRUCTION

The 68040's integer unit executes instructions piecemeal in a six-stage pipeline. An instruction enters the pipeline at the *instruction fetch* stage and progresses sequentially. As soon as stage one finishes an instruction, the processor passes the result to stage two, and stage one can begin the next instruction. At any instant, the integer unit could be executing up to six instructions in parallel.

Here you see what each stage of the pipeline does with an instruction that adds the value in a *register* (a scratch-pad portion of memory inside the integer unit) to the contents of a memory address. Typical programs contain thousands of instructions, many executed repeatedly in loops. A fast microprocessor like the 68040 can execute more than 20 million instructions per second.



INTEGER UNIT'S PIPELINE STAGES

STAGE I: INSTRUCTION FETCH Gets the instruction from the instruction cache (or main memory) and sends the instruction to the Decode stage.

STAGE II: DECODE Separates the instruction into an **operation** and **operands** (the data the operation acts on or that data's location).

STAGE III: ADDRESS CALCULATION Calculates addresses for operands located in memory.

STAGE IV: OPERAND FETCH Gets the value of an operand from the data cache (or memory address).

STAGE V: EXECUTION Initiates the operation designated by the instruction. The operation code selects the circuitry to perform the operation (in this case, addition). If the result goes to a memory address, the Execution stage sends the address and the result to the Store Result stage. If the result goes to a register, the Execution stage puts the result in the register.

STAGE VI: STORE RESULT Sends results from the Execution stage to the data cache, which in turn updates the relevant memory address.

your name—that's what a processor must do for every task.

The processor executes instructions in series (see "Executing an Instruction"). Each instruction is a binary number, and the processor must decode the number to identify the type of operation to perform, where to find the binary data on which to perform the operation, and where to put the result.

Eventually the processor encounters an instruction that tells it to branch to an instruction out of sequence and to continue from there. A branch can be conditional, perhaps happening only until a register or memory location contains a certain value—for example, a dialog box stays displayed until a user clicks Cancel or OK. Often a branch instruction returns to an instruction earlier in the program, creating a program *loop*. Programs commonly loop until an event such as a key press or a mouse-click occurs.

Improving Processor Speed To make loops run faster, some processors—the 68020, 68030, and 68040—have their own memory, called an *instruction cache*, for storing recently executed instructions. Often, an entire loop fits in the instruction cache, and the processor can repeat the loop any number of times without slowing down to repeatedly get instructions from the computer's memory. The 68030 and 68040 also have caches for data.

Processor speed is usually stated in millions of *clock cycles* per second, or megahertz (MHz). No instruction can take less than one clock cycle (if the processor completes the instruction before the cycle is over, the processor must wait). Common processors operate at speeds from 8MHz to 50MHz. At 8MHz, each clock cycle lasts 0.125 millionths of a second; at 50MHz, 0.02 millionths of a second.

But raw speed is not enough to squeeze the most performance out of a processor. Smart design augments the newest processors' brute force.

Some processors contain a group of circuits that can work on several instructions at the same time—just like a factory that has several assembly lines running simultaneously. The more instructions a processor can work on at once, the faster it runs. The Motorola 68040, for example, can work on six instructions at once. The 68030 is limited to four. That's why a 25MHz 68040 is faster than a 25MHz 68030.

Efficiency also counts. The fewer clock cycles per instruction, the better. For example, the Motorola 68020 takes 6 clock cycles to move data from a register to the logic board's main memory, while the 68040 takes just 1 clock cycle. The 68040, one of the fastest of today's processors, executes instructions at an average rate of 1.25 clock cycles each. The next generation of processors promises to do even better—achieving an average of one instruction per cycle.

Working for You The next time you turn on your computer, think about the tens of thousands (perhaps millions) of transistors switching on and off slavishly millions of times every second. Think about the processor shuffling bits of binary numbers that may represent any kind of information along incredibly thin metal traces. It's enough to make you wonder what's going on inside your own head—but that's another story. **m**

Contributing editor LON POOLE wrote *Macworld Guide to System 7* (IDG Books Worldwide, 1991) and *Amazing Mac Facts* (Microsoft Press, 1991).

Informational graphics by ARNE HURTY.

CD ROM DRIVES

MACWORLD LAB TESTS 16 DRIVES

AND TELLS YOU HOW TO PICK AMONG THE BUNCH

Into the Mainstream



NEC Technologies' InterSect CDR-74 (top) and Mirror Technologies' CD-ROM Drive

BY THE TIME YOU READ THIS, there will be hundreds of titles—from multimedia encyclopedias to animated children's books—available on CD ROM discs. QuickTime movies, using Apple's new system extension that enables the computer to play back digital video in a small window on the screen, will also be widely disseminated on CD ROM. So be forewarned: if you don't have a CD ROM drive, you'll be left out of one of the most dynamic areas of Macintosh software development. Meanwhile, drive prices aren't likely to fall much more than they already have; in March, even Apple introduced a new drive, the CD150, that cost \$200 less than its predecessor, the AppleCD SC Plus. Seven of the drives we examined retail for less than \$600.

GEORGE NELSON



But before buying, consider that CD ROM drives are specialists; they read information from CD ROM discs but don't work as storage devices. And even the fastest CD ROM drives are slow. Fast hard drives have access speeds of about 16 milliseconds (ms); the fastest CD ROM drive tested for this article, the NEC InterSect CDR-74, has an average access time of 280ms, while the slowest, Optical Access International's Performer CD ROM and the Panasonic LK-MC501S, have an average access time of 500ms. But regardless of the drive, expect plenty of long delays while it reads data.

CD ROM versus CD Audio

IF YOU HAVE RECENTLY BOUGHT A DECENT audio CD player for about \$150, paying four times that price for a CD ROM drive that seems similar (but has fewer LCD readouts and fewer fancy buttons on the front) can be a shocking surprise. How come CD ROM drives cost so much more than their audio cousins? The CD ROM drive market is much smaller than the home-audio market, so there is no economy of scale to keep prices low. CD ROM players also have higher-quality components and need to be much more accurate than CD audio players do (see "Why CD ROMs Cost More than CD Audio Players"). And because an audio player has no SCSI interface, you can't hook one up to a computer; even if you could attach it, there are no electronics in an audio player to decode data on a CD ROM disc.

Evaluating Drive Performance

DRIVE PERFORMANCE IS MEASURED BY two numbers. Access speed, measured in milliseconds, is the average time it takes a drive to locate a random piece of information; transfer rate, measured in kilobytes per second (KBps), is the time it takes a drive to transfer information to the CPU (central processing unit).

Access time is the critical performance measurement when you are repeatedly searching a large database and pulling out small amounts of information, such as that on the text-only CDs. In an application like an encyclopedia, dictionary, or database, the drive spends most of its time looking for information on the disc; once it gets there, the drive can transfer that information rapidly.

Transfer rate matters most to people using multimedia titles. In those applications, finding data is secondary to transferring it rapidly and smoothly to the CPU for display. Once a 24-bit image or QuickTime movie is located, a large amount of data, sometimes many megabytes in size, must be transferred quickly

to the CPU. But CDs offer a narrow pipeline for transmitting large data files. At 150 KBps, the standard transfer rate for CD audio files, it should take a little over a minute to transfer a 10MB file. Add overhead from CPU processing, and the actual data-transfer rate for most drives is nearly 90 KBps, so that the same file actually takes closer to two minutes to transfer.

The NEC InterSect CDR-74 doubles the data-transfer rate to 300 KBps for data and drops back to 150 KBps for audio. (Without the drop in speed, music would sound like a 33-rpm record played back at 78 rpm.) The InterSect CDR-74 is a great multimedia playback machine, with the smoothest video of any drive tested. The rest of the drives had transfer rates between 150 KBps and 153.6 KBps, but even so, there were subtle differences in how smoothly big data files played back in our tests, largely due to how evenly the data was transferred to the CPU. Drives with the Sony and Hitachi mechanisms all had smoother video performance than did the slightly faster drives with Toshiba mechanisms.

Nearly all the drives we reviewed have a 64K buffer, or internal storage area (exceptions are the Performer CD ROM and the Panasonic LK-MC501S, which have 32K buffers); this buffer smooths out fluctuations in a drive's data-transfer rate. The better the buffering scheme, the more smoothly data flows to the CPU; the drive feels faster because there are no noticeable gaps or pauses while running applications.

But access times and transfer rates are both measured in ideal settings that have little to do with how well a drive actually performs in the real world. The average access times (listed in our features table) are useful for comparing one drive to another, but we did a series of three tests to measure how well the drives perform with applications and titles you're likely to use, and two tests designed by Apple to show how well drives can play back QuickTime movies (see "CD ROM Speed Tests").

Although our video-performance test confirmed that the NEC InterSect CDR-74's data-transfer rate was twice that of the other drives we tested, that innovation didn't translate into doubled performance in any of the real-world tests. Although the InterSect CDR-74 was one of the drives at the front of the pack, it was the fastest performer in only the graphics retrieval test, where large graphics files were loaded into Adobe Photoshop. In the other two real-world tests, the InterSect CDR-74's performance was comparable to that of drives using the speedy Toshiba mechanism; these include the CD Tech-

nology Porta-Drive, the Mirror Technologies CD-ROM Drive, the MacProducts Magic CD-ROM, and the Relax Technology Vista CD-ROM drives. The four tested drives with the Sony mechanism (from Apple, DynaTek, Liberty Systems, and PLI) and the Hitachi Home Electronics CDR-1750S came in around the middle of the pack.

But the access speed and data-transfer rates of a given mechanism don't tell the whole story on performance. The driver software, which mediates between the drive and the CPU, has an effect on performance, too. Of the 16 CD ROM drives we tested, 9 ship with various versions of the same driver (from Trantor). Three drives ship with drivers based on Optical Media International's (OMI's) CD-ROM Driver. Only Apple, Procom, and Optical Access International ship with proprietary drivers.

For text-based and graphics-based applications like dictionaries, multimedia encyclopedias, and other reference titles, all of the drives are adequate for occasional use. Even the slowest drives, the Optical Access International Performer CD ROM and the Panasonic LK-MC501S, could pull up a word definition fast enough to keep my attention from wandering, although it took nearly 20 seconds longer to complete the text-search test on the slowest drive than it did on the fastest drive.

For running QuickTime movies, accessing photo databases, or playing interactive games, a faster drive makes a significant difference. The rule of thumb is that for QuickTime movies, you need a drive that has at least a 400ms access time. With the exception of the Optical Access International Performer CD ROM, the NEC InterSect CDR-37, and the Panasonic LK-MC501S, all the drives were faster than that. Because of software caching, the NEC drive had adequate video performance. On the two slowest drives, movies play back with long pauses between frames and with noticeable audio gaps. With a faster drive, photos load more quickly, and movies play without too many noticeable pauses or stutters; you

become engrossed in the story and forget about the player that makes it happen.

QuickTime movies are decompressed by the CPU as they are transferred from the CD ROM, and this requires processing time. QuickTime keeps track of how long it takes to decompress and display each frame of a movie, and skips frames if necessary to keep the movie synchronized. This behind-the-scenes monitoring means that the faster the storage device and CPU work together, the more smoothly the movie appears to play back. We tested all the drives on a Mac IIci as well as an LC II to gauge relative digital video performance. On the LC II, even the fastest drive produced slightly jerky movies; some frames froze for an instant as more of the movie loaded into RAM.

QuickTime is still in its infancy, and

as better decompression software is written and distributed, movies will play back more and more smoothly on slower Macs. For now, the NEC Intersect CDR-74, the Sony- and Toshiba-based drives, and the Hitachi CDR-1750S all offer adequate video performance, with the NEC being the smoothest performer.

Picking the Right Drive

SPEED IS CERTAINLY THE MOST IMPORTANT criterion in choosing a CD ROM drive, but it's not the only one. Reliability, ease of setup, audio support, aesthetics, bundled software, price, and technical support also matter when you're shopping for the long term.

Dust can be a problem for CD ROM drives. If it gets inside, it interferes with the optical mechanism's ability to read the

laser beam that is reflected from the CD ROM's surface, causing errors. All the drives we looked at have automatic self-cleaning mechanisms that brush the internal lens of the optical mechanism. The NEC Intersect CDR-74, the Hitachi CDR-1750S, the Todd Enterprises TCDR-7050, and the Toshiba mechanism drives also have a second door that stays closed after you insert a disc, further sealing the inside of the player from dust. Although this requires an extra step for you when inserting a disc, it provides added protection from dust.

Listening to Audio CDs

IF YOU ARE SECRETLY PLOTTING TO buy a drive so that you can listen to Mozart while crunching numbers, you're in good company. CD ROM drives are basically CD audio drives with additional features, so they can be used to play music if you have software to play the audio files from the disc and you have a pair of headphones or amplified speakers. All the drives but the Sony (which comes with no software at all) come with audio software for listening in.

But headphones aren't your only option. All the reviewed drives except the MacProducts Magic CD-ROM, the Relax Vista CD-ROM, Texel America's DM5021 CD-ROM, and Todd Enterprises' TCDR-7050 offer preamp output jacks in the back of the players so that you can set up amplified desktop speakers or connect to a stereo amplifier. All the output jacks have separate right- and left-channel output RCA jacks except the DynaTek CDS 650, which offers mono-channel output only. If you buy NEC Gallery, or Procom MacCD Station packages, you receive a pair of desktop speakers, complete with batteries.

And if you're going to blast your music, you need a drive that can produce loud sound when you've got the volume pumped up: the Apple CD150, the Liberty 115 CD-ROM, the NEC Intersect CDR 37 and Intersect CDR-74, the PLI CD-ROM, and the Texel DM5021 CD-ROM all offered better-than-average volume levels in our tests.

Aesthetics

I PREFER DRIVES THAT HAVE AN INDICATOR light on the front that shows whether the drive is on or off. The Apple, CD Technology, DynaTek, Hitachi, Liberty, MacProducts, NEC, Optical Access, Panasonic, Relax, and Todd Enterprises drives all have a power-on light.

The NEC Intersect CDR-74 and the Hitachi are the only drives that have the on/off switch conveniently located on the front of the drive.

Kodak's Photo CD

The big news in CD ROMs during the next 12 months should be the debut of the Kodak Photo CD. As this article goes to press, Kodak plans to bring its innovative new system to consumers by the summer of 1992. Consumers will be able to bring in rolls of 35mm film to participating photofinishers and get their photos back as high-resolution, color-corrected scans on a Photo CD for about \$20 for 24 images.

The scanners used for this process will be of extremely high quality, so at less than \$1 per image, the Kodak process could take a serious bite out of the desktop slide-scanner market as some consumers transfer their scanning tasks from the desktop to a Kodak outlet. Each Photo CD holds up to 100 images, so you'll be able to bring in multiple rolls of film and keep adding images until the CD is full.

In order to be considered fully Photo CD-compatible, CD ROM drives must understand the data format Photo CD uses and be able to read data that has been written in multiple sessions as each new roll of film is added to disc. Companies whose drives meet both of these criteria will be able to license a Photo CD logo from Kodak for their drives, to help consumers identify which products will work with the system.

At press time, there were no Photo CD-certified drives, although Apple, Phillips, Sony, Pioneer, and Toshiba have all announced new drives that will be fully Photo CD-compatible and available in late 1992. These drives will be known as multisession drives.

Today, only the Sony-based drives can read a Photo CD, and they can only read the first set of images written to it. This is known as single-session capability (see "CD ROM Drive Features"). If you bring your Photo CD back to a photofinisher and add another set of images to your CD, even your current Sony-based CD drive will not be able to read the new information; when you mount the CD on your desktop it will still look as if there is just one set of images on the disc. This happens because the drive's internal instructions (its firmware) haven't been updated yet to recognize data that is recorded in more than one session to a CD (until Photo CD came out, no CDs were written in this way). Still, if you're in a hurry to use Photo CD right away and you already own a Sony-based drive, or you don't need to fill up each Photo CD by adding new images to it, single-session capability might serve your needs.

Reading a Photo CD is one thing, but accessing the images in applications requires special software because Kodak writes images to Photo CD in a proprietary compressed-image format called PhotoYCC color encoding, which requires translation into standard Macintosh formats. Apple has announced that the next version of its QuickTime system software (which should be available by the end of the year) will provide direct access to Photo CD images for any application that currently supports PICT. Kodak is also selling Photo CD Access, an application for previewing and retrieving images, and the Kodak Photo CD Access Developer Toolkit, a tool for developers who want to build direct Photo CD support into their applications.

Why CD ROM Drives Cost More than CD Audio Players

CD ROM drives cost more than CD audio players because CD ROM drives are designed with more expensive, and more rugged, components.

A CD ROM drive contains extra electronics that double and triple check the data that the drive reads from the disc. The human ear cannot detect individual missed bits of data in a piece of music, but the same amount of erroneous information can crash a computer program in milliseconds.

The motor that spins the compact disc is located directly below the spindle. Spindle motors for CD ROM drives must be more durable and reliable than those used in most audio players. To search for random data a CD ROM drive must increase and decrease speed constantly, while an audio CD usually plays only from beginning to end.

CD ROM drives have SCSI interfaces and data buffers not used in audio drives.

In a CD ROM drive, a caddy protects the disc from mishandling; this requires an additional loading mechanism that audio drives don't need.

The actuator, which moves the optical head assembly across the disc, must be able to survive many more back-and-forth seeks on a CD ROM drive than on an audio CD drive.



CD ROM Speed Tests

Color Key

Fastest

Percent slower than fastest

Up to 10%

11%–20%

21%–29%

30% or more

* The Panasonic and the Sony drives were tested with Trantor's driver software.

** In June, OAI shipped version 1.5 of the Access Allegro driver; spot tests showed that the Allegro drive now runs at speeds comparable to those of the other Toshiba-based drives.

Overall Fastest

1.00	NEC InterSect CDR-74 (NEC)
0.82	Relax Vista CD-ROM (Toshiba)
0.82	Mirror CD-ROM Drive (Toshiba)
0.82	CD Technology Porta-Drive (Toshiba)
0.82	MacProducts Magic CD-ROM (Toshiba)
0.78	DynaTek CDS 650 (Sony)
0.78	PLI CD-ROM (Sony)
0.78	Liberty 115 CD-ROM (Sony)
0.77	Sony CDU7211W* (Sony)
0.77	Apple CD150 (Sony)
0.77	Hitachi CDR-1750S (Hitachi 1750)
0.76	Texel DM5021 CD-ROM (ShinaKen)
0.75	OAI CD Allegro CD ROM** (Toshiba)
0.73	NEC InterSect CDR-37 (NEC)
0.63	Panasonic LK-MC5015* (Matsushita)
Overall Slowest	0.49 OAI Performer CD ROM (Matsushita)

Text Retrieval (in seconds)	Graphics Retrieval (in seconds)	Mixed Retrieval (in seconds)	QuickTime Video (in Kbps)	Data (in Kbps)
32.8	8.3	67.2	178.0	299.7
32.1	12.2	64.4	160.0	149.0
31.9	12.3	65.2	160.0	149.0
31.9	12.3	65.3	160.0	149.0
32.3	12.4	65.2	160.3	149.0
37.0	12.3	70.0	157.0	149.0
37.2	12.4	69.2	157.7	149.0
36.9	12.5	69.9	157.0	149.0
38.9	12.4	70.1	157.0	149.0
35.7	12.4	68.3	141.0	149.0
37.4	12.6	66.5	140.7	149.0
39.0	12.6	75.9	161.0	149.7
32.0	12.3	67.5	135.0	100.0
40.8	12.6	75.2	144.0	149.0
51.1	22.4	78.8	138.0	150.0
51.3	21.6	78.1	44.0	100.0

The drives are listed from best overall performance (top) to worst overall performance (bottom), based on both application and low-level QuickTime playability tests. The manufac-

turer of the mechanism the drive uses is listed in parentheses.

For application tests, we measured each drive's ability to find and retrieve specified text from a

reference work, find and retrieve images from an image database, and load screens containing text and graphics from a multimedia presentation.

The Panasonic LK-MC501S and the Optical Access International Performer CD ROM—both based on the slow Matsushita CD ROM mechanism—require an annoying manual ejection after the drive is unmounted on the desktop.

Bundled Software

APPLE, MACPRODUCTS, MIRROR TECHNOLOGIES, Optical Access International, PLI, and Relax all ship demonstration CD ROM discs with their drives. Only the Apple CD-ROM Titles Sampler and the Introduction to Nautilus offer much in the way of entertainment. The Apple Titles Sampler lists over 200 titles available on CD and includes demos of most of the titles, as well as pricing and contact information. The Nautilus disc is a compilation of the kind of multimedia information and software that comes with a subscription to the Nautilus service—13 disks yearly for \$18 (U.S. residents) or \$30 (international residents). The other dem-

onstration discs are less enticing HyperCard stacks.

The choice for best CD bundle is among NEC's Gallery, Procom's MacCD Station, and Mirror Technologies' six-pack. NEC's Gallery, which includes seven CD titles (CD Companion Series: Beethoven Symphony No. 9; Desert Storm; Cinderella, The Original Fairy Tale; Cosmic Osmo; The Software Toolworks World Atlas; Grolier's Illustrated Encyclopedia; and Time Table of History: Science and Innovation), headphones, and speakers, adds \$107 to the cost of the NEC InterSect CDR-37 and \$159 to the cost of the InterSect CDR-74. The Procom bundle, which includes seven titles (Sherlock Holmes, Consulting Detective; The Software Toolworks World Atlas; The Software Toolworks Illustrated Encyclopedia; CD Companion Series: Mozart String Quartet in C Major; Introduction to Nautilus; The MegaROM; and the Procom audio sampler)

plus headphones and speakers, is an extra \$204. The Mirror six-pack (Grolier's Illustrated Encyclopedia; The Software Toolworks World Atlas; Time Table of History: Science and Innovation; US History; Desert Storm; The Orient) is \$189 (with no extra hardware). These bundles are excellent deals, since each title retails for \$39 to \$395.

Price

PICKING A CD ROM DRIVE IS A QUESTION of deciding how much speed you can afford, followed closely by software and support. The NEC InterSect CDR-74 is one of the fastest drives in our tests, and offers the best video performance. It retails for \$712—not the cheapest drive, but overall the top pick.

In the budget category, I eliminated the MacProducts Magic CD-ROM (\$599) because it has only the clumsy playCD stack for audio playback, the Procom MacCD/LX (\$595) because of a low tech-

CD ROM DRIVE FEATURES

	GENERAL							
	Tested by Macworld Lab	Product (mechanism manufacturer) ¹	List Price (includes Mac interface)	Average Access Time	Transfer Rate (in KBps)	Buffer Size	Double Dust Door	Vertical Orientation
Apple Computer	●	CD150 (S)	\$599	380ms	150	64K	○	○
CD Technology	●	Porta-Drive (T)	\$795	325ms	150	64K	●	○
DynaTek Automation Systems	●	CDS 650 (S)	\$895	380ms	150	64K	○	○
Hitachi Home Electronics	●	CDR-1750S (H-1750)	\$915	300ms	153.6	64K	●	○
Liberty Systems	●	115 CD-ROM (S)	\$699	380ms	150	64K	○	○
MacProducts USA	●	Magic CD-ROM (T)	\$599	380ms	153.2	64K	●	○
MicroNet Technology	○	Micro/CD-ROM (S)	\$995	350ms	150	64K	●	●
Mirror Technologies	●	CD-ROM Drive (T)	\$599	325ms	153.6	64K	●	○
NEC Technologies	●	InterSect CDR-37 (N)	\$485 ²	450ms	150	64K	○	○
	●	InterSect CDR-74 (N)	\$712	280ms	300 ⁴	64K	●	●
Optical Access International	●	Performer CD ROM (M)	\$699	500ms	153	32K	○	○
	●	Allegro CD ROM (T)	\$899	310ms	153	64K	●	○
Panasonic Communications & Systems	●	LK-MC501S (M)	\$875 ⁵	500ms	153	32K	○	○
PLI	●	CD-ROM (S)	\$699	380ms	150	64K	○	○
Procom Technology	○	MacCD/LX (S)	\$595	380ms	150	64K	○	○
Relax Technology	●	Vista CD-ROM (T)	\$579	325ms	150	64K	●	○
Sony Corporation of America	●	CDU7211W (S)	\$950	380ms	150	64K	○	○
Texel America	●	DM5021 CD-ROM (SH)	\$543	340ms	150	64K	○	○
Todd Enterprises	○	TCDR-7050 (H-3750)	\$1010	300ms	153.6	64K	●	○

● = yes; ○ = no. ¹ H = Hitachi, M = Matsushita, N = NEC, S = Sony, SH = ShinaKen, T = Toshiba. ² 12-14 = excellent, 9-11 = very good, 7-8 = good, 5-6 = satisfactory.

nical-support rating, and the Relax Vista CD-ROM (\$579) for a low technical-support rating and the lack of preamp audio output jacks. The fast Mirror CD-ROM Drive (\$599), with its good manuals, software bundle, and service rating, therefore emerged as my top budget pick.

The Sony-based Apple CD150 (\$599) and the Procom MacCD/LX (\$595) are my next choices. They both offer respectable performance for a reasonable price, and have slightly smoother video performance than the Toshiba-based drives. If you're looking for a drive primarily to play QuickTime movies, and you can't afford the Intersect CDR-74, buy one of these.

Is It Time to Buy?

PRICES AREN'T LIKELY TO FALL MUCH farther for CD drives. Instead, at the top of the market we'll begin to see drives with additional features (see "Kodak's Photo CD"). More drives that double the data-transfer speed will also appear on the

MW

EDITORS' CHOICE

High Performance

Intersect CDR-74 This drive offers speedy performance and smooth video, comes with Trantor's driver and Music Box Software, has a second door for dust prevention, and offers good technical support. For an extra \$159 you get five CD titles, a pair of speakers, and headphones. **Company:** NEC Technologies. **List price:** \$712.

Budget Choice

Mirror CD-ROM Drive This drive comes with a fast Toshiba mechanism, driver and Music Box software from Trantor, solid technical support, a second dust door, and a good manual. And for an extra \$189 you get a six-pack of excellent CD titles. **Company:** Mirror Technologies. **List price:** \$599.

market soon. Sony has announced the CDU-561, a double-speed mechanism with an expanded 256K buffer that should be available in late 1992. Texel America will be replacing its DM5021 CD-ROM with the DM5024, a 280ms double-speed drive (\$658) by September 1992. In early 1993 Optical Access will be updating its Performer to a new 350ms mechanism with an automatic eject feature, and its Allegro will debut with a 275ms access time, double-speed data transfer, and a 256K buffer.

I've always felt that the trailing edge of high technology is where the bargains are. Right now, CD ROM drives offer the best performance for the lowest prices ever, and more titles are available than ever before. Now is a good time to buy in on a sure thing. **m**

See *Where to Buy* for contact information.

Macworld Lab testing supervised by TIM WARNER.

Internal Fan	Type of Indicator Lights	Can Read 1st Sessions of Photo CD	SOFTWARE			SUPPORT	
			Driver	Bundled Titles	Audio Software	Support Rating ¹	Warranty (in months)
○	power/busy	●	Apple CD Setup	Educorp CD Sampler, Introduction to Nautilus, Apple CD-ROM, Titles Sampler	CD Remote DA	NA	12
○	busy	○	CD Tech (OMI)	none	playCD and CD Remote DA	10	parts 24; labor 12
●	power/busy	●	OMCD-S (OMI)	none	playCD	NA	12
○	power/busy/disc	○	Hitachi CD-ROM (Trantor)	none	Hitachi CD DA	2	12
●	power/busy	●	TSLCDDrvr (Trantor)	none	Music Box DA	13	12
○	power/busy	○	Toshiba CD ROM Driver (OMI)	Discovery Animation Showcase	playCD	9	12
●	power/busy	●	TSLCDDrvr (Trantor)	none	Music Box DA	NA	12
○	busy	○	TSLCDDrvr (Trantor)	Introduction to Nautilus	Music Box DA	9	12
○	power/busy	○	NECCDDrvr (Trantor)	none	Music Box DA	10	parts 24; labor 12
○	power/busy	○	NECCDDrvr (Trantor)	none	Music Box DA	10	parts 24; labor 12
○	power/busy	○	Access Performer INIT	Introduction to Nautilus; The Font Company CD; ABCD-ROM	Access CD Player DA	13	12
○	power/busy	○	Access Allegro INIT	Introduction to Nautilus; The Font Company CD; ABCD-ROM	Access CD Player DA	13	12
●	power/busy	○	none ³	none ³	none ³	2	12
●	busy	●	PLICDDrvr (Trantor)	Introduction to Nautilus	Music Box DA	11	12
○	busy	●	Procom CD-ROM Drvr	none	CD Audio DA/CD Player	5	12
●	power/busy	○	TSLCDDrvr (Trantor)	Introduction to Nautilus	Music Box DA	5	12
○	busy	●	none	none	none	2	12
○	busy	○	TSLCDDrvr (Trantor)	none	Music Box DA	NA	12
●	power/busy	○	TSLCDDrvr (Trantor)	none	Music Box DA	6	24

1-4 = poor, <1 = unsatisfactory, NA = support offered through dealer only. ³ Battery pack \$99. ⁴ Audio-transfer rate is 150 KBps. ⁵ Mac interface available in July 1992, \$149.

ALL ABOUT SCANNERS

UNLESS YOU'RE A DESKTOP PUBLISHER OR A prepress operator, you probably don't own or have easy access to a scanner. But if present trends are any indication, that situation is about to change.

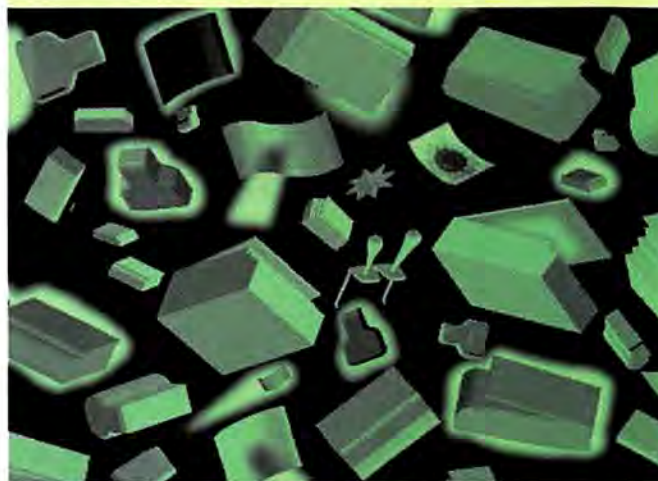
Thanks to the continuing, significant decline in scanner hardware prices, many people who thought they would never want a scanner—those who work primarily with word processing, spreadsheet, presentation, and database applications—are going to find scanners difficult to resist. Consider this: Two years ago, the majority of 24-bit, 300-dots-per-inch color scanners cost from \$7000 to \$9000. This fall, Microtek plans to ship the ScanMaker II, which could be the first 24-bit, 600-dpi color flatbed scanner boasting a street price of about \$900.

There are other encouraging developments, too, that could make a scanner a must-have. The technology is improving, as many manufacturers are selling scanners capable of higher resolutions and better image quality than previous, higher-priced versions. And a new generation of software with automatic controls is making scanners easier to operate for someone with little graphic-arts or desktop-publishing skill.

Before you take the plunge into scanning, there are important decisions to make. Should you buy a flatbed model, or will a hand-held device do the job? Do you need color, or can you get by with gray scale or black and white? Is the advertised scan resolution real or simulated? Should you care about three-pass versus one-pass scanning? Do you need new features like Twain support, or added features like optical character recognition (OCR) and image-editing software?

Hand-Held or Flatbed?

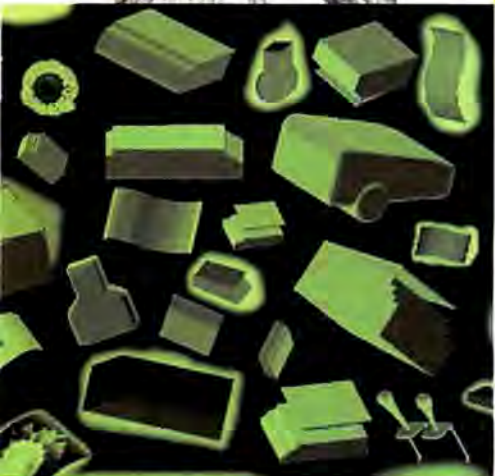
THERE ARE SEVERAL TYPES OF SCANNERS FOR THE Macintosh: hand-held, flatbed, slide, sheetfed, overhead, and drum. Because they're generally low-priced and well suited to a variety of applications, flatbed and hand-held scanners are the most common choices for first-time and general-use scanner buyers. (For an overview of the other scanner technologies, see "A Scanner Sampler"; for a review of slide scanners, see "Seeing Through Slide Scanners" in this issue.)



BY JAMES A. MARTIN

Pros and cons of hand-helds Because they're inexpensive (it's easy to find one for about \$300), hand-held models can be an ideal way to get into scanning without making a hefty investment. They're small (typically about 4 inches wide), so you can keep them in a drawer or hang them on the side of the Mac to free up desk space. Hand-held devices are portable, so you can take one on the road with your laptop (battery-powered hand-held scanners are rumored to be in the works). The method of scanning (you slowly drag the device over the object to be digitized) also lets you scan some objects you otherwise couldn't—the logo on the side of a large box, for instance.

Now the bad news. Because you must sweep a hand-held unit's scanning head over a graphic by hand, it's easy to end up with waves or other align-



Scanners come in several forms— which is right for you?

with low-resolution (laser-printed) output, needs a portable device, and doesn't usually need to scan images larger than 4 or 5 inches wide.

As for color hand-held scanners, don't even think about buying one except for the kids. With the prices of some color flatbed scanners hovering around \$1000, color hand-held models (which retail for \$700 to \$900) are getting squeezed out of the market. Mouse Systems, Sharp, and NCL America are among those dropping their color hand-held scanners.

Pros and cons of flatbeds For several reasons, a flatbed scanner is clearly the better choice.

First, there's a greater diversity of models and features from which to choose. At the high end are \$8000 to \$10,000 color flatbeds that can scan originals up to 11.7 inches by 17 inches at resolutions of 1200 dpi and higher; some include an attachment for scanning transparencies. At the other end of the spectrum are 300-dpi, 8-bit gray-scale models that usually don't include any transparency or sheet-feeder attachments (but they're often available as options), are

limited to scanning originals up to 8.5 inches by 11 or 14 inches, and cost from \$900 to \$1300.

Second, flatbed scanners usually offer better-quality scans than hand-held devices do. Most hand-held devices, for example, use a technique called *interpolation* that results in coarser images (more on interpolation later).

Third, it's easier to align images on a flatbed because the scanner head records the image by moving underneath the graphic (like a photocopier's mechanism does) rather than by having you rake the scanner over the graphic by hand.

So what's wrong with flatbeds? Most important, they cost more than hand-helds. And all too often, the scanner's software interface is unfriendly, particularly to inexperienced users.

Also, the quality of scans often varies from one model to another, despite the fact that their guts may have been engineered by the same manufacturer—the variations ordinarily arise from differences in their software interfaces and image-quality controls. If you have several scanners in-house, this can lead to inconsistent results even for the same image.

Still, in the long run, a flatbed model is the better scanner investment, even if you're in a cash squeeze. Once you buy a scanner, you will find uses for it that you didn't anticipate. And the more you scan, the more you'll begin to resent the limitations of a hand-held device.

Gray-Scale or Color?

BECAUSE THE PRICES OF COLOR SCANNERS HAVE dropped so dramatically, why buy a gray-scale scanner when a color model doesn't cost much more? Why, indeed.

When you consider that the cost of color printers is also nose-diving, color scanners take on an even

ment problems. And if you move the scanner too quickly, you run the risk of a jerky image, since the scanner's memory buffer gets full and misses some of the image data. With practice, some deep breathing, a decaffeinated life-style, and no sneezing, you can minimize—but not eliminate—these problems.

While a hand-held device's size is an advantage, it's also a limitation, as it prevents you from easily scanning images larger than 4 inches wide. To scan larger images, you must scan one 4-inch section at a time, then combine—or *stitch*, in scanning parlance—the pieces together on screen. This is an awkward process, and the graphic often reveals the seams of your stitching on close inspection.

Still, gray-scale hand-held scanners make sense for someone on a tight budget, who works primarily

stronger allure. Meanwhile, some vendors are working on ways to improve and simplify the processes of color scanning and printing. Savitar's ScanMatch program (\$199), for instance, promises to match the RGB (red, green, and blue) values of the image you see on a monitor's screen to the color values of the original scanned graphic. From there, Adobe Photoshop's calibration options fine-tune how Photoshop converts the RGB colors to the CMYK process-color values of the intended output device. In addition,

Beware that claimed resolution may not be true resolution

ColorSync, the color management system in Apple's upcoming QuickDraw GX, promises to provide color consistency between the Mac and its peripherals; QuickDraw GX is scheduled to be available later this year. And Light Source plans to release later this year a color version of its ground-breaking Ofoto software that will automate many color-calibration tasks.

Your best bet is to pay a little more for a color scanner now rather than try to save money by buying a less-expensive, gray-scale model that you'll soon outgrow. You can still scan in gray-scale and black-and-white modes with a color scanner, and then advance into color graphics when you're ready.

Understanding Optical Illusions

A GROWING NUMBER OF INEXPENSIVE FLATBED scanners are offering the ability to scan images at resolutions above 300 dpi. But beware that what a

company claims to be a scanner's true resolution is not always what it really is.

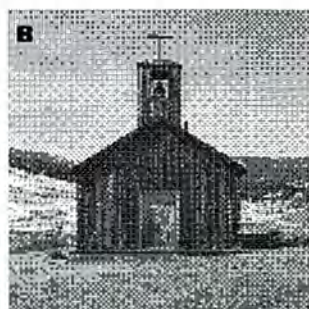
As mentioned earlier, many scanner vendors are using a technique called interpolation to boost perceived resolution. In interpolation, the scanning software creates extra pixels by calculating the range of hues (levels of color or gray) between the pixels it actually sees. For example, if a scanner sees 100 pixels per inch, it may calculate 300 pixels per inch by dividing each pixel it sees into three smaller pixels. It also adjusts the hue of the newly created smaller pixels to make the shift between hues appear smooth. (A scanner's actual resolution is limited by its array of charge-coupled devices, or CCDs—tiny silicon elements containing photon detectors that convert light reflected from an image into pixels the computer understands.)

Interpolation is useful when enlarging a color or gray-scale image after scanning it. Without interpolation, the pixels that make up an image scanned at, say, 300 dpi become more visible the more you enlarge the image. With interpolation used to scan it in at 600 dpi, that same image—because it has more pixels—is less likely to have an undesirable pixelated (blocky) quality when enlarged.

People who regularly scan line art (black-and-white drawings, for example) will also find interpolation to be an advantage. Line art is characterized by fluid lines and curves, which at lower resolutions run the risk of being plagued by aliasing (jaggies).

Because interpolation creates additional pixels by dividing existing pixels, it smooths out the jagged lines. But the process doesn't enhance the level of detail in an image. Thus, a shadowy image with poor

How Gray-Scale Interpolation Works



In interpolation, the original image (A) is sensed by the scanner hardware as a pattern of black and white dots (B), which the scanner software translates to gray levels (C). The interpolated result can be slightly muddier than the original.



In true gray-scale scanning, the scanner hardware detects the levels of gray in the original image (A) and assigns the level detected to each pixel when creating the image file (B).



The La Cie Silverscanner (top) and Hewlett-Packard ScanJet IIp both offer higher resolution through interpolation.

Scanning Methods

ANOTHER MARKETING CLAIM TO CONSIDER IS THE difference between *one-pass* and *three-pass* scanning.

One-pass scanners generate RGB values by using three separate lights that flash on and off throughout the scanning process. As the scanning mechanism moves across the image, the scanner's internal red light comes on to capture the image's red information. After the red light shuts off, the green light comes on to capture green, then shuts off so the blue light can follow the same procedure. Thus, the scanner captures the color information in one pass.

A three-pass scanner uses one light source and three color filters to create RGB values. The scanner head passes along the image three times, once while the red filter is in position, again for the green filter, and so on. The scanner's internal lamp comes on to

contrast at 300 dpi won't reveal any additional, subtle photographic details when interpolated to 600 dpi; it just won't look aliased.

Unfortunately, some vendors aren't always upfront about interpolation. Often, a manufacturer claims its scanner offers 600-dpi resolution when in fact the scanner has 600-dpi vertical resolution and 300-dpi horizontal *optical*, or *true*, resolution; the scanner's 600-dpi horizontal resolution comes through interpolation.

Although a 600-by-300-dpi scanner with interpolation creates a better-looking image than does a 300-by-300-dpi model, don't assume your image will look as sharp as one from a scanner with true 600-by-600-dpi resolution. When shopping for a scanner, ask what its optical resolution is.

Also, don't get too carried away with high resolutions. The higher the resolution, the more memory the image requires, and the more processing time the Mac needs to print, rotate, scale, or redraw the image. Considering the system resources required to handle them, high-resolution scans—for someone who isn't doing color prepress or other high-end work—are more trouble than they're worth. For general use, a 300-dpi scanner is more than adequate.

Interpolation is an issue not just in resolution but in gray (and color) levels too, especially for hand-held scanners, since interpolation lets manufacturers keep down the weight and price by using fewer and less-expensive components. Many hand-held scanners can see only black and white, so they use *dithering*—creating a series of black and white dots to simulate gray—when scanning photographs. They then use interpolation to reconstruct the gray levels. A true gray-scale scanner, by contrast, assigns an actual gray value to each pixel (see "How Gray-Scale Interpolation Works" for a visual explanation of this process). So what's the difference? A black-and-white hand-held device is fine for scanning line art or text and images for on-screen presentations and some laser-printed output. But the gray levels it generates won't have the depth and clarity of an image scanned on a true, gray-scale scanner, particularly if output on an imagesetter.

When shopping around, check if the scanner achieves gray scale by interpolation (usually through software) rather than by true gray-scale detection.

A Scanner Sampler

Aside from flatbed and hand-held devices, there are several other scanning technologies for the Macintosh, ranging in price from \$250 for hand-held scanners to more than \$70,000 for prepress scanners.

Sheetfed scanners, such as Microtek's MS-II (\$1195), are similar to fax machines in that you feed the original page into a slot, where rollers move the page over the scanner's stationary light source and charge-coupled device (CCD) array. Thunderware's ThunderScan Plus (\$249) is an unusual example of this genre: its hardware replaces the ribbon cartridge in an ImageWriter, turning the printer into a sheetfed scanner. Sheetfed scanners are ideal for OCR applications and light desktop publishing but are limited by supporting few page sizes. It's also easy to inadvertently insert a page at an angle.

With overhead scanners, the scanning head and CCD array are mounted over the platen (glass) to capture the image from above rather than from below (as traditional flatbed scanners do). With this method, you can capture 3-D materials (a telephone, for example), but because light is projected onto the object, high-quality scans are difficult to obtain. Truvel sells a 24-bit color overhead scanner, the TruScan 3D Color Scanner, beginning at \$8695.

With slide scanners, a piece of film is placed in a slot inside the scanner; light is directed through it and into the CCD array. The results are highly saturated colors and a greater level of detail than you'd get with a reflective scan (with a typical flatbed scanner). Dedicated slide scanners are frequently used for color prepress and other high-end photographic applications and usually offer greater resolution than do traditional flatbed scanners with transparency options. Barneyscan Corporation's \$4495 CIS 3515 and Nikon's LS-3510AF Film Scanner (\$9535) are two examples of 35mm slide scanners.

Drum scanners are the most expensive, and advanced, scanners for the Macintosh. They originally were available only for high-end Crosfield, Linotype-Hell, and Scitex prepress systems. With this drum process, the original transparency or reflective art is mounted on a scanning drum, while the photographic film to be exposed is mounted on an exposing, or recording, drum. A small spot of light illuminates the copy being made on the film; as the scanning drum rotates, the light spot scans a fine line of copy for every resolution. The result is an extremely-high-quality scan. Because they're expensive—consider that Howtek's Scanmaster D4000 unit represents a significant price breakthrough at nearly \$40,000—not to mention complicated to operate and maintain, drum scanners aren't recommended for anyone other than high-end desktop publishers and service bureaus.

record the red information, goes off, comes back on for the green information, then repeats the process for the blue information.

Some scanner vendors are moving toward the one-pass method for several reasons. One is that these devices can sometimes scan faster than three-pass models. (Because implementations often differ widely, there's no guarantee that a particular product will be faster than another.) Another reason is that a one-pass scanner, because it digitizes the image in one fell swoop, is often less likely to cause registration problems than is a three-pass scanner.

But a one-pass scanner sometimes creates slightly fuzzier scans than a three-pass model does. Because a one-pass scanner uses three lamps that flash on and off, it can introduce lighting errors into the process, which translate into reduced sharpness.

Ultimately, the one-pass versus three-pass debate shouldn't be a substantial consideration for anyone buying an inexpensive color scanner. Indeed, don't worry about speed at all—generally, the slower the scan, the better the results.

WHO SELLS SCANNERS UNDER \$3000

Company	Hand-Held Scanners		Flatbed Scanners		
	Black-and-White	True Gray-Scale	Gray-Scale	Color/Gray-Scale	Optional Flatbed Attachments
Abaton ¹	○	○	●	●	○
Advanced Vision Research	○	○	●	●	ADF, S
Animas ²	●	●	○	○	○
Apple Computer	○	○	●	○	○
Caere Corporation	● ³	○	○	○	○
The Complete PC	○	●	○	○	○
Computer Friends	○	○	○	●	S
Epson America	○	○	○	●	○
Fujitsu Computer Products	○	○	○	●	ADF
Hardware That Fits	○	○	○	●	S
Hewlett-Packard	○	○	●	○	ADF
Howtek	○	○	○	●	○
HSD Microcomputer USA	○	○	●	●	ADF, S
La Cie, a Quantum Company	○	○	○	●	○
Logitech	● ³	○	○	○	○
Marstek	○	●	○	●	○
Microtek	○	○	○	●	ADF, S
Mirror Technologies	○	○	○	○	ADF
New Dest Corporation	●	○	●	○	ADF
Nisca Corporation	○	○	○	●	○
Our Business Machines	○	○	●	●	ADF
Panasonic	○	○	●	○	ADF
Pentax Technologies	○	○	●	○	ADF
Prime Option	○	○	●	●	ADF
Relax Technology	○	○	○	●	S
Sharp Electronics Corporation	○	○	○	●	S
Tamarack/Artix Technologies	○	○	○	○	S
Thunderware	● ³	●	○	○	○
Umax Technologies	○	○	●	●	ADF, S
XRS	○	○	○	●	ADF, S

● = yes; ○ = no.

ADF = automatic document feeder, used for optical character recognition (OCR) applications.

S = slide or transparency mount. ¹ A subsidiary of Everex Systems. ² A subsidiary of Mouse Systems.

³ Gray levels simulated through software interpolation.



Hand-held scanners are convenient for occasional use. Shown here are (clockwise from top left) the Logitech ScanMan, Thunderware ThunderScan, and Caere Typist, an OCR product.

Improved Ease of Use

NO MATTER HOW INEXPENSIVE, ADVANCED, OR efficient scanners become, they aren't worth much if you can't easily operate them. With this in mind, Light Source developed Ofoto, a breakthrough program that automates a variety of gray-scale scanning functions and controls so that anyone can get acceptable results with a minimum of pain. (For more on Ofoto, see "OneScanner," *Reviews, Macworld*, February 1992.)

Ofoto (bundled with some scanners and available as a separate program for others) automates most common scanning tasks. For example, Ofoto scans and sharpens an image, straightens it on screen (in case you've inadvertently inserted the original at an angle), and crops the white space around the image. Most important, Ofoto determines for you the image's best scanning resolution and bit-depth values (hue or levels of gray) for the intended output device—a task that has perplexed many scanning novices. This ensures that you get the best-quality output on your printer, without scanning an image at a needlessly high resolution.

In addition, Ofoto offers some basic image controls (rotating, inverting, scaling, and flipping), although you still need Adobe Photoshop or Micro-Frontier's Enhance to perform any sophisticated image enhancement (such as blending pixels to rid an old photograph of its scratches).

As is the case with auto-everything 35mm photography, you get the best results from Ofoto by taking the time to learn how to adjust controls yourself, as not every scanning job is the same. (Ofoto offers manual control options as well as automatic mode.)

Ofoto is not alone in tackling ease-of-use issues. Flamingo Bay's new ScanPrep Resolution Calculator (\$275) calculates resolution for gray-scale and color flatbed scanner users. Tell the program the

resolution of your scanner, the dimensions of your original image, and its final output size, then answer a few multiple-choice questions, and ScanPrep tells you the optimum resolution at which to scan your image. Flamingo Bay sells ScanPrep versions for use with transparency scanners and for transferring high-end scans from a Linotype-Hell or Crosfield system to the Macintosh for PostScript output.

Perhaps taking a cue from Ofoto, Hewlett-Packard recently began shipping an enhanced version of its DeskScan utility for the HP ScanJet IIP and IIC. DeskScan was originally shipped with HP's ScanJet Plus and included the Auto Exposure feature, which automatically adjusts brightness and contrast. For the latest DeskScan version, HP has added AutoFind, which determines if an image is continuous-tone or line art so it can switch automatically to gray-scale or black-and-white mode. DeskScan also now lets you easily select a calibration path.

While they aren't perfect—Ofoto's autocropping feature rarely eliminates precisely what you want it to, and DeskScan, while much improved, can still be cryptic for neophytes—these programs are ultimately as important as price cuts in making scanners accessible to a wider number of users.

There's another ease-of-use development for scanner users—called Twain—but at the time of this writing, it was still on the horizon. Developed by Hewlett-Packard, Caere, Aldus, Logitech, and Eastman Kodak, Twain is an application program interface and protocol—a kind of political unification between scanning hardware and software. (Hence the name: *twain* means “two,” as in “never the twain shall meet.”) Twain's promise is to let you input an image directly into any DOS or Mac application, as long as both the program and the hardware support Twain. This would work like Photoshop plug-ins but would not be application-specific.

Several companies have announced support for Twain in upcoming products, but ultimately, Twain will most likely benefit product developers more than you or me. The ability to scan directly into an application probably won't be a major advantage to most. With System 7's Finder—which lets you open as many programs as your Mac's memory allows—and enough memory (at least 8MB), moving between an application and a scanning utility on the Mac is only a matter of a few mouse-clicks, anyway.

Bundles and Add-Ons

PEOPLE DON'T SCAN IN A VACUUM—THEIR IMAGES are meant to be used for real projects—so scanner vendors are increasingly bundling with their scanners valuable software programs—among them, Micro-Frontier's Enhance, Aldus Consumer Division's Aldus Digital Darkroom, and Ofoto for gray-scale images, and Adobe Photoshop and Letraset's ColorStudio for color scanning.

But many vendors bundle only limited editions of some software. Photoshop LE (Limited Edition), for example, which comes with many scanners, lacks the full-blown color-separation capabilities of Photoshop. But it's fine for anyone not involved in prepress work, which means that it's fine for most business users.

If you're buying a scanner for your office or department, you might consider a model that offers an automatic document feeder option, which lets you easily scan pages of text for OCR purposes. OCR packages have shown strong signs of improvement recently. (For a review of OCR packages, see “From

Together, words and images are an unbeatable combination

Page to Pixel,” *Macworld*, July 1992.) A document feeder can add about \$400 to the cost of your scanner, and an OCR package will set you back another \$300 to \$900, depending on its sophistication.

No Need to Wait

IF YOU'RE WAITING FOR COLOR SCANNERS TO COME down even further in price before you buy, that's fine. But as with any computer device, you can count on the fact that tomorrow there will be something cheaper and better than what you buy today—which means you might end up never making a move.

And that would be too bad, for scanned images can enliven your documents and presentations, offering images where words just aren't enough. The simple truth is that together, words and images are an unbeatable combination. **m**

See *Where to Buy* for contact information.

Scanners in Focus

Looking for further information on scanners? Here's where to start.

The October 1991 issue of *Macworld* contains a Macworld Lab review of 13 gray-scale flatbed scanners (“Scanners in View”). The June 1991 issue of *Macworld* offers a review of 15 low- to mid-priced color flatbed scanners (“Affordable Color Scanning”) and 8 hand-held models, including black-and-white, gray-scale, and color (“One in the Hand”).

The Verbum Book of Scanned Imagery, by Michael Gosney, Linnea Dayton, and Phil Inje Chang (M&T Books, \$29.95), explains scanning technology in easily understandable terms, offers how-to advice, and includes plenty of sample scanned images.

The Complete Scanner Handbook for Desktop Publishing: Macintosh Edition, by David D. Busch (Business One Irwin Books, \$24.95), provides an overview of scanner technology and is aimed at entry-level scanner users. Busch's companion volume, *The Complete Scanner Toolkit: Macintosh Edition* (Business One Irwin Books, \$34.95, with disk) offers how-to information for more-advanced users. A follow-up book, *David Busch's Hands-On Hand Scanner Book*, is due this fall from the same publisher.

Macworld Complete Mac Handbook, by Jim Heid (IDG Books Worldwide, \$26.95), includes a chapter on scanners that provides useful information on how they work as well as tips for getting the best results.

Image '92 is a three-day seminar devoted entirely to the subjects of color and gray-scale scanning, desktop stripping, and color separations on the Macintosh. The seminar, aimed at graphic designers, prepress technicians, and anyone with at least some knowledge of scanning, is held in major cities around the country throughout the year and costs \$995. For more information, call ImageXpress at 404/979-8811.

Seeing Through Slide Scanners

Macworld

Lab tests 13

scanners

that digitize

slides and

transparencies

USERS OF TRANSPARENCY SCANNERS are a varied lot. Artists, archivists, print-production people, designers, business-people with slide presentations, multimedia producers—each group has different hardware and software needs. But whatever the job, scanner users want the best image quality possible at the price they can afford to pay.

To sort out how to find a scanner that does the job you need done, and to determine which units deliver the best scans, Macworld Lab tested 13 scanners for ease-of-use and speed, and applied a half-dozen tests for quality-related criteria such as sharpness, color fidelity, and *dynamic range*—the ability to capture shadow and highlight detail. The price cutoff for this roundup was \$16,400; we looked at any model below that price that can scan transparencies, including 5 dedicated slide scanners, 8 flatbeds with transparency attachments, and a couple of inexpensive hybrid designs.

Types of Scanners

35MM SLIDE SCANNERS ARE STRAIGHT-forward to use: open the door on the bread-box-shape device, slip the slide into metal clips on a movable stage, close the door, and scan. These scanners do only

one thing—scan 35mm slides and negatives—but they generally do it better than all but the most expensive flatbeds.

Flatbed scanners resemble small photocopy machines. You open the cover, lay the artwork on a glass platen, close the cover, and scan. Most of the transparency attachments in this review replace the scanner cover with a panel that opens and closes on a hinge and illuminates the transparency from above. A few units do away with the cover altogether and simply suspend a light source above the scan bed.

In either case, flatbed transparency attachments are awkward, retrofit affairs. To use them with slides you have to do things like cut windows in plastic sheets to make masks (these stop light from flooding the image), unmount the slide, and then tape the slide to the mask and the mask to the scanner. And only expensive flatbeds have resolution ratings approaching those offered by inexpensive, dedicated 35mm scanners.

The advantage of flatbeds with transparency units is that they can scan just about anything in the two-dimensional world, from X-ray film to watercolor sketches to dried flowers. One would like to say that flatbeds with attachments can do the job of two scanners, but the limited resolution and image quality of all but the most expensive models makes these cross-breeds feel more like one-and-a-half machines. Unfortunately, flatbed makers tend to price transparency units as though they were half a scanner.

Coming to a Resolution

SCANNER RESOLUTION RATINGS TELL you how many image measurements, or samples, a scanner makes per inch. A higher-resolution scanner typically can produce bigger, sharper images. But scanner makers charge high prices for high resolution. How much resolution is enough for your needs?

The answer depends entirely on how you're going to use your scans. Producing film separations for print is a resolution-hungry application. If this is your reason for buying a scanner, the easiest way to figure out your resolution needs is to check the table "Resolution and Print Dimensions," which shows the maximum enlargements possible from a 35mm slide using various scanners and assuming some typical halftone resolutions. As you can see, 600-dots-per-inch resolution is the bare minimum for 35mm slides intended for print.

Printing to a film recorder also requires lots of data. If you use a 35mm recorder, look for a scanner that has resolution at least equal to the resolution you use for film-recorder output.

BY JOE MATAZZONI

Image sharpness increases progressively as scan resolution approaches twice that of the output figure; after that, you get diminishing returns.

People who make scans for on-screen display don't have to worry much about resolution unless they typically crop slides severely. The smaller the image scanned, the higher the scanning resolution required to enlarge the image. The only scanners in this article that can't produce a photographic-looking image larger than an Apple 13-inch monitor are the Raster-

Ops Espresso Personal Slide Scanner and the Niscan Spectra.

When comparing scan-resolution ratings, be sure the number you're looking at is the *optical resolution*. Scanner makers and salespeople have a bad habit of quoting figures for *interpolated* or *nonproportional* resolutions instead. Interpolation is an image processing technique by which a program simulates a higher resolution than the scanner actually captures—helpful for avoiding jaggies when you blow up a scan beyond its normal limits. But like

most synthesized commodities, interpolated data is a poor substitute for the real thing.

Nonproportional scanners collect more data in the vertical direction than in the horizontal one, then use interpolation to build up the resolution on the weak side. Nonproportional files offer about the same amount of image detail as scans with a resolution midway between the nonproportional rates. So, having a 300-by-600-dpi scanner is almost as good as having a 450-dpi machine. The disadvantage

Among the top scanners: The Imapro QCS-600 (left), the LeafScan 35 (top), and the Nikon LS-3510AF Film Scanner (bottom).



is that the files you create take up as much space as 600-dpi files—about 78 percent more space than 450-dpi files.

Tonal Control: Hardware Factors

ANYONE WHO HAS USED A GOOD camera knows that taking good pictures involves adjusting exposure. Scanners have much more flexible controls than cameras, but the idea is the same: adjusting the scanner so that it responds differently to different slides is essential to making optimal scans.

This is true not only because slides vary considerably, but also because all slides contain a lot more visual information than Mac scanners can capture. A 24-bit scan captures 256 shades (8 bits) per red, green, and blue color channel, while a color transparency can contain thousands of shades per color. Without the ability to adjust the scanner's tonal response, your chances of capturing the 256 shades that best represent the slide's information are slim. Unadjusted scans typically miss shadow detail or drop the high-light information—or both.

RESOLUTION AND PRINT DIMENSIONS

Input (device) Resolution	Output (effective) Resolution			
	128 dpi (85 lines at 1.5:1 ratio)	200 dpi (133 lines at 1.5:1 ratio)	225 dpi (150 lines at 1.5:1 ratio)	300 dpi (150 lines at 2:1 ratio)
600 dpi (Imapro QCS-600)	4.4" × 6.6"	2.8" × 4.3"	2.5" × 3.8"	1.9" × 2.8"
1000 dpi (Barneyscan CIS 3515)	7.4" × 11"	4.7" × 7"	4.2" × 6.3"	3.1" × 4.7"
1850 dpi (Microtek ScanMaker 1850S)	13.6" × 21.2"	8.7" × 13.1"	7.8" × 11.7"	5.8" × 9"
3175 dpi (Nikon LS-3510AF)	23.4" × 35"	15" × 22.5"	13.3" × 20"	10" × 15"
4000 dpi (Leaf LeafScan 35)	29.5" × 44.3"	18.9" × 28.3"	16.8" × 25.2"	12.6" × 18.9"

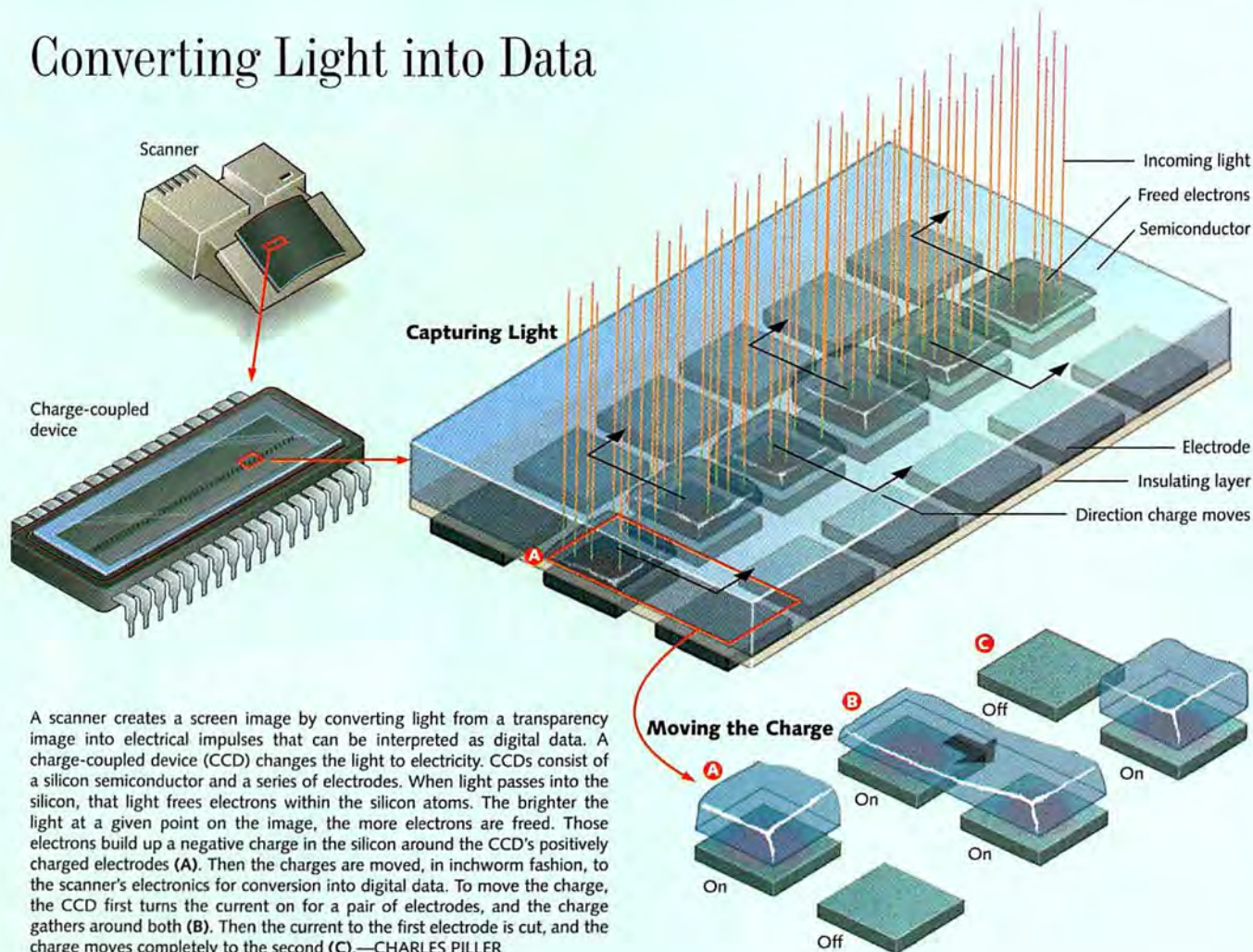
Why buy a high-priced, high-resolution scanner? The most common reason is a desire to print at larger sizes and finer line screens. This table shows maximum output dimensions of 35mm slides scanned on various machines and printed at typical line screens. For output resolution, *effective* refers to the resolution achieved after a scan has been enlarged (enlarging reduces resolution, since image samples are spread over a larger area). *Ratio* refers to the relationship between scan resolution and halftone linescreen. A ratio of 1:1 is the minimum; 1.5:1 provides good image sharpness; 2:1 provides maximum sharpness.

Scanners achieve tone corrections in three basic ways. Two ways make a difference in getting the best possible scan. The third is irrelevant—but it's the cheapest and easiest to implement, and therefore the most commonly found.

The method that doesn't make a dif-

ference I call *8-bit processing*. In 8-bit processing, a scanner simply takes 8 bits of data per color channel from the device within the scanner that converts analog light signals to digital information. It then runs the data through a software lookup table that adjusts the values—for example,

Converting Light into Data



A scanner creates a screen image by converting light from a transparency image into electrical impulses that can be interpreted as digital data. A charge-coupled device (CCD) changes the light to electricity. CCDs consist of a silicon semiconductor and a series of electrodes. When light passes into the silicon, that light frees electrons within the silicon atoms. The brighter the light at a given point on the image, the more electrons are freed. Those electrons build up a negative charge in the silicon around the CCD's positively charged electrodes (A). Then the charges are moved, in inchworm fashion, to the scanner's electronics for conversion into digital data. To move the charge, the CCD first turns the current on for a pair of electrodes, and the charge gathers around both (B). Then the current to the first electrode is cut, and the charge moves completely to the second (C).—CHARLES PILLER

enhancing brightness—according to your instructions. While this technique can make a scan look better, it can't buy you any new information about the image. You're simply optimizing the appearance of the 256 values you've already collected.

Eight-bit processing is the type of processing Adobe Photoshop and most other Mac image editors perform—which is exactly why it's irrelevant to scan quality. In most cases where 8-bit processing is the only option, it's easier to just make post-scan corrections in Photoshop, where you have more control over the results.

The other two tone-correction methods actually bring new information—and therefore new image detail—into the scan. One method involves adjustments made before the data hits the analog-to-digital converter. To brighten a scan, for example, many scanners simply crank up the light source or increase exposure time. Another common technique is to reset the sensitivity of the analog-to-digital converter by changing its *reference voltages*—the electric charge values it interprets as black and white.

The Nikon LS-3510AF Film Scanner passes the charges through circuitry that boosts or dampens their strength, effectively causing the scanner to read the charges as brighter or darker light impulses. While hardware tone corrections make more meaningful changes than does 8-bit processing, the level of control they offer typically isn't as precise as that provided by digital image processing. Relatively precise analog methods, like the Nikon's, are expensive to implement.

The third adjustment strategy involves simply collecting more than 24 bits of data. For example, instead of 256 shades per color channel, the LeafScan 35 captures more than 65,000 values (16 bits per channel). With all that extra input, you can sift, sort, and select quite a bit yet still deliver a full complement of 256 (optimized) values to the Mac when you save the file.

Collecting more than 8 bits per channel also helps to get around the electronic *noise* problem that afflicts all the scanners in this article. Scanner noise is inaccurate data caused by interference from a variety of physical and electronic sources. The more data the scanner collects, the less significant the noise is as a percentage of the total information available, and the fewer errors noise causes. (Noise usually forms streaks or random tone variations in dark areas of an image.)

Tone Controls: Software

HARDWARE CAPABILITIES CREATE THE potential for meaningful tone adjustment, but software gives you the tools for work-

ing your will on an image. The most critical controls are those that enable you to match the tones the scanner captures with the brightness range of an image. The clumsy way to do this is through brightness and contrast settings.

Imagine a scanner as a net that you cast out over a stream of fish representing brightness values. The net can hold only 256 fish, and you're trying to catch a particular school. Brightness adjustments control how far up- or downstream you throw the net, while contrast settings determine how broadly or narrowly you cast. Obviously, catching the fish you want—those fish and no others—requires both controls.

Actually, using brightness and contrast to control the range of a scan is just about as precise as the fishing simile suggests. The process usually involves scanning, measuring the scan in Photoshop, adjusting one or both settings, and then rescanning—over and over.

The better scanners use more-elegant approaches to solving this problem. The Nikon and Leaf automatically analyze the prescan and make a stab at an automatic adjustment. For those who want more control, the Set Highlight tool in Barneyscan's CIS 3515, Leaf Systems' LeafScan 35, and Imapro's QCS-600, and the Set Shadow tool in the Leaf machine let you click on areas of the prescan to identify which parts of the image the scanner will assign to values 256 (highlight) and 0 (shadow). Other scanners can crop the prescan so that only a limited area is considered in the scanner's automatic range calculations, which achieves almost the same purpose.

The Leaf and Imapro units, as well as the Sharp JX-600S and the Umax UC-1200S, offer a further level of tone control. Once you've staked down your highlight and shadow points, it's often desirable to adjust the distribution of tones between those poles. Entering a new *gamma* number enables you to assign a disproportionate number of the 256 shades at your disposal to, say, the mid-tones of an image, thus sharpening details in that part of the slide.



Good, Better, Out of Our Price Range

Scans by an \$80,000 Scitex SmartTwo (top), the Nikon LS-3510AF (middle) and the Barneyscan CIS 3515 (bottom). The CIS 3515 gives very nice color, but showed marked noise problems in some scans. Also, notice the variations in shadow detail in the Asian woman's hair.

Even more advanced is the ability to create custom tone curves that let you reassign values in the highlight, midtone, and shadow areas individually. At this writing, only the LeafScan 35 offers this capability. By the time you read this, new software for the Nikon scanner should give tone-curve control to those with the 12-bit option installed.

You should be aware that while many of the scanners in this review *appear* to have a complete set of the tone tools just discussed, it's not uncommon for scan programs to mix controls that invoke 8-bit processing with other, more meaningful types of adjustment. "Slide Scanners at a Glance" lists only those tools that we determined make changes you couldn't make in Photoshop.

"Slide Scanners at a Glance" also includes a number of software features that are useful but do not directly relate to a scanner's ability to produce top-quality scans. This list provides an index

of the care that went into producing a scanner package.

A few items require a word of clarification: "Calculate Output Size and Resolution" refers to a program's ability to tell you what a scan's final, effective resolution and dimensions will be once the image has been enlarged by the amount chosen. "Maintain Prescan between Scans" refers to an ability that's an essential in my book. Without it, every time you need to rescan an image for whatever reason, you also have to re-create the prescan.

"Magnify Prescan" is the ability to zoom in on the prescan. This feature can save quite a bit of rescanning time by

keeping you from missing your intended subject when you are cropping a tiny, 35mm prescan.

Recommendations: Flatbeds

THE GOOD AND SOMEWHAT SURPRISING news about flatbed scanners is that it's possible to use them for color publishing—which is great if you need the flexibility flatbeds afford. The bad news is that if you want a flatbed that has the ability to do prepress work, it'll set you back at least 14 grand.

Unless you always print at low resolutions or small sizes—or from large transparencies—and you are not very

SLIDE SCANNERS AT A GLANCE

Company	Tested by Macworld Lab	Model	Price	Price Transparency Option	Bundled Image Editing Software	Bits per Channel	Optical Resolution (in dpi)	Maximum Scan Area, Transparency	Maximum Scan Area, Reflective	Warranty (in days)	Technical Support Rating ¹
35 mm											
Barneyscan Corporation	●	CIS 3515	\$4495	NA	Photoshop Ltd. Edition	8	1000	35mm	NA	90	10
Ektron Applied Imaging	○	Slide Scanner	\$11,190 (with required GPIB board)	NA	none	12	2800	36mm X 24mm	NA	90	not tested
Leaf Systems	●	LeafScan 35	\$9995	NA	none	16	4000	38.1mm	NA	90	11
Microtek	●	ScanMaker 1850S	\$2199	NA	Photoshop	8	1850	35mm	NA	365	12
Nikon	●	LS-3510AF Film Scanner	\$9535 (8-bit) ⁵ \$11,316 (12-bit)	NA	Photoshop or ColorStudio 1.5	8 and 12	3175	40mm	NA	365	dealer support primary
RasterOps Corporation	●	Expresso Personal Slide Scanner	\$849 (without required video capture board)	NA	none	NA	variable	35mm	NA	1095	7
Santos Technology	○	Mira 35	\$2695	NA	Photoshop	10	2700	35mm X 24mm	NA	365	not tested
Victor Hasselblad	○	Hasselblad Macsie 35A	\$12,995 (with required GPIB board)	NA	Cirrus	12	2200	36mm X 24mm	NA	183	not tested
FLATBED											
Agfa Corporation	○	Arcus	\$3950	\$1000	none	10	600 X 1200	6" X 9"	8" X 11.75"	365	not tested
	○	Agfa Focus Slide Scanner	\$6995	\$1500	none	8	400 X 800	5" X 5"	8.5" X 13"	90	not tested
Computer Friends	○	Artiscan AS8000 ⁷	\$1445	\$699	Photoshop	8	800	8.5" X 11.75"	8.5" X 11.75"	365	not tested
Hardware That Fits	○	RealTech Scan 800	\$1299	\$495	ColorShop 24, ScanMatch, Photo- shop \$200 extra	8	400 X 800	8.5" X 11.75"	8.5" X 11.75"	365	not tested
HSD Microcomputer U.S. A.	○	Scan-X Color ⁸	\$1495	\$695	Photoshop	8	600 X 300	6" X 9"	8.5" X 14"	365	not tested
Imapro Corporation	●	QCS-600	\$16,395 (with re- quired GPIB board)	included	none	10	600	11" X 17"	11" X 17"	90	13
Mitsubishi International	○	SC-7500	\$5500	\$949	Photoshop	8	400	11" X 11"	11" X 17"	90	not tested
Nisca	●	Niscan Spectra	\$995	requires light table	none	8	200 X 400	4" X 6"	4" X 6"	365	8
Sharp Electronics Corporation	●	JX-320	\$1895 ¹⁰	\$1195	Photoshop	8	300 X 600	8.5" X 10.5"	8.5" X 11"	90	-5
	○	JX-450	\$5995 (with re- quired GPIB board)	\$500	Photoshop	8	300	8.5" X 11"	11" X 17"	90	-5
	●	JX-600S	\$14,500	included	Photoshop	10	600 X 1200	11" X 17"	11" X 17"	90	-5
Tamarack/Artix Technologies	●	ArtiScan 6000C	\$1295	\$695	Photoshop	8	300 X 600	8.5" X 11.75"	8.5" X 11.75"	365	7
Umax Technologies	●	UC630 Color Scanner	\$1995	\$895	Photoshop	8	300 X 600	6" X 9"	8.5" X 14"	365	6
	●	UC1200S	\$5495	\$895	Photoshop	10	1200 X 600	6" X 9"	8.5" X 11.75"	365	6
XRS	●	OmniMedia 6cx	\$4000 ¹²	included	Photoshop ScanMatch	8	300 X 600	8.5" X 13.5"	8.5" X 13.5"	365	4

● = yes; ○ = no. ¹12-14 = excellent, 9-11 = very good, 7-8 = good, 5-6 = satisfactory, 1-4 = poor, <1 = unsatisfactory. ²For tested scanners, credit given for exposure and other tonal adjustments only if controls affect analog data or lookup tables of greater than 8 bits. ³Highlight only. ⁴To avoid confusion over differences in definitions between companies, features listed only for scanners tested. ⁵12-bit board as an upgrade is \$1780. ⁶12-bit version. ⁷AS6000, with 600-by-600-dpi resolution available for \$1699. ⁸Scan-X Grayscale available for \$1295.

If I had to pick, I'd probably go for the Imapro, which has some added processing circuitry that eliminates the streaking the JX-600S is prone to. In addition, the Imapro software helps you get the right exposure, instead of dooming you to trial

If you want a flatbed-and-slide scanner for less demanding jobs such as producing mock-ups or on-screen presentations, you have two choices: the ArtiScan 6000C and the Sharp JX-320. Both machines can produce good-looking scans larger than an Apple 13-inch monitor, in under 30 seconds. Scans from the JX-320 are noticeably sharper, but the Arti-

If you need to scan 8½-by-14-inch items, don't be tempted by either the XRS OmniMedia 6cx or the Umax UC630 Color Scanner. Both were among the poor-

⁹ Prescan is quite large, however. ¹⁰ \$1345 without Photoshop. ¹¹ Exists, but not useful. ¹² Upgrade from Microtek scanner \$2000. Model 6C is \$3000, \$1500 for upgrade. ¹³ Software recently upgraded to version 2.1.1, but not tested.



Scanner Speed

Times are in seconds;
shorter bars are better.

Gray-Scale Prescan

Color Prescan

Final Scan

35mm Scanners

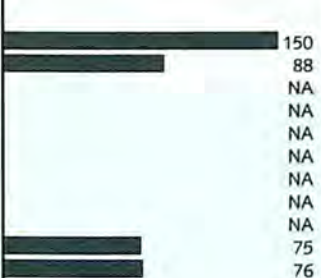
Barneyscan CIS 3515	19
Leaf LeafScan 35	NA
Microtek ScanMaker 1850S	45
Nikon LS-3510AF/12 (fast)	61
Nikon LS-3510AF/12 (high quality)	61
Nikon LS-3510AF/8 (fast)	61
Nikon LS-3510AF/8 (high quality)	61



NA	98
105	271
115	234
89	98
89	163
95	101
95	175

Flatbed Scanners

Imapro QCS-600	NA
Nisca Niscan Spectra	NA
Sharp JX-320 (fast)	17
Sharp JX-320 (high quality)	17
Sharp JX-600S (fast)	25
Sharp JX-600S (high quality)	24
Tamarack/Artix ArtiScan 6000C	23
Umax UC630 Color Scanner	22
Umax UC1200S	11
XRS OmniMedia 6cx (fast)	26
XRS OmniMedia 6cx (high quality)	25



150	134
88	109
NA	28
NA	36
NA	49
NA	84
NA	36
NA	70
NA	24
75	43
76	61

A 35mm color slide was scanned for all tests. Flatbed resolution was 300 dpi; 35mm scanners were tested at 1000 dpi. The test computer was a Mac IIci with an Apple cache card and 8MB of RAM. Some scanners operate faster in either landscape or portrait mode; all times are for the faster orientation.

est performers in our color-response tests. The XRS—basically a Microtek 600ZS with a transparency attachment added—is blurry and extremely noisy, which leads to very bad shadow-detail discrimination.

Recommendations: 35mm

IN THE 35MM ARENA, ONCE AGAIN the only options for the prepress set are expensive. Both Leaf and Nikon offer capable machines and include polished software modules that help you to get excellent results. The units do have their respective strengths and weaknesses, however.

The main point in the Nikon LS-3510AF Film Scanner's favor is that it was better able to resolve small detail in our tests, despite the Leaf's higher resolution rating. The problem here seems to be the Leaf's fixed-focus design; the scanner is focused at the factory, where an assumption is made about the thickness of the slide holders you'll use. The Nikon focuses automatically during prescan.

Our experience also showed the Nikon to be the more reliable machine. We had to get Leaf to ship us three different LeafScan 35's into the lab before we found one that didn't have some kind of problem. This might just have been bad luck, but it casts the Leaf's 90-day warranty in a worrisome light.

The LeafScan's edge is that it has a higher bit depth than its direct price competitor, the Nikon with an 8-bit option. This gives the LeafScan more dynamic range, and it gives experienced users who know their way around a gamma curve more tonal control than they would have with the Nikon.

The 12-bit option for the Nikon, which you install as a plug-in board, should give the LS-3510AF capabilities similar to the LeafScan's—albeit at a higher price. When this was written, the Nikon software driver wasn't able to effectively access the 12-bit data, so we weren't able to test the upgrade.

If you need a less expensive 35mm scanner, your choices are a mixed bag. The Barneyscan CIS 3515 produces far better color than does the Microtek ScanMaker 1850S, and the BarneyScan software is much more useful. On the other hand, the Microtek sells for less than half the price and offers almost twice the resolution. Both scanners have problems holding shadow detail, but either one will provide better quality than a low-price flatbed. The mira 35, from Santos Technology, is the first inexpensive 10-bit Mac scanner. It offers a resolution of 2700 dpi and has a projected price of \$2695. It began shipping after our test deadline.

By the time you read this, another new medium-price 35mm scanner should be available. An upgrade to Eastman Kodak's Rapid Film Scanner, the RFS 2035, is a 10-bit, 2100-dpi device that will sell for \$7995.

Two other units not covered in this article will be of interest to people who want to scan transparencies up to 4 by 5 inches in size. Microtek should be selling its new 12-bit 45T by the time you read this; at press time, the company had not announced a price. And Leaf has announced that it will be holding a closeout sale on the current implementation of its Leaf 45 before bringing in a new version. The scanner, which usually sells for \$22,995, will go for \$14,900.

Scanning on the Cheap

MY BASIC ADVICE ABOUT THE RASTER-ops Expresso Personal Slide Scanner and the Niscan Spectra: don't bother. Even for

The Good and the Mediocre Scans by the Imapro QCS-600 (facing page, right) and Tamarack/Artix ArtiScan (facing page, left) give an idea of the quality flatbeds are capable of. Compare the sharpness of the Imapro versus that of the Tamarack/Artix to appreciate the difference between the Imapro's true 600-dpi and the Tamarack/Artix's 300-by-600-dpi files.

Dynamic Range and Saturation

Good and poor dynamic range.

LeafScan 35 OmniMedia 6cx



Dynamic Range

This test measures a scanner's ability to detect subtle differences in brightness at the extreme ends of the tonal scale—100 is black, 0 is white. This is important, because highlight and shadow detail are what give an image the illusion of three-dimensionality.

Saturation

This test rates scanners by how efficiently they separate the color spectrum into the three primary colors red, green, and blue. A small amount of "crosstalk" between color channels can be desirable. But for our purposes, the lower the number, the better the scanner's ability to distinguish among colors.

35mm Scanners

Barneyscan CIS 3515
Leaf LeafScan 35
Microtek ScanMaker 1850S
Nikon LS-3510AF (8- and 12-bit)
RasterOps Expresso

Flatbed Scanners

Imapro QCS-600
Nisca Niscan Spectra
Sharp JX-320
Sharp JX-600S
Tamarack/Artix ArtiScan 6000C
Umax UC630 Color Scanner
XRS OmniMedia 6cx

Longer bars are better.



Shorter bars are better.



* Video scanner; saturation test not applicable. ** Scanner can produce corrected scans only.

on-screen display, these units offer questionable quality.

To be fair, the RasterOps—actually a video camera mounted permanently above a lighted stage—is fast and easy to use. If convenience is your main consideration and you already have a display board with video-digitizing capability, the Expresso is an inexpensive option. But Expresso scans are useful only for purposes of representation, not presentation.

The Niscan works like a miniature flatbed; to use it with slides you have to set it on top of a light table. This machine

simply doesn't have the resolution for 35mm, and for larger media its deathly slowness is a real problem. In a spot test it took the Niscan almost 20 minutes to scan a 4-by-5-inch transparency.

In the end, with the exception of the Leaf and the Nikon, it's hard to get excited about any of the units we tested. Your money definitely buys more scanner today than it did two years ago, but all these machines have notable shortcomings. The new generation of scanners just coming to market looks promising; features keep getting better while prices fall.

MW

EDITORS' CHOICE

LS-3510AF Film Scanner

Autofocus design offers maximum sharpness with minimum hassle. The Nikon's sophisticated analog hardware adjustments mean that even the 8-bit machine provides good dynamic range. **Company:** Nikon. **List price:** \$9535 for 8-bit option; \$11,316 for 12-bit unit.

LeafScan 35

Fixed-focus design and resulting sharpness problems are offset by superior tonal control and dynamic range. The Leaf yielded the best-looking color in test separations. **Company:** Leaf Systems. **List price:** \$9995.

For some users, however, the best way to meet their scanning needs may be to buy a CD ROM player. Kodak's Photo CD program, which should be up and running by the time you read this, promises high-quality 35mm scans at about a dollar apiece (see "CD ROM Drives: Into the Mainstream," in this issue).

If you decide to buy your own device, remember that using a scanner is a lot like using a camera. You can always operate in automatic mode, but getting professional-looking pictures requires know-how and practice. If you're really interested in quality imaging, your efforts at learning about how scanners work won't end when you've finished this article. **m**

See *Where to Buy* for contact information.

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Macworld Lab testing supervised by MARK HURLOW.



WHAT'S WRONG WITH THIS

Picture?

HOW
TO PRESENT
DATA
ACCURATELY—
AND
ATTRACTIVELY

BY CHARLES SEITER

Human eyes are superb at locating edges and color in images, and at estimating sizes of objects in a view with known perspective. For our first half million years, these functions were necessary for survival. But our eyes are not particularly good at deciphering a mass of text with a quick glance and yet a table of numbers is usually the most accurate representation of business and scientific data.

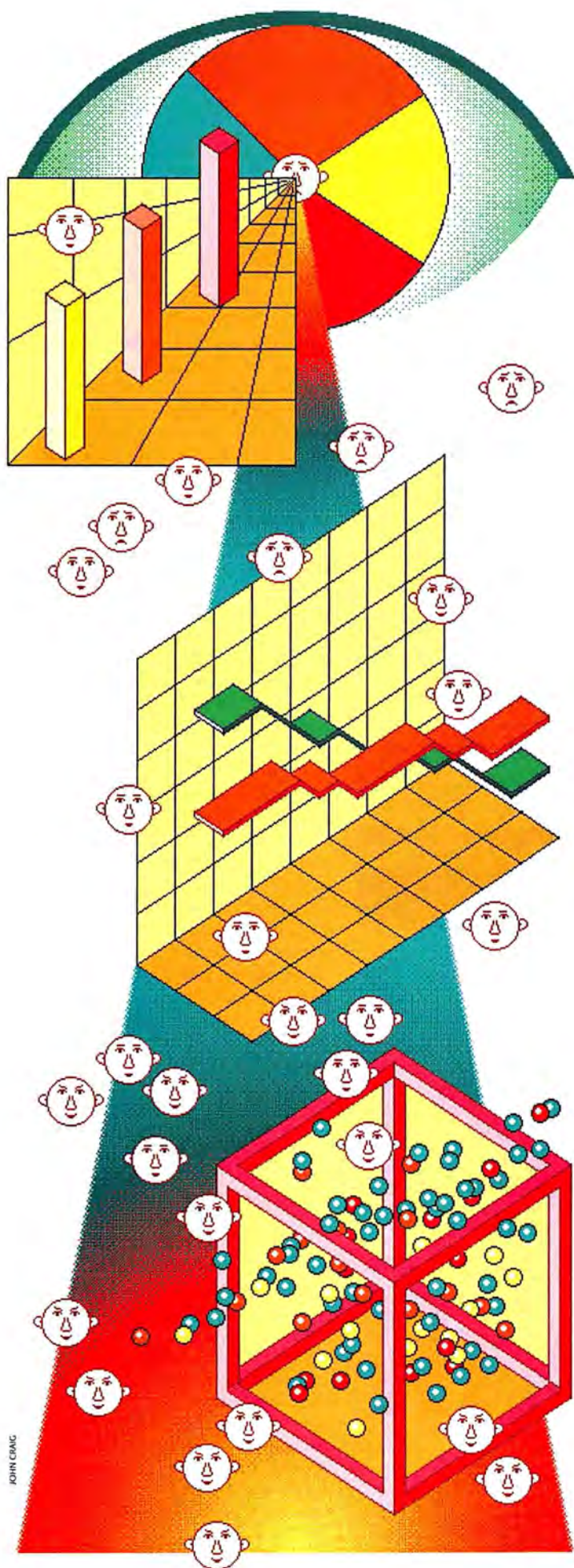
Thus, if you can translate a table of numbers into a picture, people will perceive your data much more easily. But if you're not careful about presentation—particularly in matters of perspective and scale—a picture can be remarkably misleading. It's easy with gee-whiz features in today's presentation, graphics, and publishing software to obscure or even alter the data's real

message by using the wrong effects or by using the right ones incorrectly.

The best software for translating numbers into pictures runs on the Mac, but you may find little documented guidance for the actual process of translation. This article presents a gallery of data-representation examples.

Distortion from Special Effects

Consider the first graphic in "Distorted Data." It was drawn in DeltaGraph Professional, one of the most capable and easiest-to-use graphing programs. DeltaGraph takes advantage of 3-D presentation features that are only partially implemented in the newest spreadsheets. The graphic makes a dramatic conference-room slide. It's also a fairly misleading picture of the underlying numbers.

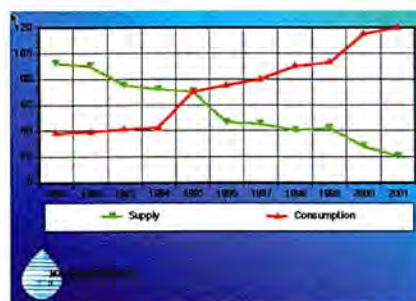
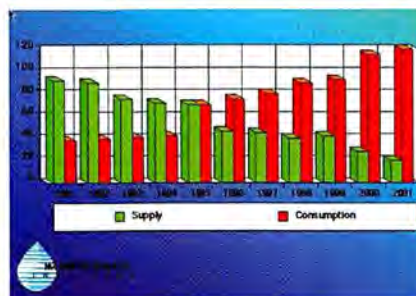


This ribbon chart has two problems. You cannot simply look at the picture and decipher, point by point, the original numbers underlying the table—you can do this more easily with a simple line chart. The second problem is that the viewing angle deemphasizes the last numbers in the series. By inadvertently rotating the “glass brick”—the 3-D grid in which the ribbons float—you can make the ribbons appear to zoom away from each other (if viewed from the right corner) or nearly converge (if viewed on a slant from the chart’s origin).

The same data would also be distorted, although perhaps not to the same extent, by the familiar 3-D bar chart format offered in most business graphics packages. It turns out that, in this case, the least-imaginative graphic, the line chart (also shown in “Distorted Data”), gives the least-biased representation of the original numbers.

As luck would have it, several other ways to make plain numbers into exciting graphics are also fraught with problems. For example, suppose you want to represent the net worth of executives as a row of money bags, as *Macworld* did in its February 1992 article “Year in Review” (reproduced here as “Overstating the Case”). If you make the bag for Microsoft’s Bill

Distorted Data The dramatic presentation-quality ribbon chart (top) makes a 3-D graphic out of data that's really only two-dimensional, making an accurate reading more difficult. A bar chart's straight-on perspective (middle) eliminates the confusion introduced by the ribbon charts's skewed perspective, but the alternating bars make it hard to follow the data's trend. The much plainer line chart (bottom) presents the same data in a way that lets you reconstruct the underlying numbers easily by eye.



Gates, who is worth \$4.8 billion, twice as big as the bag for Microsoft's cofounder Paul Allen, who is worth \$2.3 billion, you will show a symbol with *four* times the area of the single worth unit (as was done in "Year in Review"). If, more accurately, you use a bag for Gates twice as high as the bag for Allen, you find that you can't represent much range without ridiculous distortion of the symbol. If you make Gates's bag have twice the area, it won't appear to be twice as big, since people are better at estimating size differences of regular objects along one dimension than along two or more dimensions.

Does this mean that all attempts to liven up a presentation result in distortion? Not necessarily, but it means that the effects of filtering our new reams of data through our old Stone Age visual system need to be considered carefully. Properly applied, graph elements, space, and color *can* make data representation both interesting and accurate.

A Table of Elements

VIRTUALLY ALL PROGRAMS THAT HANDLE numbers let you make up pie charts, bar charts, and line charts. So when do you choose one type of chart over another? Consider the data table and associated Microsoft Excel 3.0 charts in "True Differences." That image demonstrates how hard it is to pick out small differences in angles but how easy it is to pick out small differences in bar height when the bars are adjacent. Pie charts work well to show relative, gross differences. For example, in "True Differences," the pie chart shows that the three pieces of data are roughly equal. Bar charts work well to show slight differences among similar data, as the figure shows. Which you pick depends on what you want to emphasize. Bar charts also work better when you have many small quantities, since small quantities can get lost in a series of small pie slivers; in a bar chart, each bar has the same weight along one dimension, and the small data are readily apparent in the other dimension by their obvious lack of presence.

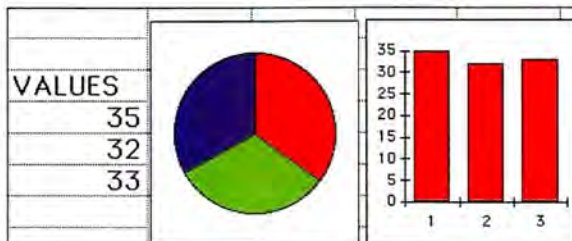
There are, in statistics programs, more-exotic ways to represent any set of data. Because people are very good at picking out differences in the areas of irregular objects, advanced statistics programs give you the option of displaying quantities as "blobs"—stars, sunflowers,

Overstating the Case When using basic shapes to show differences in scale, it's typical—but wrong—to double the size both vertically and horizontally to show that something is twice as big as something else. But doubling along both axes makes the difference 4 to 1 rather than 2 to 1. *Macworld* made just this mistake in an earlier issue's graphics.

Computer Millionaires



True Differences For regular objects, such as triangles and bars, people can see small changes in edges better than they can see small changes in area—it's far easier to pick out differences in this data looking at the bars. By the way, if you need to present numerical data to cats, always use bars. Cats basically just see edges, according to recent research.



PROPERLY APPLIED, MODERN TOOLS CAN MAKE DATA REPRESENTATION BOTH INTERESTING AND ACCURATE

and other symbols that provide you with several outside edges.

An even more imaginative use of graphic elements was introduced by the American statistician H. Chernoff in the 1970s. Not only is a person's visual system good at discriminating certain kinds of small differences in objects, but it's really impressive at evaluating facial expressions—you can probably detect a slight frown from three blocks away. "How Did You Do?" shows a sales data set represented by SYSTAT 5.2 in this whimsical but surprisingly useful mode. The faces are most useful for large data sets; it is possible to devise a ratings scheme in which people can pick out the "happiest" face (using ratings of several variables) from a set of nearly 100 faces printed in a small area.

Scattered in Space

LOOK AT THE DATA IN THE TABLE IN "Scattered Scatterplots" and then look at the standard spreadsheet scatterplots. This is an exceptionally clear example, formulated by F. J. Anscombe, in which the tabular data shows you almost nothing—the statistics for the two data sets are nearly identical—but simple scatterplots make the underlying trends in the two data sets absolutely clear.

The scatterplot is the preferred vehicle for scientific exposition (you can find scholarly journals in which it is the only type of graphic displayed throughout an issue) because it's intrinsically nondistorting and can handle lots of data. Where pie charts start to get cluttered at 6 values and bar charts look like cityscapes beyond 15 categories, several hundred points can fit on a scatterplot with no visual problems.

The standard scatterplot is good for two-dimensional (x-by-y) cases, like housing starts per county versus county family income, or weight at age 40 versus lifetime doughnut consumption. For data comparing more possibly related variables—different types of crime, for example—another representation is needed. That's why the graphics in "Scattered Scatterplots" wouldn't work for such kinds of relationships. The trick for extending the usefulness of the scatterplot is to find a way to represent higher-dimensional spaces.

The first space-expanding technique developed for this situation was the

scatterplot matrix. The principle is simple, as shown in the SYSTAT 5.2 scatterplot matrix in "Correlating Crimes." If you have four crime variables to inspect, you make up scatterplots of each set of pairs of variables and arrange them in a grid. You can then view the set of scatterplots, looking for cases where the data clusters along a line or curve.

The scatterplot matrix exploits two strengths of the scatterplot. First, a scatterplot can be reduced to a fairly tiny scale and still give the same information on quick inspection. Second, even a black-and-white dot matrix printer can do a respectable job of hard-copy production (the method appeared in early statistical computing on mainframes in the 1960s). As a technique to help you in a blind search for some sort of connection in a group of variables, it's hard to beat.

But now that computer displays have progressed from monochrome character-based output to movielike 3-D, there's another method that's a sort of scatterplot on steroids—the rotating 3-D scatterplot. In this technique, you select three variables at a time from your data table, and the Mac creates a plot of points inside a



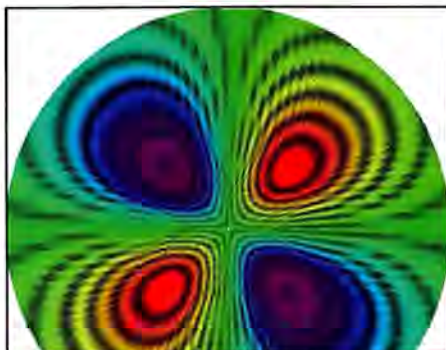
How Did You Do? In this picture, facial expression (eyebrow angle and smile) represents one set of numbers, and the nose size another. It's easy to pick out extreme values from even a huge array of tiny faces.

Data-Representation Software Picks

There is no shortage of Mac products designed to enhance the graphical display of data. Among the better ones are the following.

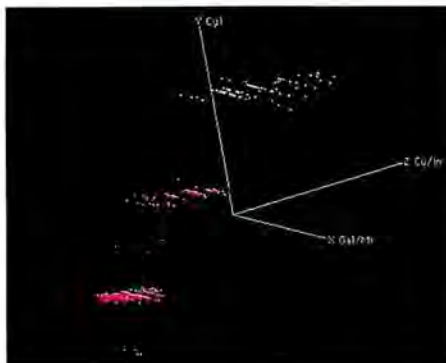
- **Presentation packages** Although their flashier chart types should be used with caution, many presentation packages offer effects that will wake up a figure-weary audience. DeltaPoint's \$295 DeltaGraph Professional and Bravo Technologies' \$199 MacGraphX are notable for a variety of graphs and charting control, while Aldus's \$495 Persuasion, Microsoft's \$395 PowerPoint, and Computer Associates' \$199 CA-Cricket Presents are leaders at producing charts as slides and overheads.
- **Exploratory charting** The giant \$895 program SYSTAT 5.2, from SYSTAT, includes nearly every data representation ever developed, right down to QuickTime movies of scatterplots. Other programs with strong exploratory-data charting are Data Description's \$595 Data Desk and SAS Institute's \$695 JMP. Still the champion at 3-D visualization is Abacus Concepts' \$295 MacSpin.
- **Scientific analysis** The leading color 3-D visualization system for the Mac is a suite of three programs—the \$495 Transform, \$195 Format, and \$495 Dicer—from Spyglass. For visualizing computational data, the \$399.95 symbolic math program Theorist, from Prescience Corporation, is probably easiest for beginners to use, while Wolfram Research's \$595 Mathematica (\$895 for the coprocessor version) offers more scope at the cost of a steeper learning curve. Later this year, the powerful numerical computation package MATLAB from The MathWorks is expected to add to the Mac version (currently \$795) the impressive color 3-D graphing capabilities now available in its \$2995 Unix workstation version.

In Orbit Because color scales can represent arbitrary quantities, they can represent things that can't be seen or felt. This plot shows electron density in an atom's orbital shell.

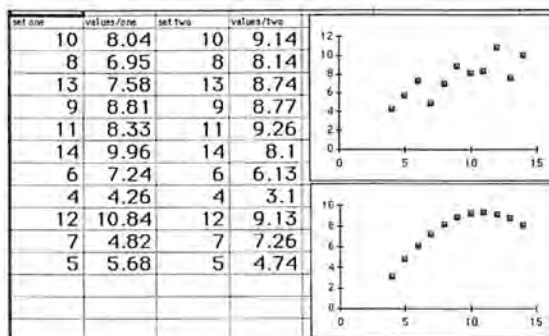


Seeking a Relationship in a Data Stack

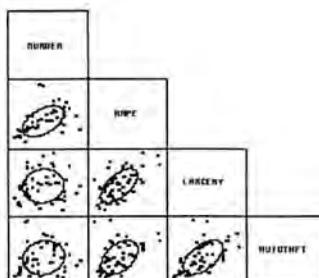
This 3-D plot relating automobile gas mileage to engine displacement and number of cylinders is another type of spatially expanded scatterplot. With appropriate color coding (here yellow indicates the large engines and red indicates small engines), a rotatable 3-D plot is the most powerful tool for visualizing data.



Scattered Scatterplots The two data sets shown here are characterized by the same statistics (mean, standard deviation, and regression line). The scatterplots in this case make obvious the differences that the statistics do not.



Correlating Crimes A scatterplot matrix lets you survey many relationships at once. Here, from data on 50 states, you can see a correlation between murder and rape but not between murder and auto theft.



transparent cube that you can rotate around any of the three axes. (We used Abacus Concepts' MacSpin 3.0 to show the plot in "Seeking a Relationship in a Data Stack.")

Picking out a relationship in this kind of plot is simple. You set the cloud of data points to rotate slowly around the axes, one axis at a time. If the cloud always looks like intergalactic mush, it means that there isn't a strong relationship between one variable and another. On the other hand, if some viewpoint on the cloud makes the points appear to compress or somehow line up, as in the example plot, you have discovered an underlying connection.

In the classic example given here, one view of the cloud simply shows that larger engines generally get worse gas mileage, but the technique works just as well for less commonplace observations.

In an advanced three-dimensional scatterplot application, you can actually display a fourth variable (usually time) by letting this variable control an animation. You can watch the cloud of points evolve in time as you rotate them, so that time trends in data can be picked out separately from correlations between variables. With a little experience, you will be able to perform qualitatively correct analyses by eyeball, in a few minutes, something that would have constituted month-long studies with mountains of printouts only a few years ago.

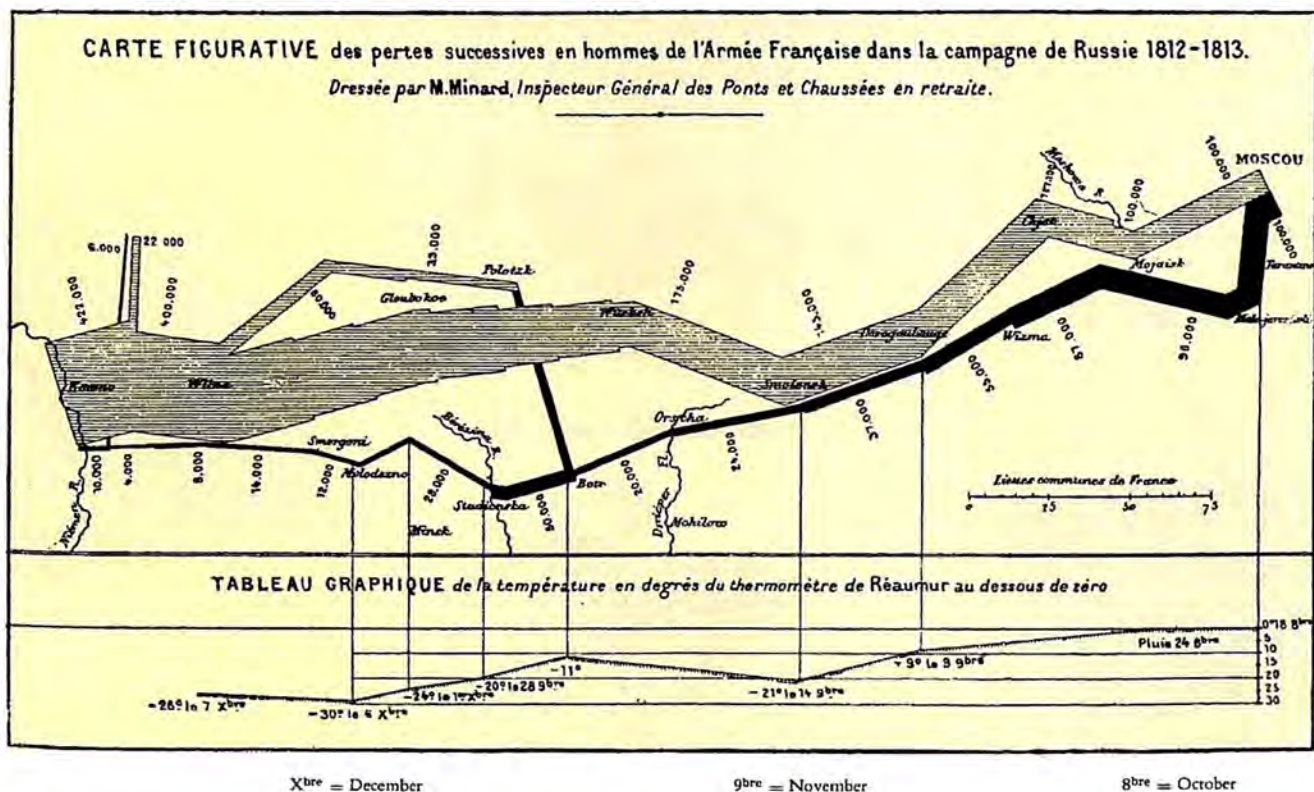
The message is this: With the right representation of data, you can simply see what the data is telling you.

The Importance of Correct Colors

IN THE PROFESSIONAL HANDBOOKS ON graphing, color has two recognized uses: quantization and categorization. The concept of color quantization is not profound—orange as hot, red as very hot, blue green as cold, and blue as freezing is the most typical use of this technique in everyday life. The familiar *USA Today* weather map is an example.

But some uses of color quantization are more subtle. Color can be used to add another dimension to a 2-D plot, as well as to plot quantities that have no direct sensory analog, as is often the case with scientific data. A common use of color quantization in science divides an arbitrary numeric scale into a color scale. An example is the colorization of charts dis-

WITH THE RIGHT REPRESENTATION OF DATA, YOU CAN SIMPLY SEE WHAT THE DATA IS TELLING YOU



playing ozone-depletion levels over the Antarctic that you see every once in a while on the evening news. Fractal images are represented this way, as are color CT scans and such abstract quantities as electron density in atomic orbitals (see "In Orbit," which was produced in Spyglass Transform).

Representation of categories in color simply means assigning colors to related groups of points. Although this assignment is considered so trivial in the case of bar and pie charts that the program does it for you by default, there's usually something to be gained by taking charge of color assignment yourself. To do this usually requires some effort as you slog through dialog boxes to change assignments, but the result is a figure that contains extra information that the viewer can easily perceive (for example, the clear separation of data clouds by engine type in "Seeking a Relationship in a Data Stack").

But color should not be used just because it is available. As an example, look at the classic graphic ("Still a Classic") by Charles Minard that shows the march of survivors of Napoleon's Russian campaign. The path of the soldiers (gray) on

the way to Moscow follows the actual route they took. Its width is based on the number of soldiers alive at each point along the way, graphically showing how many soldiers died. The black path follows the route of their retreat. Below the paths is a temperature chart showing the temperatures during the dates of the retreat. From October 18 to December 7, 1812, the temperature ranged from 0 degrees Centigrade (32 degrees Fahrenheit) to -26 degrees Centigrade (-15 degrees Fahrenheit), which was a main reason that so many soldiers perished during the retreat.

It's tempting to make the effects of the temperature more obvious by colorizing the retreat path so that the color changes (perhaps from light blue to dark blue) as the temperature declines. But the path is too thin to effectively show such color changes, and using color changes without the temperature graph would make it too hard to see the actual temperature on any given day.

The Tools Are at Hand

WITH THE HUMBLEST INTEGRATED software package for beginners, and a few days of practice on a Mac LC, you can

Still a Classic This image showing the diminishing number of survivors in Napoleon's 1812 march on Moscow and his subsequent retreat, plotted against the temperature, does not benefit from special effects available in today's graphing programs. It remains, as graphics guru Edward Tufte called it, possibly "the best statistical graph ever drawn."

produce data graphics that would have astounded the world ten years ago. With the most advanced graphing software (and equivalently powered Mac hardware), you can produce results that will astound the world now. Despite the orientation of many programs toward the producing of "conference room" three-dimensional bar charts, you are likely to find unusual and impressive styles of graphics that lend themselves to experimentation if you poke around in the program's features. **m**

See *Where to Buy* for contact information.

A research analyst and consultant, CHARLES SEITER is also a *Macworld* contributing editor who usually writes about mathematics, spreadsheets, and statistics.

HOW TO MAKE YOUR FIRST



QuickTime

APPLE'S NEW DIGITAL-MOVIE TECHNOLOGY has hit the streets, and there are already enough QuickTime products for sale to make your head spin. Wasn't QuickTime supposed to make movie-making *simpler*?

Fear not: here's the recipe. First, though, some psychological prep work—steel yourself to pay between \$500 and \$8000 for a digital movie-editing studio inside your Mac. Prepare to learn some new terminology. Make a *lot* of room on your hard drive—or, if you have a Bernoulli or SyQuest drive, grab a couple of blank cartridges. Understand from the get-go that we're not talking about Technicolor quality here—more like Max Headroom. And without an extra converter box, or a high-priced video board, you can't record the finished product with your VCR.

But rest assured that the jerkiness, high disk-space overhead, and tiny picture size of today's QuickTime movies will be state of the art for about as long as the 400K floppy disk was. By the time you read this—or much sooner—newly engineered products will flood the market. They'll make your movies smoother, more colorful, and more compact on your hard drive.

One Unpeeled Mac

LOGICALLY, DIGITAL MOVIES ON THE Mac shouldn't be possible at all. If you've worked with graphics, you know that just one color picture can take up a megabyte of disk space. When you watch TV, you're watching 30 pictures, or frames, per second. So you're going to ask the Mac to store—and play back—30MB per second? What are you, crazy?

That's why QuickTime is such an achievement. It pulls every trick in the book to reduce the amount of information

necessary to display video. First of all, most QuickTime productions play in a rectangle that's 160-by-120 screen dots (pixels) square—that's $\frac{1}{16}$ the size of the standard screen and much less information to store. Next, QuickTime compresses the file, discarding redundant information as it analyzes the color information in the movie.

Despite these data-reducing shenanigans, the Mac must still process a huge amount of information every second. Therefore, the first item in your equipment list for Desktop Pictures, Inc., is a fast Mac. At minimum, you need a 68020-processor Mac; you also need at least 5MB of memory and System 7. If you want to make your own movies with a camcorder, instead of just playing other peoples', you need a *digitizing board*. Technically, you don't need a color monitor, but QuickTime isn't very impressive in black and white. Finally, you need the QuickTime extension itself—a 440K file you can get from a user group, Apple dealer, or online service.

Stir In Video

TO MAKE YOUR OWN DIGITAL OPUS, BEGIN with a video source. A TV cable, VCR, or laser disc is fine if you want to play around with existing footage and can get permission to do so legally; get a camcorder if you want to shoot your own. With the relatively low quality of today's QuickTime flicks, the tape format doesn't much matter: *composite*, or home-video gear (like the VHS, VHS-C, and 8mm formats) make just as good digital movies as the more expensive *component* gear (S-VHS and Hi8 formats). (Better yet, of course, are professional $\frac{1}{4}$ -inch tape decks, which produce the highest-quality picture signal of all—the three-channel RGB signal.) As 1992 wears on, though,

Your First Time

BY DAVID POGUE

higher-quality QuickTime products will dramatically improve the picture. The caliber of your video setup will start to make a difference in your finished product. If you are buying a camcorder right now, it's probably worth planning ahead—get Hi8 or S-VHS equipment.

Once you have your footage in hand, shop for a digitizing board. This NuBus or PDS board slips into a slot in your Mac and provides a jack or two into which you can plug your video source.

Here's where the market gets interesting. There are three general types of digitizing boards: *frame-grabber* boards, which were originally developed for capturing still frames from live video, but have been modified to work with QuickTime; the VideoSpigot; and boards not available to evaluate by press time. The third category is the most intriguing of all.

Frame-Grabber Boards

WHAT MAGIC SPELL TURNED THESE former still-frame-grabbing boards into movie-making machines? A special component of the QuickTime software family called a *VDIG*. (Pronounced *VEE-dij*, it stands for video digitizing component, but nobody calls it that.) When you drop a VDIG into your System Folder, any program that can record QuickTime works with your digitizer board. For a list

of digitizing boards with VDIGs, see "QuickTime Input Features."

These born-again frame grabbers are often loaded with non-moviemaking features. They may double as full-color display boards for your monitor, let you watch real-time TV, or let you attach a secondary circuit board (a *piggyback board*) to provide extra features like acceleration or stereo sound.

It's important to understand that although these are excellent boards rich with features, you're likely to be disappointed with the captured footage—not by the picture quality (16-bit and 24-bit images are dazzling to look at) but by the frame rate (smoothness of motion). While TV is 30 fps, movies are 24 fps, and the QuickTime movies you've seen at user groups are usually 15 fps, these frame-grabbing boards average 6 fps to 12 fps at the smallest size (about 2 inches square).

Spigotville

THE NEXT CATEGORY OF DIGITIZER board has only one occupant today: the \$599 VideoSpigot, from SuperMac Technology. It is not a display board for your monitor. Nor is it meant to be a frame grabber, although it can capture an absolutely frozen image at half-screen size (a VCR on pause generally isn't quite still enough). It has only one video input

—for composite video, so you lose the high quality of S-VHS or Hi8 equipment. Instead of those frills, every centimeter of this specialized board was designed with low-cost, high-quality movie-digitizing in mind.

The VideoSpigot doesn't need a VDIG to record (but at press time it began shipping with one that is also available from SuperMac's folder on America Online, and in SuperMac's forum on CompuServe.) Instead, the Spigot comes with its own recording program, called Screen Play.

Frame-grabber-style boards can put the incoming video into one of two places: RAM (at a high frame rate but very short movie lengths); or, using the VDIG, directly onto a hard drive (at a low frame rate, but long movie lengths). The Spigot has no such trade-off: it records directly to a hard drive with a high frame rate. It accomplishes this feat, first, by devoting every iota of the Mac's processing power to the task of furiously storing video information into a temporary file on the hard drive; second, by performing some compression on the video (about 3:1) before it goes to that temporary file; and third, by displaying only a crude, 1-inch-square, black-and-white, choppy preview while you're recording; this saves the CPU's energy for the first step. (See "How the

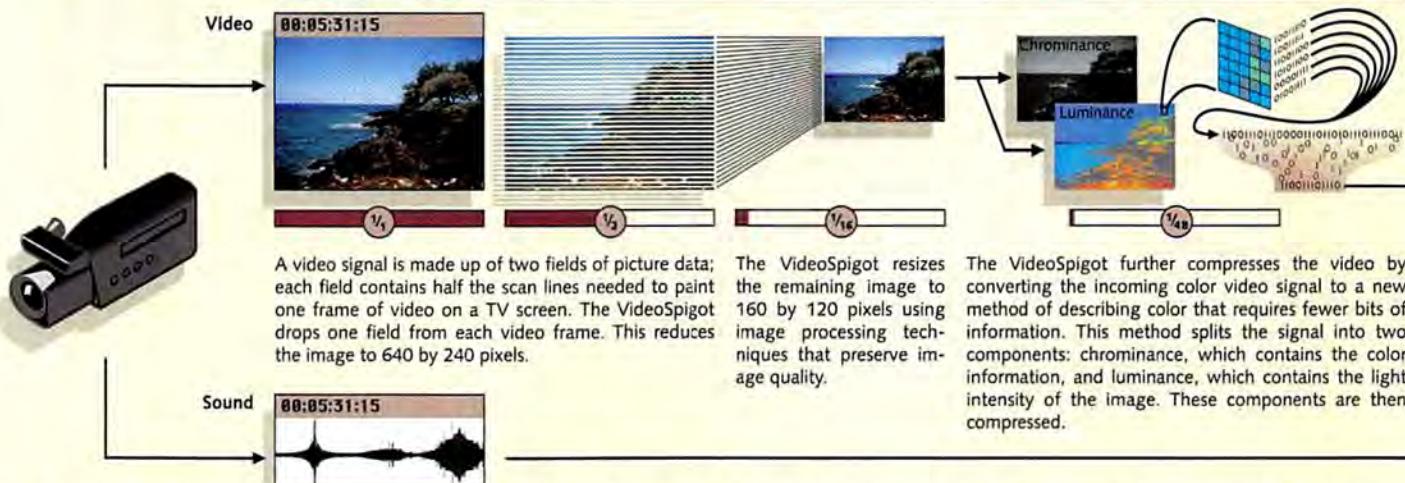
How the VideoSpigot Works

Recording video to a hard drive at a high frame rate isn't easy. A video signal contains much more information per second than a hard drive can record. In order to capture video to a hard drive, much of the video

information must be thrown away, and the remaining video information must be highly compressed. This image processing must happen quickly so that the changing images can be recorded without discernible

skips and gaps. To win its QuickTime stripes, an input board must figure out how to preserve image quality and still record 12 to 15 frames per second.

VIDEOSPIGOT



Because the VideoSpigot doesn't digitize the audio signal that comes out of a video camera, you must use the Mac's built-in microphone or an external sound digitizer like Macromedia's MacRecorder to get your

video sound track into a QuickTime movie. Screen Play, the VideoSpigot's recording software, synchronizes the sound track by stamping each incoming sound chunk with a time code that shows hours,

minutes, seconds, and frame numbers. After the video has been compressed, the stamped time code is used to synchronize each video frame with its corresponding sound chunk.

VideoSpigot Works" for a technology lover's description of the process.)

Once the Spigot has created its large temporary file on a hard drive, you still haven't actually used QuickTime. Only when you use Screen Play's Save command does the footage get converted into QuickTime format and compressed.

Boards Not Available Yet

YOUR DIGITIZING BOARD CHOICES ARE soon to multiply. In the fourth quarter of 1992, SuperMac plans to release Digital Film (\$5999), a new video board that can grab full-screen video and record to hard disks at 30 fps with stereo sound. Digital Film will come bundled with Adobe Premier 2.0, will drive monitors up to 16 inches in 24-bit color, and will provide expansion capabilities. RasterOps' \$Quick Pak piggyback board (circa \$1800) will add high-octane circuitry to any RasterOps TV-line of boards, boosting your movies' playback speed to 30 fps even at full-screen size, without requiring the purchase of a Quadra.

Especially tempting is the VideoVision board from Radius (\$2399 including DiVA's VideoShop and Action from Macromedia). Using a special technology licensed from Apple, VideoVision will feature integrated audio, video, and full-color output to a VCR, as well as special slots

to accommodate expansion boards (for QuickTime acceleration or compression) from other companies. Using increasingly sophisticated high-speed compression circuitry, both of these boards will make QuickTime movies smoother, more colorful, larger on the screen, and smaller on the hard drive.

Sounding Boards

OF COURSE, CRAMMING DIGITAL VIDEO into the Mac is only half the battle. Then there's sound.

Fortunately, the Macintosh world is already familiar with digital audio. That's what you create whenever you use the MacRecorder, or the microphone that comes with recent Mac models. This sound isn't exactly CD-quality, but it's good enough for QuickTime. To record sound with your movies, you can use either the Mac mike jack (plugged into your video source's audio-out jack) or a MacRecorder. But if you have a MacRecorder, you have to have its driver software, which you drop into the System Folder. (This driver is available as part of SoundEdit Professional [\$295] or MacRecorder Sound System Professional [\$349], both from Macromedia; the driver is also available for free on AppleLink and America Online.)

If you meet those conditions, the QuickImage and RasterOps boards can record sound and pictures simultaneously, as long as you're using a QuickTime recording program that supports a VDIG to do so. The VideoSpigot's Screen Play program can record sound, too. The QuickView Studio QT can't use the Mac's mike jack or the MacRecorder; you must purchase QuickView's \$395 sound piggyback board.

If 8-bit, Mac speaker-quality sound isn't hi-fi enough for you, then you can pay \$1295 for an Audiomedia II board from Digidesign, which, when seated into another slot in the Mac, gives you CD-quality sound. Otherwise, wait for some of the new QuickTime-production boards that are being readied for prime time.

How Small Do You Want It?

SUPPOSE YOU'VE SELECTED A DIGITIZING board, hooked up your videotape player, and captured a juicy segment of video. You play it back on the screen; it looks great. You want to save it as a movie file on your hard drive, but without taking over all 40MB. Enter QuickTime.

When you save the file, you'll be asked to choose a compression method. If you want to sound impressive at cocktail parties, use the term *codec*—that's techie shorthand for compressor/decompressor, the piece of software that determines how



In the Shop Notice three things about DiVA VideoShop. First, you always have access to your hard drives and folders; QuickTime files show up as large icons (top right), which you just drag into a track (bottom) to edit. Second, you can have unlimited multiple video tracks. They play simultaneously, either side by side or on top of one another—that's why it's so easy to create superimposed titles (top left). Third, you can always get an immediate playback of your movie-in-progress (top left). You can jump from any frame of the playback to the corresponding frame of the time-line view—and vice versa.

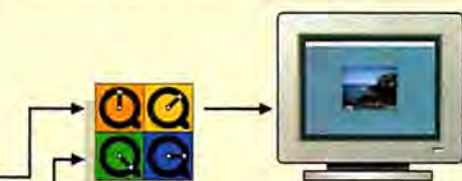


Making Tracks Adobe Premiere's time-line view, the Construction Window, holds seven horizontal strips: three video tracks, three audio tracks, and a special-effects track. In this illustration, a gray cross-fade icon has been dragged into position between the end of the top scene and the beginning of the lower one. Transitions like these are Premiere's best feature; a few of them are listed at left in the Special Effects window.

a movie file should be condensed. Most QuickTime products come with a selection of codecs: one works best for video, another for animations, another for still images, and so on. More codecs are being developed. Each strikes a different balance between picture quality and the space the file takes up on a hard drive.

Welcome to the world of QuickTime, where you eat, sleep, and breathe trade-offs. The better the quality of the movie, the more disk space it's going to take. The options you're given when you save your movie are all variants on that theme. Smaller files mean worse quality, because more color information has been discarded. More frames per second result in smoother motion but bigger files. Twenty-four-bit color equals bigger files and choppy playback, because the Mac is being asked to process much larger chunks of information in the same amount of time. (Record in 16-bit color if you can;

QUICKTIME



When the movie is played back on the Macintosh screen, the SuperMac video compressor component of the QuickTime system software decompresses and displays the images in RGB color.

it looks almost as good as 24-bit color, but requires the Mac to process only half as much data.) A larger movie window equals slower motion; once again, the Mac has to skip frames of the movie to keep up with the flow of picture info. Sound, too, muddies the issue: if you're recording sound with your picture, you get a slower frame rate, because part of the Mac's attention is devoted to recording sound.

Keeping in mind that a lower frame rate means a jerkier movie, here are some examples. On a Mac IIcx with 8MB of memory, the VideoSpigot can capture a soundless 8-bit movie at about 15 fps—if the window is at its smallest size, 160 by 120 pixels. (Record directly into memory, and you get an impressive 24 fps—but the top movie length is 8 seconds.) Record sound simultaneously, and you lose 3 fps. Double the window size, and you get half the frame rate. Use the VideoSpigot VDIG software instead of its Screen Play recording program, and you sacrifice two-thirds of your frame rate. Wait a few months, and you'll be able to capture 24-bit full-screen video with sound at 30 fps. You get the idea.

In the meantime, you can increase your odds of capturing high-quality footage by saving movies onto a fast, freshly defragmented hard drive.

The Cutting Room

ONCE YOU'VE CAPTURED A PILE OF raw film clips, you need an editing program to assemble them into some kind of artistic order. The \$99 Apple QuickTime Starter Kit is one possibility; it's a CD

ROM full of video clips and some floppy disks containing simple moviemaking programs, one of which lets you copy and paste pieces of your movies. But if you want to edit sound tracks, do cross-fades, or superimpose titles, you'll need one of the Big Two: Adobe Premiere 1.0 (\$495; bundled free with the VideoSpigot) and DiVA VideoShop 1.0 (\$599).

When you run VideoShop, the screen changes completely. You still see your disk and folder icons, as though the desktop were still there, yet VideoShop hides everything except QuickTime documents (and the folders that contain them). To prepare a QuickTime movie for editing, you drag its icon from its folder into a time-line window, where you see each frame side by side like a filmstrip (see "In the Shop").

Editing is simple. You drag to select frames, just as you select letters in a word processor. If three frames of a shot are ruined because a truck drove past the camera, select those frames and press the delete key. Presto: history rewritten.

At any time, as frequently as you wish, you can view your movie-under-construction in a playback window, which has the usual movie controls—play, stop, back up a frame, fast forward, and so on. To make navigation easy, you can drag the playback window's "scrubbing" control back and forth (and watch/hear the movie backward and forward) to locate a specific frame, then double-click on the picture. Instantly the time-line window jumps to that frame, so that you can go to town with the editing tools.

Those tools include much more than just cut, copy, and paste. If you place a second movie end-to-end with the first, you can create a smooth transition between them: a cross-fade, a page-turning effect, and so on. A Paste to Fit command lets you paste some footage into a preselected slice of time; in other words, you can create slo-mo (or fast-mo) effects. There's also a series of special-effect filters. Some are Photoshop filters, which you can apply to any stretch of your film. Others affect the movie over time, such as the fade-to-black filter. VideoShop also lets multiple video tracks play simultaneously. You can position these independent movie screens side-by-side or superimpose them. You can designate one particular color of a superimposed scene to be transparent, so that (for example) the forests of Brazil are visible through the transparent-white of your best friend's teeth.

VideoShop's most attractive feature, though, is that it's currently the only QuickTime editing program that lets you record directly from any VDIG-equipped video board. VideoShop's arch rival, Adobe Premiere, doesn't yet support VDIGs, so you can't capture movies directly within Premiere, you have to import them into the program.

Not all is light and clarity in VideoShop, though. The bare-bones manual was written so far in advance of the program that it's measured in errors per second. Applying transitional effects takes a long time. And, as the Too-Much-Data-for-the-Mac-to-Handle Theory suggests, playback bogs down when you use some

QUICKTIME INPUT FEATURES

General	Computer Friends	Display Research Laboratory	E-Machines	Mass Microsystems	New Video Corporation	Radius	Radius	RasterOps Corporation
Product	ColorSnap 32+	MR Shot 1/LC	QuickView Studio QT	QuickImage 24	EyeQ Authoring System	VideoVision ¹	RadiusTV	RasterOps 24STV
Price	\$995 ¹	\$500	\$1799	\$495	\$4495	\$2399	\$1695	\$999
Slots required (number/type)	1/NuBus	1/PDS	1/NuBus	1/NuBus	2/NuBus	1/NuBus	1/NuBus	1/NuBus
FEATURES								
Also serves as regular display board	○	○	○	○	●	●	○	●
Bit depth	NA	NA	NA	NA	8, 24 bits	8, 24 bits	NA	24 bits
Monitor sizes supported (in inches)	NA	NA	NA	NA	13	13, 16, 19, 21	NA	13
Includes VDIG component	○	●	●	●	●	●	●	●
Expandable (with expansion board)	○	○	●	○	●	●	○	●
Includes QuickDraw acceleration	○	○	○	○	○	○	○	○
On-board video compression	○	●	○	○	●	○	○	○
Still-frame grabber	●	●	●	●	●	●	●	●
Hardware pan and zoom	○	○	○	○	○	○	○	●
INPUT								
Video inputs (composite, S-VHS, RGB)	C, S, RGB	C, S	C, S, RGB	C, S	C, S, RGB	C, S	C, RGB	C, S
Built-in TV tuner	○	○	○	○	○	○	●	○
Built-in sound digitizer	○	○	○	○	16-bit stereo	8-bit stereo	8-bit mono	○
OUTPUT TO VIDEOTAPE								
Converts signal to NTSC scan rate	○	○	○	○	●	●	○	○
Encodes Mac RGB signal to composite	○	○	○	○	○	●	○	○
Requires add-on for tape output/price	○/NA	○/NA	●/\$499	○/NA	○/NA	○/NA	●/\$599	●/\$599

● = yes; ○ = no; NA = not applicable. ¹ Board due to ship in fourth quarter of 1992. ² Board due to ship in July 1992. ³ Available with DiVA VideoShop as MovieProducer (\$1195). ⁴ PDS adaptable.

QuickTime Input Boards

Selecting a video-input board isn't quite as easy as choosing an ice cream flavor. Some boards, for example, are regular display boards for a monitor (which—if you use any two-piece Mac except the IIsi, IIfx, and Quadra—you already have). If you already own a Mac, a display board may be redundant; if you don't, getting a display and movie-making board in one package may be a good deal. A note to IIsi, IIfx, and Quadra owners: Even though you don't technically need a display board for your monitor, don't forget that adding a display board anyway can significantly speed up your display.

Even if you decide to get a board that's also a display board, life doesn't get much simpler. You have to worry about what *bit depth* the board is. (Apple recommends 16-bit color for the best QuickTime movies.) You should also take into account which monitor sizes the display board can handle; some of them, for example, work only with 13-inch monitors, which isn't much help if you've spent a couple months' salary on a larger color monitor. Finally, check to make sure you have enough slots in your Mac to accommodate the board you're considering—the occasional board listed in the table is actually two boards, requiring two slots.

Feature Attractions

Some boards give you *hardware pan*, which sounds like a bad equipment review but is actually the ability to display an image that's larger than the glass of your monitor; you can shift the picture to

bring hidden portions into view. *Hardware zoom* lets you blow up each dot of the screen to twice its size, magnifying the image.

If you plan to record your movies onto videotape, you have another set of stats to study. Unfortunately, the Mac video signal and a TV signal are different enough that special converters are necessary. There are two steps to converting one to the other: converting the *scan rate* of the signal to the type required by your VCR, and converting the color information. Most boards that provide tape-output features handle both steps. You can see in "QuickTime Input Features," by the way, that some boards don't have tape-output features built in, but offer that function as an additional-cost add-on.

And speaking of TV, you'll have to decide how important sound and picture quality is to you. There are three kinds of video-signal types for your QuickTime footage, and each requires a separate kind of jack on your video board: *composite*, which is the usual TV, VCR, or VHS camcorder connector; *S-video*, like the S-VHS and Hi8 videotape recorders that provide a sharper picture; and *RGB*, the pro format that has separate jacks for red, green, and blue color signals. Check the table to see which boards accept which signals. Also check to see what kind of sound recording you can expect. If the table shows that a board can record in *8-bit mono*, that's the same quality you get when you record with the Mac's included microphone or with a MacRecorder. *16-bit sound* is CD quality but takes up more disk space. And *stereo*, of course, is stereo.

of the juicier features—multiple tracks (for superimposing titles), for example, or cross-fades. When you save an edited movie, of course, these playback problems go away; VideoShop compiles all your tracks, clips, and sound bites into a single, unified, one-track QuickTime movie. The interface takes some getting used to, too, and you can't smoothly adjust audio levels over time, as you can in Premiere.

Editing in Reel Time

ADOBE PREMIERE SHARES A FEW ELEMENTS with VideoShop: both have a window that displays icons for your various clips (like VideoShop's folders), and a time-line view that shows you horizontally arrayed frames, for editing. As in VideoShop, you drag clip icons into parallel tracks of the time line; also as in VideoShop, you can superimpose or create

cross-fades (and other transitions) between the clips.

Premiere's interface is easy to grasp; there's no fumbling for different tools that work only in specific modes, as in VideoShop. Cross-fades and other transitions are especially easy to create. Easy to modify, too—to make an effect last longer, you just grab it with the mouse and stretch it.

RasterOps Corporation	RasterOps Corporation	RasterOps Corporation	RasterOps Corporation	SuperMac Technology	SuperMac Technology	SuperMac Technology	Truevision	VideoLogic	Workstation Technologies
RasterOps 24XLTV	VideoTime	MediaTime	RasterOps MxTV	VideoSpigot	VideoSpigot Pro	Digital Film 2	NuVista+	DVA-4000/ Macintosh	WTI-Moonraker
\$3499	\$1499	\$1999	\$2199	\$599	\$1599	\$5999	\$2995-\$4795	\$2395	\$1499
1/NuBus	1/NuBus	1/NuBus	1/NuBus	1/NuBus or PDS	2/NuBus 4	1/NuBus	1/NuBus	2/NuBus	1/NuBus
●	○	●	●	○	●	●	●	●	○
24 bits	NA	24 bits	24 bits	NA	5	24 bits	8, 16, 24 bits	8 bits	NA
13, 16, 19, 21	NA	13	13, 16	NA	13, 16, 19-21	13, 16	13, 16, 19	13	NA
●	●	●	●	●	●	●	●	●	●
●	○	●	●	○	○	●	○	○	●
●	●	○	●	○	●	●	○	○	●
○	○	○	○	●	●	●	○	●	○
●	●	●	●	●	●	●	●	●	●
●	○	●	●	○	●	●	●	○	●
C, S, RGB	C, S	C, S	C, S	C	C	C, S, RGB	C, S, RGB	C, S, RGB	C, S, RGB 6
○	○	○	○	○	○	○	○	○	○
○	○	16-bit stereo	○	○	○	16-bit stereo	○	○	○
○	○	○	○	○	●	●	●	○	○
○	○	○	○	○	○	●	●	○	○
●/\$599	○/NA	●/\$599	●/\$599	●/17	●/17	○/NA	○/NA	●/\$2395	●/\$375

uded. 2 24 bits at 13"; 16 bits at 16"; 8 bits at 19"-21". 4 Accepts two inputs displayed in separate windows simultaneously. 5 Not available from SuperMac.

But unlike its competition, Premiere removes you from the immediacy of seeing what you've just done. Each time you want to view part of the assembled movie, you select a region in the time-line view, then invoke the Preview command. Premiere displays the stopwatch for a while as it computes, then it shows you a low-quality, jerky preview of the selected snippet. Once. You can't rewind it, scroll back to see a particular frame, slow it down, or even see it again (without using the Preview command a second time). It's reminiscent of Adobe Illustrator, where you edit your artwork in a wire-frame view; you can see colors, shadings, and objects' opacity only in Preview mode (where you can't make any changes).

Navigation is tough in Premiere, too. When you watch a raw, unassembled clip (this viewing doesn't require the time-consuming Preview process), you can slap a numbered marker onto any frame. Then, by pressing a number key, you jump instantly to that frame.

Unfortunately, that navigational aid is pointless, since you can't edit anything when you're viewing a raw clip. You can edit only in the time-line window—yet there aren't any markers in that view. You can jump to the first frame of any clip—but beyond that, the only navigational control in the editing window is a scroll bar. While you're dragging the scroll box, you get no feedback as to where you are in the movie (like "frame: 100"). You have to guess where you are, let go, wait for the entire window to redraw each color frame, discover that you're in the wrong place, and go for the scroll bar all over again when you're trying to make changes in your clip.

Premiere's editing strength is its ability to manipulate several layers of information (see "Making Tracks"), although it can't play back side-by-side clips. Sound tracks appear as additional strips, and they can be edited independently—you can adjust each sound track's volume graphically, and you can mix several audio tracks.

The program's editing weakness, though, is that it thinks in clips, not frames. You can't select a few frames and snip them out, as you can in VideoShop. To delete that passing truck in Premiere, you'd have to create two copies of the clip—one cropped to end just before the truck appears, and the second cropped to begin just after the truck has passed.

And there's no Undo.

Rough Cuts

IN PREMIERE 1.0, YOU CAN'T SEE HOW the final product will look until you use the Make Movie command. Much like VideoShop's Save command, Make Movie

takes quite a while. It creates a completely new QuickTime file that incorporates all the editing and effects you've specified. The best part of the entire process is watching the finished movie; both Premiere and VideoShop have a special command that centers the playback window on a blackened screen. It looks terrific.

Like everything in the QuickTime world, of course, the editing-software market is rapidly expanding. Nearing completion is VideoFusion, from VideoLake, for example, a high-power editing program that can pan, zoom, filter, and distort movies to a new high in desktop-produced special effects.

Adobe hopes to address some of Premiere's shortcomings with version 2.0, which is expected to ship by August 1992. According to the company, the new version will provide better interactive editing, support VDIGs (so you can record directly into the program), and have multiple levels of Undo. The program will also let you open a sequence of frames in Photoshop, called a Filmstrip, for retouching or colorizing.

Until those improvements materialize, VideoShop makes a more natural and creative editing environment, since you have a clear view of your work in progress at all times. Premiere's method of applying transitions between shots is much superior, and it's easier to learn. But the cumbersome Preview feature teaches you to avoid viewing your work as much as possible; in a medium as visual as movie-making, that's like trying to sculpt clay with your eyes closed.

Final Print

WHEN YOU FIRST SEE WHAT ALL THE fuss is about—a tiny, jittery movie the size of a matchbox, with tinny sound—you might wonder why it's worth spending the money and learning the terms. But a hundred companies rushing products to market must know something. They probably remember the primitive beginnings of desktop publishing.

Whoever coined the term QuickTime must have been thinking of this technological revolution's speed. Already The NEC Video Sequencer (a program from Light Source) lets you control the NEC PC-VCR, frame by frame, from your Mac. Zorro, software from Mass Microsystems that is due out in the third quarter of 1992, promises frame-by-frame control over supported video devices through the use of a proprietary serial interface remote controller. In other words, one day soon, a QuickTime movie will be only a mock-up of a real movie—which your Mac, controlling a pair of tape decks, will automatically construct. Within a



Premier FX In this time-lapse example, you can see one of Adobe Premiere's most dazzling effects—the Page Turn, where one video clip peels away to reveal another one underneath.

couple of years, analog (tape) machines may disappear from the loop entirely: the quality of digital movies on the Mac will be so high that they can be used as actual broadcast material. For thousands of Mac fans and video pros, the arrival of that time can't be quick enough. **m**

See *Where to Buy* for contact information.

Contributing editor DAVID POGUE is the author of *Macs for Dummies*, published by IDG Books Worldwide. He began his moviemaking career with a QuickTime movie about his 102-year-old grandfather.

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Reviews

IN THIS ISSUE: RasterOps CorrectPrint, Norton Utilities, MacTools, LetraStudio, The Miracle Piano Teaching System, The Bat, Nok Nok, easyPrint, Kid Pix Companion, and more

Spreadsheet

Microsoft Excel 4.0

PROS: Many new convenience features; customizable tool bar; added analytical tools. **CONS:** Slower than 3.0 at most tasks; Wizards a work-around rather than a solution; Toolpak of uneven quality. **COMPANY:** Microsoft Corporation (206/882-8080). **REQUIRES:** Mac Plus; 2MB of RAM for System 7 or MultiFinder; hard drive; System 6.0.2. **LIST PRICE:** \$495.



WHAT DO YOU DO FOR AN ENCORE when you're already the hottest act in town? That's Microsoft Corporation's problem with Excel, which has dominated the Macintosh spreadsheet market. Microsoft expanded the working tool set in the spreadsheet and made Excel easier to customize. The result is a product that needs 2MB of RAM for practical use and runs a bit slower than its predecessor, but includes everything you could wish for (and more) in a spreadsheet.

The New Look

MICROSOFT'S DILIGENT MARKET RESEARCHERS have concluded that the typical user spends much more time formatting spreadsheets than recalculating, so Excel 4.0 is loaded with new formatting features. First, the tool bar, introduced in 3.0, features a different default set of items (outlining is off, font sizing is on). But since Microsoft also worries that perhaps its statistically validated cross section of users might not represent you ex-



PETER HOKY

actly, the entire tool bar is now customizable. You can drag items away, replace them with icons for other tasks from a predefined set, or make up your own icons on your own named tool bar and link them to Excel commands, or, for that matter, to macros. If you don't want to learn anything new, you can just call up the Excel 3.0 tool bar, also provided. If you are too lazy to drag the mouse all the way to a tool bar, ⌘-option-click calls a pop-up menu of likely menu choices right under the cursor. And if you don't want to format spreadsheets yourself, Autoformat gives you a choice of 14 nice formats, which, we are earnestly assured, were produced by professional designers.

There are numerous other "sheet management" functions. You can now select blocks of cells and drag them around with the mouse (the Drag and Drop func-

tion). There's an Autofit function to adjust column widths and row heights. There's an Autofill function that fills in the rest of a predictable series from a single entry—select *Jan* and drag down, and you'll see *Feb*, *Mar*, and so forth fill in order. Always losing track of files? Now you can keep related files in a workbook that opens them all at once. Can't spell? There's a spelling checker. Forget charting procedures? There are Wizards (really just a dialog box—plus-help) to step you through the still-clunky sequences for chart modification (at least there's a new chart tool bar). Need to do a presentation? There's a Slide Show manager. Keep different spreadsheet views, detailed or condensed? Ah, that would be the function of the new View Manager. Coffee getting cold? Excel 4.0's context-dependent Help will probably realize this and tell you to

put the cup on top of your monitor. None of these functions is a particularly monumental programming accomplishment (in fact, many of them have appeared in other software first), but they have a cumulative impact: you can put together a professional-looking, amaze-the-boss report in 4.0 as fast as you can type in the numbers.

But Wait

THERE'S MORE! THE LIST OF FINANCIAL functions has been expanded past old standbys like PMT to include TBILLYIELD and about 20 other money marketeers' favorites. New engineering functions include Bessel functions, imaginary arithmetic, and all sorts of number-base conversions. Even the time function list has new entries—NETWORKDAYS is one example. Building on the new function lists, Excel has included an analysis Toolpak with an array of statistics tests from simple descriptive statistics to ANOVA, and a Fourier analysis routine (the Toolpak is called up as needed from the Utilities menu to save memory).

More to the point for business users, who may in fact seldom be called on to solve circularly symmetric vibration problems at work, are the new Scenario Manager and database crosstabs. Excel still has the best Solver of any current spreadsheet, and the Scenario Manager (an add-in module, meaning again that it's called up from disk when needed) basically lets you organize a set of "what-if" Solver problems as a group, recording outcomes for changes in input parameters. This is a serious improvement over the facilities in 3.0, for two reasons. First, most realistic business simulations call for a large spectrum of "what-if" analyses rather than single-variable tests, and Scenario Manager can keep track of all the tests you are likely to formulate. Second, the new set of statistical distribution functions (Weibull, for example) built into 4.0 makes possible really sophisticated work—before 4.0 you needed third-party simulation programs to make models at this level. Crosstabs are another useful feature, new in the Database menu. You can save different Crosstab views (one might be sales per quarter by region, one might be sales of each



Charting the Way It's easy to sample charting styles with the new icon menu for charts, and chart drawing itself is faster. Wizards will step you through the details of chart modification, but the details are for the most part the same old Excel procedures.

brand of product by region) from the same database, and print them in sequence for a report.

Autosum

SCENARIO MANAGER AND THE CROSS-tab function, like the formatting aids, show that Microsoft has indeed been listening to users. What the users are saying is that they need to impress the next level up in their respective corporate food chains to survive in the nineties. Excel 4.0 is a smashing success in this context.

Still, it's possible to have some misgivings about this giant product. There are no obvious changes in the core computing engine, so performance has taken only a moderate hit with expansion. The vast range of customization possibilities will be welcomed by old Excel hands, but the program is now less accessible to beginners. The new functions may have laid waste several sections of the market for third-party macro packages, but some of these additions suffer from mediocre implementation. The statistics in the Toolpak, for example, are limited in scope and unreasonably slow; if you need a bit of statistics, invest \$14.95 in Course Technology's MYSTAT disks-plus-textbook package. Similarly, if you use Crosstabs regularly you need Brio's DataPivot and not Excel's minimal approach, and for real Fourier analysis on data sets larger than a handful of points you had better turn to Bimillennium's HiQ (see *Reviews*, this issue) or The MathWorks' MATLAB. In filling all possible customer

wishes, Excel has picked up as excess baggage some functions at which it is not particularly good.

On balance, though, Excel 4.0 is the premier business tool on the Mac. Almost all 3.0 users will want to upgrade; almost no one will want to defect to another spreadsheet; hybrid Mac-PC offices will love 4.0's perfect compatibility with the Windows version released earlier; and product managers for competing spreadsheets will just have to dive for niches. This program will dominate for a long, long time.—CHARLES SEITER

Disk Utility Packages

MacTools 2.0

PROS: Automatic disk scanning and repair; includes antivirus utilities; fixes damaged Word and Excel files. **CONS:** CP Backup could be easier to use. **COMPANY:** Central Point Software (503/690-8090). **REQUIRES:** Mac Plus; 2MB of RAM; System 6.0.5. **LIST PRICE:** \$149.



Norton Utilities for Macintosh 2.0

PROS: Excellent disk repair and file recovery. **CONS:** Inconsistent interface between utilities. **COMPANY:** Symantec Corporation (800/441-7234). **REQUIRES:** Mac Plus; System 6.0.4. **LIST PRICE:** \$149.



UNTIL NOW, THE CHAMPION OF file-recovery packages has been Symantec's Norton Utilities for Macintosh (NUM). But with the release of Central Point Software's MacTools version 2.0, NUM will have to share the top of the data-recovery heap.

Norton Utilities for Macintosh

NUM VERSION 2.0 ADDS SOME NEW features to the previous version and incorporates portions of the now-discontinued Symantec Utilities for Macintosh. This amalgamation of the two packages gives NUM 2.0 a wide range of utilities, but the package lacks focus; it's the everything-including-the-kitchen-sink approach.

NUM's main business is disk repair and file recovery. It provides three approaches to dealing with a damaged disk. The first is FileSaver, a control panel that makes invisible backup files of the drive's directory, on your hard drive. To be able to create these backup files, FileSaver must be installed and running before you

continues

SPREADSHEET SPEEDS

	Open	Save	Insert/Delete	Recalc Plain	Recalc Math	Sort
Excel 4.0	11.8	27.5	18.0	9.6	26.5	9.2
Excel 3.0	11.3	24.5	17.2	9.4	21.0	8.8
Lotus 1-2-3 Mac	13.3	9.3	10.1	9.8	37.5	12.1
Resolve 1.02	4.0	8.4	19.4	9.6	14.4	15.8

Tests were run on a Macintosh IIci with 4MB of RAM and System 7.0.1. Files used were in native file formats and consisted of 10 fields with a database of 1200 records; worksheet size was 2 sheets, with 10,000 cells. The Autorecalc and Undo features were turned on. Times are in seconds.



Looking Good, Doing Good MacTools' DiskFix shows off its attractive 3-D-style user interface; this style is used throughout the other utilities in the package, contributing to MacTools' superior ease of use.

experience problems. FileSaver can automatically update the backup of the directory on shutdown, or you can update when you press a user-definable hot key. The FileSaver files are used by two other utilities in the package: UnErase, which recovers files that have been put in the Trash Can; and Volume Recover, which resurrects your entire hard drive if you've accidentally erased it. The next approach is the excellent Norton Disk Doctor, which attempts (and usually succeeds) to repair damaged hard drive or floppy disk directories. And the last approach, used when Disk Doctor doesn't work, is to use UnErase or Volume Recover to recover individual files to another medium.

The combination of these utilities does an excellent job diagnosing and repairing damaged hard drives and floppy disks. Disk Doctor fixes most damaged hard drives; UnErase seems almost miraculous in its ability to bring back trashed files. And if you haven't installed FileSaver, NUM still has a good chance of recovering your files, although it might take longer and be less reliable.

Norton Backup backs up files to floppy disks, removable cartridges (SyQuest, Bernoulli, and optical), or to another hard drive (but not to tape drives). You can choose between full, partial, or incremental backups. Unlike Dantz Development's DiskFit Pro, Norton Backup doesn't erase old versions of backed-up files, so the backup disks are ever-growing. NUM includes a scheduling extension that lets you back up unattended if the backup medium is large enough, or it reminds you to back up if you're using floppy disks.

Speedy Disk, a hard drive optimization utility, is mostly unchanged since the last version of NUM. It does a good job of defragmenting hard drives for better performance. Directory Assistance II modifies the Open and Save dialog boxes, adding a menu bar that lets you move eas-

ily between drives and folders, and view the file list by Name, Date, Size, and so on. DiskLight puts a small icon in your menu bar that flashes to indicate disk activity. Wipe Info and Norton Encrypt are security utilities. Wipe Info performs multiple overwrites on erased sectors to ensure that file recovery is impossible, and Norton Encrypt requires a password to read the scrambled files. Fast Find is a high-powered file finder. Floppier improves on the Finder in copying and formatting floppy disks. Key-

Finder shows you the entire contents of a font set at a glance, and tells you which key to press to get the character you want. It's a little better than Apple's Key Caps DA, but not much. Layout Plus lets System 6 users adjust the file views, the font used, and so on, of the Finder. And Norton Disk Editor lets you view and modify the bits and bytes on your hard drive or floppy disks.

The NUM manual is laid out well for the panic-stricken user who has bought the package specifically to save a bad drive, with step-by-step instructions for recovery, and a section on common problems and their solutions. The manual explains the utilities well, and it includes the Norton Disk Companion, a terrific, clearly written guide to how hard drives and floppy disks work. Symantec's technical support was prompt and knowledgeable when I called.

MacTools 2.0

THE MACTOOLS 2.0 PACKAGE HAS A tighter focus than NUM, zeroing in on disk and data protection. Central Point includes a complete virus-protection program in the package. CP Anti-Virus has an application and a control panel to scan your hard drive and floppy disks for any viruses. Updates to the virus detector for new viruses are widely available; since they are simply character strings that are typed into CP Anti-Virus, Central Point notifies registered owners by postcard and publishes the strings on America Online, CompuServe, and other networks.

MacTools' equivalent of NUM's FileSaver is called Mirror. DiskFix is MacTools' disk- and file-repair utility. It works as well as does Norton's Disk Doctor, but with several useful differences. The best of these differences are that all repair operations can be undone and that DiskFix can save a snapshot of the catalog file it is working on before the repairs are complete. This is a great idea, since in rare

cases, using any file-repair utility can make matters worse instead of better. DiskFix uses Mirror's backup catalog files to unerase hard drives. I found DiskFix considerably slower than NUM's Disk Doctor, but no less efficient at fixing hard drives. In fact, DiskFix repaired some directory damage on my hard drive that Disk Doctor reported it was unable to repair. DiskFix can also be set, using the CP Scheduler cdev (control panel in System 7), to scan your hard drive at specified intervals and automatically repair any damage it finds. CP Undelete uses Mirror's files to recover trashed documents, but also works without Mirror's help.

CP FileFix recovers damaged Microsoft Word 4.0 or Excel 2.2 and 3.0 files. It extracts the text from the damaged Word file and copies it to a new document. Excel files that can't be opened in Excel are similarly read and the readable portions copied to a new spreadsheet.

Central Point's backup program has much the same feature set as Norton Backup, with the exception that CP Backup can back up to some tape drives: the discontinued Apple 40 Mb DC-2000 drive and WangDAT's 1300 and 2600 DAT drives. According to Central Point, more varieties of tape drives will be supported in future versions.

MacTools' 3-D-style interface makes it easy for the inexperienced to move around the many parts of the package. NUM suffers in comparison; its various components have wildly differing interfaces. MacTools also includes a disk-editing utility, a hard drive optimizer, and finally, DriveLight, another hard-drive-icon-in-the-menu-bar utility.

Central Point's tech support was good. When I couldn't reach it on the first try, I left a message and received a prompt callback. The MacTools manual isn't up to the standard set by NUM's, but it's complete and more than adequate.

Comparing

BOTH PACKAGES PROVIDE USEFUL, effective tools for hard drive and floppy disk file recovery. Which package to buy depends on the utility software you have. The two packages use different methods to recover files and volumes, and sometimes one package works where the other fails. If you're a consultant or a corporate support specialist, you want all the firepower you can bring to bear on a crashed disk, and you should own both NUM and MacTools. For the individual Mac owner who wants only one package, my pick is MacTools, because of its automated hard drive and floppy disk repair capabilities, antivirus capabilities, and tighter focus on data protection.—TOM NEGRINO

Performance/040 (33MHz)

PROS: Easy-to-use software; compatible with all Mac II's; two-year warranty. **CONS:** Slow; not virtual memory-compatible; requires on-board RAM. **COMPANY:** Impulse Technology (404/889-8294). **REQUIRES:** Mac II with Rev. B ROM, IIx, IIcx, IICI, IIfx, IISI (with NuBus adapter board); 2MB of RAM for System 7; as much RAM (or more) on accelerator board as on system board; System 6.0.5. Recommended: 8MB of RAM on Performance/040. **LIST PRICE:** \$2399.



Radius Rocket 33

PROS: Fast; many software features; multiprocessing capability through optional software; a good value. **CONS:** Not virtual memory-compatible; requires on-board RAM; incompatible with IIcx and IISI. **COMPANY:** Radius (408/434-1010). **REQUIRES:** Mac II with Rev. B ROM, IIx, IIcx, IICI; 4MB of RAM; 4MB of RAM on Rocket; System 6.0.7. Recommended: 8MB of RAM on Rocket. **LIST PRICE:** \$2499.



TokaMac II FX 33

PROS: Excellent performance; doesn't require on-board RAM. **CONS:** Not virtual memory-compatible; expensive; works with only the Mac IIcx; installation requires shipping system board to vendor or paying \$2000 deposit. **COMPANY:** Fusion Data Systems (512/338-5326). **REQUIRES:** Mac IIcx; System 6.0.7. **LIST PRICE:** \$3995.



THE 33MHZ 68040 ACCELERATOR boards reviewed here are all capable of outrunning the fastest 68030-based accelerator and, due to the software vendors' efforts to make their applications compatible with Apple's 040 models, most programs run without trouble on these boards.

If you have a IICI, IIcx, IIx, or II and crave some speed improvement, the 33MHz Radius Rocket accelerator is for you. The Rocket board performed well in Macworld Lab tests, except for video and Disk I/O, compared with the Quadra 950.

For performance on a par with the Macintosh Quadra 950, you need a video accelerator like the Spectrum/8 24 PDQ and the forthcoming SCSI accelerator piggyback board for the Radius Rocket (a \$299 option that will use the same SCSI chip as the Quadra 950). I recommended getting the Rocket board and

the SCSI option when it becomes available. (Radius promises Quadra, IIcx, and IISI support with version 2.0 of its software for the board.)

The Radius Rocket 33 is my board of choice, although it requires at least 4MB of its own RAM (you pop on the chips before installing the board). It has 8 SIMM slots for 16MB 80-nanosecond SIMMs, giving it space for up to 128MB of memory.

The Rocketware control panel is loaded with features such as a screen saver, screen capture, and large-type menu titles. Unfortunately, the software defaults to the board's slower write-through mode. I wish users could set the faster 68040-compatible copy-back mode as the default instead of having to set each application to 040 mode manually.

Radius is putting the finishing touches on an optional software add-on called RocketShare (under \$500) that divides processing tasks among two or more boards—the Rocket board, the system board, and any other Rockets you have installed. Radius says the speedy multiprocessing should work with any program that can work in the background under System 7, but its real advantage of multiprocessing is for high-resolution 32-bit color rendering and other high-end graphics tasks.

The 33MHz Rocket board had no software-compatibility problems with the Macworld Lab test suite, although the board is still incompatible with A/UX and virtual memory. But before you place your order, make sure you read Radius's compatibility guide. Some hardware, like the older RasterOps color boards and Macro-media MacRecorder, don't work with the Radius Rocket 33.

Similar to the Radius Rocket, the Impulse Performance/040 is also a NuBus-based accelerator that requires its own memory—8MB of RAM is recommended. The board comes with software that lets you choose cache settings. The

33MHz Performance/040, with new software and firmware, fixes most of the bugs and incompatibilities that I encountered when testing the 25MHz version a while back. (The 33MHz version still has some trouble with ACIUS's 4D, but a forthcoming software upgrade addresses that problem.) The performance of the board, however, is not up to par with the Rocket.

Even though the price was recently cut from \$3499 to \$2399, I do not recommend the Performance/040. It ran a lot slower than the other boards in most of the tests. It's even slower than the native CPU in disk-intensive tasks because it uses the system board as an intermediary for all I/O activity—now you know why Impulse ships the board with a RAM disk utility. (The utility can use the on-board RAM, but not the RAM on the system board.)

There's a hardware/software upgrade in the wings that Impulse claims will speed up the board considerably. I tried the beta software and noticed only minor improvement in most benchmarks. Until I have a chance to try the new hardware upgrade, I can't recommend this board. Besides the performance improvement, the product could use a better manual.

Installation of both the Performance/040 and the Rocket is very easy; you just load up the board with the RAM and then plug it into a NuBus slot. (Radius's clear instructions make it particularly simple.)

The Fusion Data Systems TokaMac II FX 33, which works only with the Mac IIcx, is a completely new design. The board plugs into two slots at once on the Mac IIcx—the PDS, or Processor Direct Slot (which provides faster access to the CPU's processor), and a nearby NuBus slot (for efficient NuBus data transfer). The TokaMac also sports a fast 128KB memory cache that speeds processing by minimizing the number of times the sys-

continues

ACCELERATOR PERFORMANCE

Board	System	FPU Math	Processor	Disk I/O	Video
Quadra 950		0.88	0.82	1.00	1.00
TokaMac II FX 33	IIcx	1.00	1.00	0.85	0.68
Performance/040	IIcx	0.65	0.65	0.52	0.42
Macintosh IIcx		0.56	0.54	0.71	0.39
Radius Rocket 33	IICI	0.80	0.95	0.83	0.54
Performance/040	IICI	0.66	0.69	0.59	0.36
Macintosh IICI		0.28	0.28	0.53	0.40

This table compares the performance of three 33MHz 68040 accelerator boards. Macworld Lab conducted several tests in each category. The results have been combined and indexed so that each product's performance is equally weighted. As you can see, the TokaMac and Radius boards are the best at speeding up processor tasks, while the Quadra 950 excels in disk I/O and video performance. Higher numbers are better.

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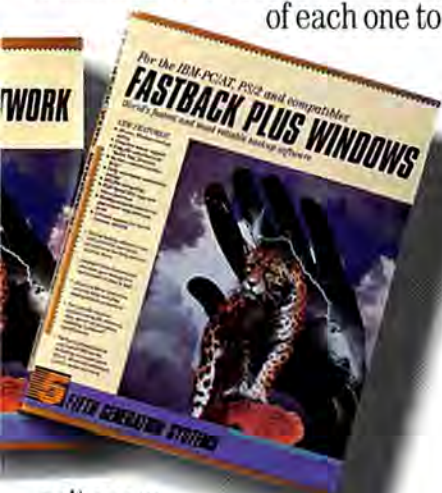
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tem board memory must be accessed. Unlike the two other boards, the TokaMac takes full advantage of system board memory—the TokaMac doesn't require any memory of its own. (The board handles older software that has trouble running in 040 copy-back mode with a control panel that lets you switch to write-through mode.)

The test results show that the board was faster than the Quadra 950 in most CPU and FPU tasks. The Quadra 950 edged out the TokaMac in both video and disk-intensive tasks because it has a built-in video accelerator and support for faster SCSI I/O. But you should be able to exceed video performance on the Quadra 950 by coupling the TokaMac with a video accelerator board that supports block-transfer mode. The TokaMac board has custom chips designed to speed up data transfer to other NuBus slots and free up the 040 processor as quickly as possible. (Fusion Data is still trying to fine-tune the board's software to work efficiently with SCSI accelerator boards such as the PLI QuickSCSI.)

To accommodate the TokaMac's unique design, the system board must be fitted with a new chip, which is why you have to send the system board to Fusion Data Systems (the company promises a one-day turnaround) or pay a \$2000 deposit for a new system board (you get the \$2000 back when you turn in your original system board). Installation is straightforward, with one thing to watch for: you must very carefully align the board with both the NuBus and PDS slots before seating the board, unless you want a chance to practice your needle-nose pliers technique.

The only problem I encountered with the TokaMac was an occasional divided-by-zero error during restart. Fusion Data Systems acknowledges the problem and says the company is working on a fix.

With a price tag of \$3995, the TokaMac board is the most expensive accelerator board available today. If I owned a Macintosh IIfx with a plain video board and desperately needed the performance and functionality of a Quadra 950, I would first consider selling the IIfx to trade up to a 950, which has built-in video acceleration and much faster SCSI performance—not to mention the fact that it has Ethernet, a hefty power supply, and room for additional internal hard drives; has conventional SIMM's; and when necessary, runs virtual memory. If you already have a loaded Mac IIfx with a fast video board and more than enough memory, however, the TokaMac II FX 33 might make good sense as a route to speed.—MARK HURLLOW

Color Ink-Jet Printer

HP PaintJet XL300

PROS: Prints tabloid-size images; high resolution (300 dpi); good Pantone color simulation. **CONS:** Poor documentation; noisy. **COMPANY:** Hewlett-Packard (800/752-0900; 800/387-3867 in Canada). **REQUIRES:** Mac Plus; System 6.0.5. **LIST PRICE:** \$3495.



HEWLETT-PACKARD'S PAINTJET XL300 is a color ink-jet printer that prints at a resolution of 300 dots per inch. It handles letter, legal, and tabloid paper sizes. While the XL300's output will not satisfy demanding graphic arts professionals looking for a color-proofing device, business users interested in punching up their presentations with color should be quite happy with the printer.

The XL300 is based on an Intel 80960 RISC processor and comes with an AppleTalk network connection and a Centronics parallel port for DOS PCs. The printer switches automatically between the two ports, so it can be shared on a mixed Mac and DOS PC network. For PC users, the printer contains HP's LaserJet-compatible PCL 5C printer language. The HP PaintJet XL300 replaces the discontinued HP PaintJet XL as the tabloid-size unit in HP's line of color printers.

The printer comes with 2MB of RAM. There are also two RAM slots, and you can add more RAM on SIMMs to bring the XL300 to a maximum of 18MB of RAM. In my tests, the standard 2MB of RAM worked fine, handling all of the test documents with no "out of memory" messages. HP tech support indicated that the extra RAM capacity was chiefly useful for DOS PC users and for people who have the PostScript option board installed in the XL300.

Setup was easy. Installation of the four ink cartridges (cyan, magenta, yellow, and black) was fast and clean, with none of the drips and mess associated with loading some color ink-jets. HP provides a software installer, and the print driver is available in the Chooser. The driver is based on QuickDraw, and is compatible with Adobe Type Manager (ATM).

After selecting the print driver, you print by selecting Print from any application. A Print dialog option allows you to adjust the colors printed in two main ways: by attempting to match printed colors to the screen, or by using Pantone color simulations. To attempt to match screen color, you first use a pop-up menu to tell the driver which monitor you're using.

The choices are limited to Apple 12", Apple 13", SuperMac 19", RasterOps 19", Radius 19", and Other. If your monitor is not listed in the pop-up, HP tech support suggests that you use the Other setting, or call for more assistance. Once the monitor is set, you can pick from two choices: Match to Screen and More Vivid Than Screen. The first choice attempts to replicate the color balance of your monitor; the second uses your monitor's color balance as a starting point, then increases the saturation of the printed output for more snap in the colors. You can also select one of three dither patterns. I found that the default dither pattern, Cluster, worked best in my tests.

The XL300 print driver also has a setting to print Pantone colors, which are an industry-standard color-swatch system used as a reference by printshops, designers, and other graphics professionals.

To test the fidelity of the Pantone colors, I printed test pages containing Pantone color swatches from Aldus PageMaker 4.2a and Adobe Photoshop, then compared the test sheets to the Pantone Color Formula Guide 747XR (provided with the printer). Printing Pantone colors requires that you use HP's CX JetSeries coated paper. The results were good. Because the XL300 prints halftone patterns, rather than continuous tones, the printed colors can only simulate the true Pantone colors, rather than match them exactly. But the simulations are quite good.

Results on other test images were mixed. Color photographs scanned into Photoshop, then printed, fared the worst. Lighter colors tended to look muddy and dull. Images created on the Mac, such as PICT graphics, printed well, with vivid colors and crisp, sharp edges. TrueType and PostScript text (using ATM) also printed cleanly. Bar graphs and bullet charts from Aldus Persuasion, and other pages where the color was used for accent, generally looked good. Transparencies looked fine, with smooth, consistent ink density and detailed edges.

The documentation is a mixed bag; designed to serve Macintosh, Windows, and DOS users of the printer, it provides some generic information but falls down on specifics. The *User's Guide* has no detailed information describing the print driver's color options; you are left on your own to see what results the different settings produce.

Aside from the incomplete documentation, the XL300 is somewhat noisy, with a fairly loud fan. It makes the strangest clunking noises when beginning to print; it sounds as though the printer has slammed the ink carriage against its stop, *continues*

Efi

*"Scanned in
too light"*



4:30
PM



4:31
PM

*"Too blue,
use the
color filter"*



4:33
PM

*"No color,
pump up the
saturation"*



4:42
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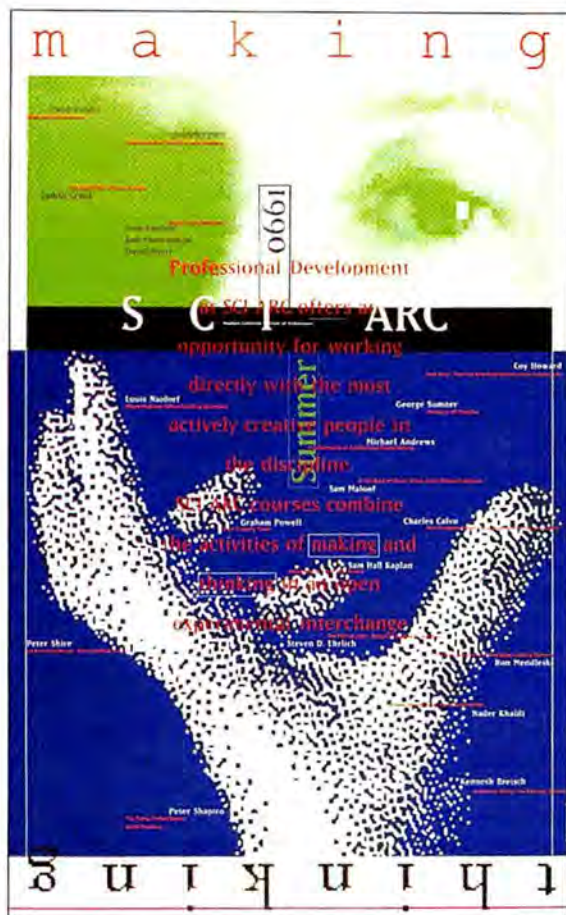
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then the printer goes completely silent for a few seconds, then it starts to print. These noises are a bit disconcerting, but I eventually got used to them.

The XL300 is a good printer, well worth considering if you're in the market for color in business presentations. It is also appropriate for desktop publishers using spot color. People who need to do process color for photographs are probably best served by a thermal-wax or dye-sublimation printer, however. Tabloid-paper capability is unusual in this printer's price range, and makes the XL300 a good value.—TOM NEGRINO

File-Transfer Utilities

AccessPC 2.0

PROS: Supports multiple types of DOS media; can be set to identify PC files by extension. **CONS:** Does not let users define DOS file name for copied Mac files. **COMPANY:** Insignia Solutions (415/694-7600). **REQUIRES:** Mac Plus; SuperDrive or compatible high-density floppy drive; System 6.0.5. **LIST PRICE:** \$99.95.



DOS Mounter 3.0

PROS: Supports DOS wild cards in extension mapping. **CONS:** Runs more slowly than other file-exchange programs. **COMPANY:** Dayna Communications (801/531-0600). **REQUIRES:** Mac Plus; SuperDrive or compatible high-density floppy drive; System 6.0.5. **LIST PRICE:** \$89.95.



Macintosh PC Exchange 1.01

PROS: Can be set to identify files by DOS extension. **CONS:** Does not let users define DOS file name for copied Mac files. **COMPANY:** Apple Computer (408/996-1010). **REQUIRES:** Mac Plus; 3MB of RAM; SuperDrive or compatible high-density floppy drive; System 7.0. **LIST PRICE:** \$79.



WITH APPLE'S AGGRESSIVE POSITIONING of its product line as corporate computers that support the DOS standards as well as the Macintosh approach to computing (for example, Apple markets its PowerBooks as DOS-capable computers), you might think that Apple's solution to Mac-DOS file sharing would be innovative, maybe even trend-setting. You'd be wrong. Apple's new Macintosh PC Exchange, a \$79 control panel, is adequate but hardly the state of the art in cross-platform file sharing.

Like Insignia Solutions' \$99.95 AccessPC, Dayna Communications' \$89.95 DOS Mounter, and Outbound Systems' DOS.INI (bundled with its Mac-compatible notebooks), Macintosh PC Exchange lets you put DOS 720K or 1.4MB 3.5-inch disks into a SuperDrive and instructs the Mac on how to read and write to these disks and how to translate DOS directories into Mac folders, so Mac users can manipulate DOS files using a familiar metaphor. But Macintosh PC Exchange's main competitors—AccessPC and DOS Mounter—are better products that cost only a little more.

All these programs let you map DOS file extensions (the three letters after the period in a DOS file name, used to identify the file type) to Mac applications and file type. Thus, for Macintosh Microsoft Word 4.0 you can associate the WDBN file type with DOS files that have the extension .DOC, and you can have the Mac launch Microsoft Word 4.0 when you double-click on such files. (On the Mac you see the Word icon for this file rather than the usual DOS text icon.) This feature is handy if you use applications that are file-compatible across Mac and DOS/Windows versions. (Such applications include Word, Microsoft Excel, Lotus 1-2-3, Frame Technology's FrameMaker, Aldus PageMaker, Ventura Publisher, Aldus FreeHand, Adobe Illustrator, and Intuit Quicken.) Other file-transfer programs offer file-extension mapping, although the interface on Macintosh PC Exchange is slightly simpler.

But none of the three programs take the next logical step: giving (or prompting the user to give) DOS file names and adding the appropriate extension when copying Mac files to a DOS disk. The programs seem to treat file transfer as something that happens mainly from DOS to Mac, a bit of unhelpful Mac chauvinism. You end up with arcane names like *9&.9CO* (for what had been called *9.9 Color Monitors*) and *WORKSHE&.* (for what had been called *Worksheet1*). The program should automatically name the files something like *99COLORM.DOC* and *WORKSHEE.XLS*, respectively.

Pacific Microelectronics' \$249 Mac-In-DOS 2.0 for Windows and \$199 Mac-In-DOS 2.0 for DOS, which do for DOS users what AccessPC and the like do for Macintosh users—do give you the option to rename files during transfers. But they have no file-extension-mapping features to assign the right Mac resources to a DOS file or the right DOS file extension to a transferred Mac file.

Neither AccessPC nor Macintosh PC Exchange understands wild cards in DOS file names. For example, in DOS the ex-

tension .PM* means any extension beginning with PM, which for PageMaker users would cover the .PM3 extension for Version 3 and the .PM4 extension for Version 4; for 1-2-3 users, .WK* would cover the .WKS, .WK1, and .WK3 extensions (again, for different versions). Letting users specify wild cards would reduce the number of extension assignments, as well as help ensure that appropriate assignments would not be forgotten. DOS Mounter supports wild cards.

Ideally, file exchange should be easy in both directions, and each platform's conventions should be respected. That has yet to happen with these three programs or with DOS programs.

Copying, opening, and deleting files seems slow under the file-exchange programs—my tests showed that they run at 40 to 80 percent of the speed of normal Mac-disk operations. This is due to the overhead in translating between Mac-disk format and DOS format. DOS Mounter was significantly slower in my tests, taking up to twice as long as did AccessPC or Macintosh PC Exchange.

Unlike the others, Macintosh PC Exchange is further limited by running only under System 7 and by supporting only 3.5-inch floppies. AccessPC and DOS Mounter also work under System 6; and they support DOS-formatted, SCSI-based removable media such as flopticals, SyQuest cartridges, and Bernoulli cartridges, as well as drives that read 5.25-inch DOS floppy disks. Apple erroneously seems to think that only people with floppy disks and System 7 need file-exchange solutions. In contrast, AccessPC's control over formatting various DOS media is slick—its MediaFormatter and MultiDriver utilities even know about the removable-hard-drive formatting requirements for different versions of DOS.

When transferring files, Macintosh PC Exchange creates two directories on DOS disks—one for the Trash, the other for the Macintosh file's resource fork—so Macintosh PC Exchange can remember the original Mac file name and type even after copying the file to the DOS disk. (If you move a file to a DOS PC, work on it, and move it back, the Mac will know what icon and application to associate with the modified file. This is not as helpful as it might seem, since chances are you've renamed the file with a more DOS-like name, so the Mac will not know to apply these resources to the renamed file.)

These resource files show up on your DOS disk when loaded into a DOS computer but cause no harm other than taking some disk space. You can delete them anytime without causing Macintosh PC

continues

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Exchange a problem (although it will create new resource files if you put the DOS disk back in the Mac).

AccessPC offers resource-file copying as an option, although the files are invisible to DOS users. DOS Mounter copies resource files automatically, as does Macintosh PC Exchange, but these files are invisible to DOS users.

Any of these programs is fine for basic file transfer, although anyone dealing with multiple media should forgo Macintosh PC Exchange in favor of AccessPC or DOS Mounter. AccessPC is the best choice if you deal with several types of DOS media; choose DOS Mounter if you need wild cards in extension mapping. If you rarely do file transfers with DOS users, stick with Apple File Exchange, which comes with the Mac's system software.

But if you work in a multiplatform environment, where data moves both ways, get a product like DataViz's MacLinkPlus/PC (see *Reviews*, *Macworld*, March 1992), which combines file transfer and file translation. This \$199 program (which includes the DOS Mounter software) translates formats while copying files back and forth and lets you give usable names to the Mac files you copy to a DOS disk.—GALEN GRUMAN

Type-Manipulation Program

LetraStudio 2.0

PROS: Compatible with all major font formats; faster than previous version; many new effects; new dialog boxes allow for precise positioning and resizing; reduced price. **CONS:** No built-in text-styling effects; text can't have graduated fills; no publish-and-subscribe support. **COMPANY:** Letraset USA (201/845-6100). **REQUIRES:** Mac Plus; 2MB of RAM; hard drive. Recommended: 4MB of RAM for Mac LC, Mac II, or Quadra.

LIST PRICE: \$249.



DISPLAY TYPE IS ONE OF THE MOST demanding forms of typography. The type in product labels, magazine and poster headlines, logos, and the like not only must be precisely spaced, it also is often stretched, rotated, attached to a curving baseline, or otherwise contorted. The typographic features in a desktop publishing program can't begin to meet those demands. Even illustration programs like Adobe Illustrator and Aldus FreeHand fall short—they don't let you drag individual characters to control spacing, for example. For serious display-type work, there's no substitute for a dedicated display-type program like LetraStudio.



The Envelope, Please A sampling of LetraStudio effects. Text shaped within envelopes, top; text attached to a circular baseline, bottom left; a character reshaped using Bézier control points, bottom right.

LetraStudio has been around for several years, but early versions were flawed. With version 2.0, the program has hit its stride, although it still lacks some of the flashy features of its major competitor, Broderbund Software's TypeStyler.

Version 2.0 supports all major outline-font formats—PostScript Type 1 (including Adobe Multiple Master), PostScript Type 3, and Apple's TrueType. (In a related development, Letraset has recently converted its library of display typefaces into Type 1 and TrueType formats. Each Letraset Fontek package includes a given font in both formats.)

LetraStudio's operating style has always been straightforward: click on the text tool, choose a font, and type the text. Unlike TypeStyler, LetraStudio lets you type and edit text directly in the drawing area—no separate dialog box.

Better still, LetraStudio lets you adjust character spacing by clicking and dragging individual characters. It's the most logical way to adjust spacing, and a vast improvement over the tendon-taxing keyboard kerning commands that illustration and publishing programs provide. Similar techniques let you slant or resize characters and move them up and down relative to the baseline.

LetraStudio provides two basic mechanisms for stretching and reshaping a block of text: you can reshape the baseline, making it wavy or even circular; and you can apply an *envelope*—a shape that LetraStudio reshapes text to fit within. The program provides more than a dozen preset envelope shapes that simulate a fish-eye lens, create a perspective effect, and more. You can reshape a baseline or an envelope using selection handles; with version 2.0, you can also use Bézier controls. Another new feature: you can copy effects that have been applied to one element and apply them to another.

Its mouse-oriented style has always been one of LetraStudio's strengths, but 2.0 adds commands that let you type precise values. The Object Specs command

lets you specify an object's location and size. (Oddly, though, the dialog box's Cancel button is the default—the one chosen when you press the return key.) The Align dialog box lets you align selected objects to each other (and this time, the OK button is the default). Several new keyboard shortcuts let you nudge objects and adjust character spacing in increments as small as 1/10 point.

You can save completed display type in encapsulated PostScript, PICT, and Adobe Illustrator 1.1 formats. Unlike its predecessors, LetraStudio 2.0 can also import Illustrator 1.1 and Illustrator 88 line art. LetraStudio 2.0 also lets you convert text into a graphic. Convert a single character to a graphic and then choose Ungroup, and you can reshape the character by dragging its Bézier control points.

No matter how you contort text, all of LetraStudio's text-editing and spacing controls are still available. (One exception: you can't edit text that you've converted to a graphic.) Watching text reflow within a circle as you type or dragging characters along a roller-coaster baseline can be a real thrill.

It can also be slow. LetraStudio 2.0 is faster than earlier versions, and it has a variety of display preferences that let you speed up screen redraws at the expense of on-screen text quality. Still, complex documents demand a fast Mac with at least 5MB of RAM. Even then, this program isn't going to get any speeding tickets.

How does LetraStudio 2.0 compare with TypeStyler 2.0 in other areas? LetraStudio lets you assign colors using the industry-standard Pantone Matching System; TypeStyler 2.0 doesn't. LetraStudio can have numerous documents open simultaneously; TypeStyler supports just one. But TypeStyler provides a wonderful selection of canned (and customizable) text effects—gradient fills, drop shadows, and so on—that LetraStudio lacks. Indeed, LetraStudio can't apply a gradient fill to characters at all. TypeStyler also provides a tool for creating commonly used graphic shapes such as starbursts and diamonds; in LetraStudio, creating shapes other than rectangles and circles requires extra effort. And TypeStyler supports System 7's publish and subscribe features; LetraStudio 2.0 doesn't, although it does run fine under System 7.

In the end, LetraStudio provides superior features for manipulating characters, while TypeStyler provides a larger gallery of flashy effects. The program you choose may depend on the kinds of display type you create. If you're after precise, intuitive control over character spacing and shape, LetraStudio is the better program.—JIM HEID

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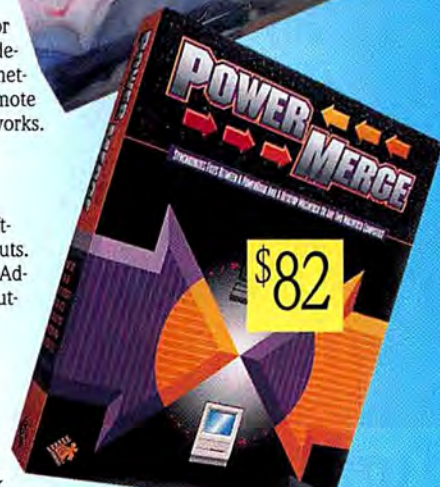
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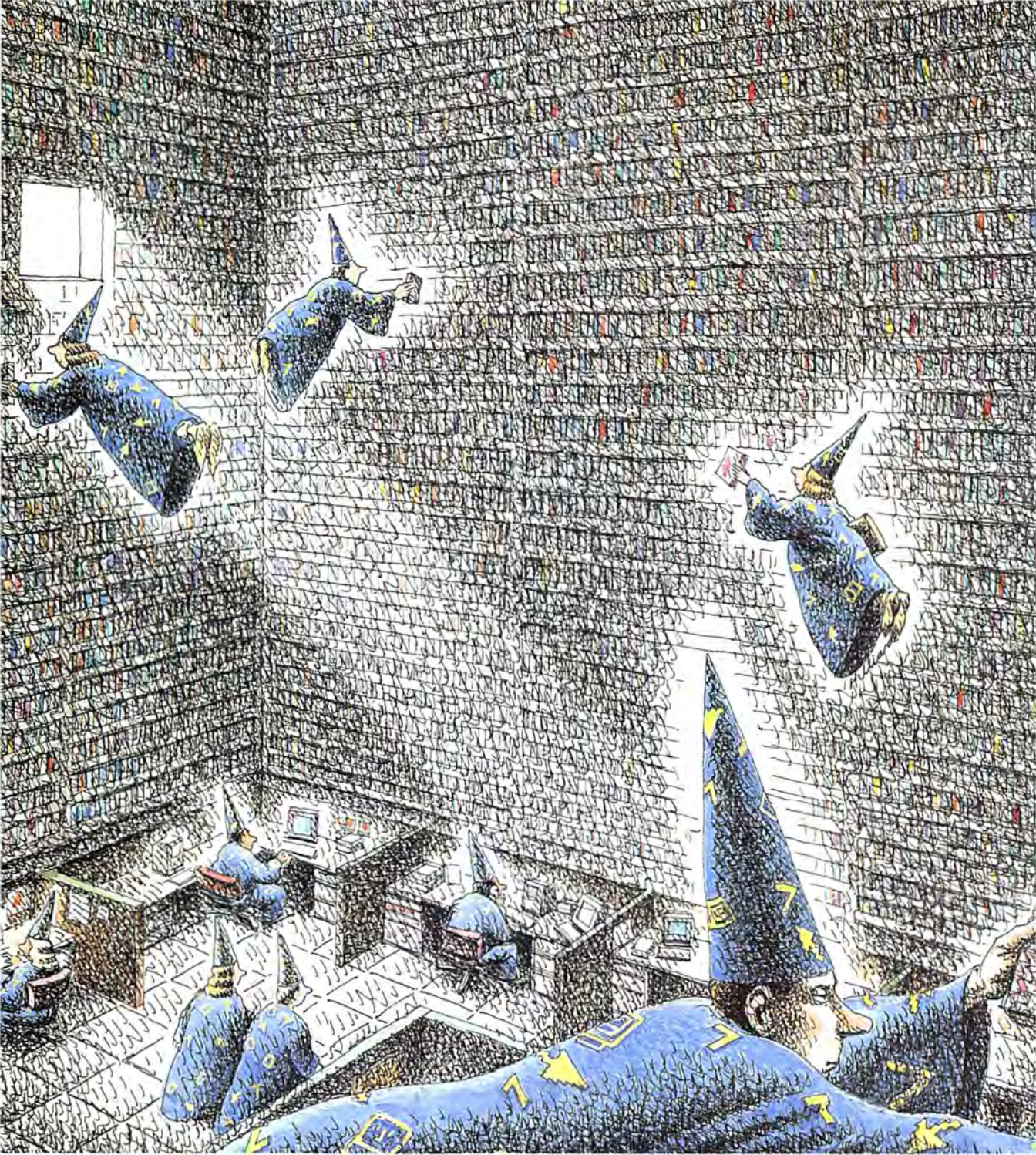
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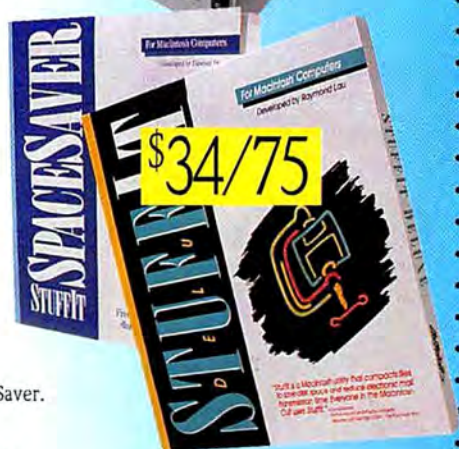
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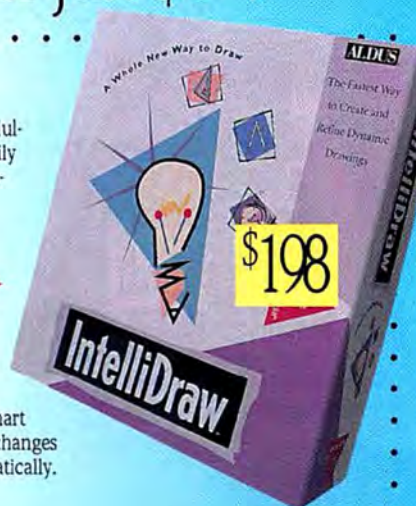
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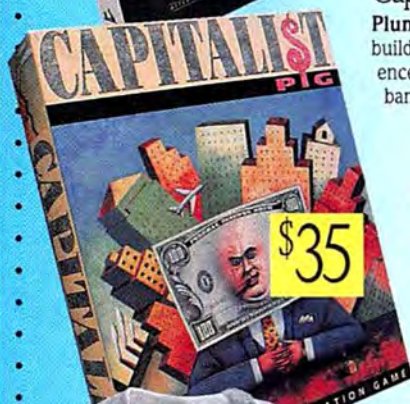
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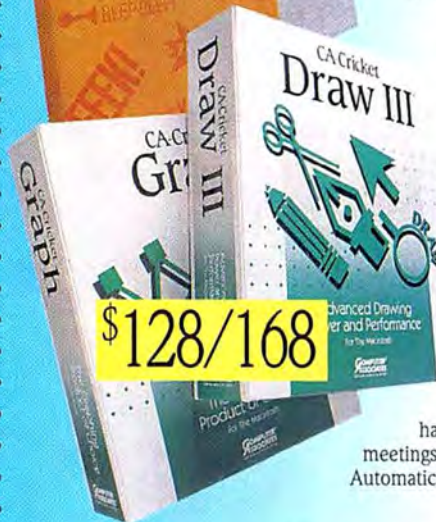
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Asanté 70 The AsantéHub 1012, a 12-port intelligent 10BaseT hub, brings enterprise-level hub capabilities to departmental Ethernet networks. AsantéView network management software offers graphical in-band/out-of-band management, power, flexibility, and reliability at a very economical price.



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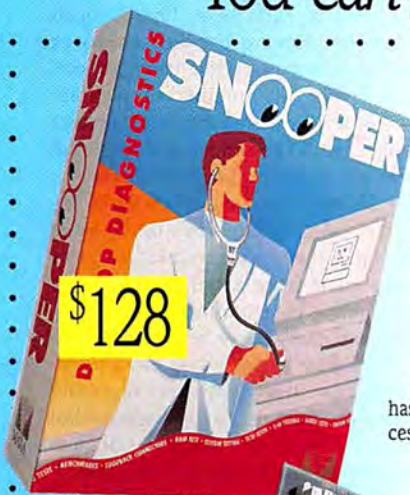
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Motion Works Works Easily create full-color animations with multiple audio tracks, even if you can't draw. Interface follows traditional animation techniques, such as cel-based actors, onion skinning and path-based motion. Other features include cel tweening and Pring to Video. Export your animations to QuickTime or Berkeley Systems After Dark.



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Fractal/Wacom Personal Publishing's painting product of the year! Painter delivers real natural media effects, brushes, pens, chalks, and paper grains (22 included). The Wacom tablet has the premier pressure sensitive stylus.



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Fair Witness 1.1

PROS: Coherent combination of outlining, project info, scheduling, and voting; stores multiple versions of ideas; different views of same data can be stored and accessed via menu selection; links between views simplify navigation. **CONS:** Displays only one window at a time. **COMPANY:** Chena Software (215/770-1210). **REQUIRES:** Mac Plus; System 6.0.2. **LIST PRICE:** Version 1.2 \$295.



PLANNING A PROJECT USUALLY REQUIRES project-management software. While Fair Witness isn't a substitute for the typical project-management programs, it makes project planning easier by integrating the following actions in one program: outlining, information charts, time charts (scheduling), and voting.

When you start a project, you enter your ideas in Fair Witness's outline mode. As with other outliners, ideas can be in any order, since you can always reorganize them. Setting up subtopics and other outline hierarchy is important because Fair Witness depends on the outline's contents to create other views (or layouts) of the project. In outline mode, you can expand any subtopic

and display it independently. If you need to get back to another topic or another part of the outline, Fair Witness provides a pop-up menu that lists the outline's topics.

When you're ready to add more details to your project's outline, you can create an information chart and define the columns you want to add, such as start and finish dates, notes, and the person in charge of a project. These columns can contain text, numbers, dates (including time), icons, or pictures. If you create date columns (say for the start and finish dates of project stages), Fair Witness can display a Gantt chart. To alter dates in the chart you click on one end of the bar and drag it to a new date—new dates are displayed as you drag, and the information chart is updated accordingly.

While an outline can be a good way to organize a project, project priorities also have to be set. Fair Witness allows you to rank ideas in sequential order and have team members vote for ideas; you can then score the ideas on a predefined scale, or compare each idea against all other ideas. Each member of the team can cast a vote, and Fair Witness tabulates the results. (Fair Witness is not multiuser software; project leaders create a voting table or matrix and enter the votes.) Fair Witness can also create pie charts or bar charts to display the results.

Fair Witness lets you save formatted views and review them at any time. You can

assign a name to each view. These tagged views simplify moving between charts or outline views as you review your project. You can create any number of separate views—for project members, major project milestones, project resources, and so on. All the views are stored in the project's file.

Fair Witness lets you create links between items in different views in the same project. Thus, if you want to refer back to a particular chart from a major subtopic in another view of your outline, you can create a link and easily move between the two items. With Fair Witness you can also refine previous ideas without replacing them—the program uses a flip-page symbol with a number to show that a series of ideas is being stored (each idea in the series is time-stamped).

If you don't want to use the structured layouts, Fair Witness's free-form text mode allows you to place text anywhere on the screen, making it easy to group ideas or show links between groups of ideas.

Fair Witness can be a valuable tool for planning any project, but it's not a total solution for project management. I suggest using Fair Witness to plan your project and prioritize items within the project, then using more traditional project-management software (like MacProject II or Micro Planner Manager) to create PERT charts and allocate project resources.—DAVE KOSIUR

Ergonomic Keypad

The Bat

PROS: Best ergonomic input device I've seen. **CONS:** You have to learn to type all over again. **COMPANY:** Infogrip (504/766-8082). **REQUIRES:** Any Mac with ADB port; MultiFinder or System 7. **LIST PRICE:** Single keypad \$295; two keypads \$495.



IF YOUR KEYBOARD ISN'T CAUSING you pain, count your blessings. I joined the ranks of the computer-injured six years ago, thus qualifying to review The Bat, a new keyboard—or keypad, as the manufacturer calls it. It's the best ergonomic computer device I've seen, but let me hasten to add that this judgment is based on my own symptoms—pain and spasm in the right shoulder and neck. Though I now use a trackball with my left hand instead of a mouse with my right, the cramped arm and shoulder position enforced by the typical QWERTY keyboard still hurts. If you don't know what I mean by "cramped arm and shoulder position," put your hands on a keyboard and observe. If you're human, your arms are now hugging your sides and your shoulders are scrunching inward because

your hands are together on the keys and parallel to the ground. I try to counteract these constraints, thinking "chest up, shoulders back," as physical therapists instruct, but I can't fight the scrunch for long.

With the Bat I have no need to scrunch. Its right- and left-hand keypads slant the little fingers down and the thumbs up, opening the shoulders. Better yet, I can spread the keypads apart, or use only one of them—one unit can replace the entire keyboard. And since maintaining any position too long causes me pain, I'm delighted that The Bat allows me to change positions. (Though I'm focusing on ergonomics, I should add that The Bat is an excellent choice if you have use of only one hand, or if you need to type with one hand while using the other.)

I don't suffer from wrist or hand pain, so I can't say whether The Bat will help those who do. However, the built-in wrist rests keep wrist and hand aligned, preventing an injurious angle. Infogrip hopes that The Bat will cut down on repetitive-motion strain in the hands and wrists because only the thumbs move about on the keypads.

On the downside, to use The Bat you must learn to type all over again. Each keypad uses only 7 keys to replace the 60 or more on typical keyboards. You usually have to press several keys at once to type one character, "chording," much as you would on a piano. Your fingers rest on 5 gray keys,



The Infogrip Bat

except when you shift a thumb to a red or blue key to switch between letters, caps, numbers, symbols, screen movement, and cursor control. If you're in chronic pain and The Bat really helps you, its ergonomic relief is worth the retraining.

Bat advocates claim that chording increases input speed once you're used to it, but I can't say yet. After practicing during the evening news for a month, I can chord 25 words per minute, instead of my usual 80 on a standard keyboard. I still wish someone would manufacture a split, angled QWERTY keyboard like the one Tony Hodges designed (see *The Iconoclast*, *Macworld*, February 1990). In the meantime, I'll keep practicing on The Bat. If you want to try it, buy it direct from Infogrip, which offers a money-back guarantee, or from a vendor who offers one.—ANN GARRISON

RasterOps CorrectPrint 300

PROS: Reasonably priced; 300 dpi; photo-realistic printing. **CONS:** Limited print area. **COMPANY:** RasterOps Corporation (800/729-2656). **LIST PRICE:** \$8999; 12MB of RAM \$1719; fully configured system with 36MB of RAM \$11,999.



UNTIL RECENTLY, 300-DOTS-PER-INCH dye-sublimation printers cost in the neighborhood of \$20,000 to \$30,000. The RasterOps CorrectPrint 300 brings high-quality, photo-realistic printing to half that price. The CorrectPrint itself costs \$8999, but the printer needs a minimum of 12MB of RAM, plus a dedicated hard drive for font storage. RasterOps will sell you 12MB of RAM for \$1719 (you still need to buy a hard drive), or you can buy a fully configured printer system—with 36MB of RAM and no need for a hard drive—for approximately \$12,000 total.

Dye-sublimation printers can produce near-photographic images because they use a completely different imaging technique from that used by most Mac printers. Instead of printing cyan, magenta, yellow, and black dots next to one another and relying

on the viewer's eye to mix the colors, dye-sublimation printers lay translucent process-color dots one on top of another. Dye-sublimation printers can also vary the size of the printer dot itself. Most Mac laser printers build different-size halftone dots from a limited range of small printer dots; dye-sublimation printers can produce printer dots in a wide range of sizes. The CorrectPrint can lay down 256 sizes of printer dots. Because of this, it can build a wider range of halftone dots and thus can produce a wider range of colors. Theoretically, in fact, the CorrectPrint can represent every color a 32-bit file might contain. It can lay dots down at a rate of 300 per inch—fine enough to be visible only with a strong loupe. The disadvantage of these printers is that they require special media; four-color prints from the CorrectPrint cost \$3.94 apiece for letter size and \$4.09 for legal size, according to RasterOps.

The CorrectPrint has many features to recommend it besides price. It comes with a PostScript interpreter (a RIPS clone), so it can print files from programs like Aldus FreeHand. The CorrectPrint's ROMs include routines for JPEG decompression, which makes life easier if you use large bitmap files because you don't have to decompress them before sending them over a network to the printer. The device has built-in AppleTalk, Ethernet, SCSI, and RS-232C ports, plus a one-year warranty.

For our performance tests, we used the printer's maximum 36MB configuration. Our tests were run over an EtherTalk network taking advantage of the internal EtherTalk capabilities. If you use less than the \$12,000 version, you can expect a dramatic slowdown in performance; ditto for using AppleTalk. Still, \$12,000 is a good price for a printer with that much RAM and built-in EtherTalk, but don't expect miracles from the \$9000 bare-bones configuration.

The device was a little faster than average at printing bitmaps but was among the speediest printers at outputting PostScript files. RasterOps says new ROMs, which should be in printers by the time you read this, will improve bitmap printing by 50 to 60 percent—making the CorrectPrint quite a performer. (Users should contact the company for upgrade information.) As for color fidelity, the CorrectPrint's colors are accurate, though a bit oversaturated.

The CorrectPrint's most significant failure is its relatively small print area—8.1 by 8.6 inches on letter-size media and 8.1 by 11 inches on a legal-size sheet. RasterOps says the large margins are required to ensure perfect color registration, but other printer makers don't seem to agree. If you need a slightly bigger print, you might look into the Prime Option ColorRight, which sells for a price similar to the CorrectPrint's but prints up to 8.5 by 12.3 inches.—JOE MATAZZONI

The Miracle Piano Teaching System

PROS: Brilliant conception; rich graphics; good value. **CONS:** Gives short shift to dynamics and expression; oversimplified arrangements. **COMPANY:** Software Toolworks (415/883-3000). **REQUIRES:** Mac Plus; 2MB of RAM (3MB for color); hard drive; System 6.0.2 (6.0.5 for color). **LIST PRICE:** \$499.95.



WHEN THEY WATCH THE TV commercials for The Miracle Piano Teaching system, music teachers nationwide must shiver. Has it come to this, then? Do we have to sucker kids into learning music with Nintendo-style video games?

Not to worry. The Miracle may be a computer program, but it's no game. Instead, it's a painstakingly crafted, patient, and encouraging music and piano instructor designed to appeal to both kids and adults.

There are two parts to The Miracle kit: a four-octave stereo synthesizer that plugs into a Mac, and the software. The keyboard is no Steinway, but its full-size keys play louder when you strike them harder. (Even

nontracking keyboards in this price range don't have touch-sensitive keys.) It's also a real MIDI keyboard (it works with other Mac music programs; see *The Desktop Critic* in this issue). If you want to hear what it sounds like, I've posted some samples in the Macworld forum of America Online.

Once the keyboard is plugged into the Mac's modem port, and you've turned off Suitcase II and Adobe Type Manager, you're ready. The Mac plays a song for you. (No music is ever played without the sheet music on the screen, reinforcing the association of written to played notes.) You try just the right hand, as slowly as you want. The program encourages you, and suggests that you try it with the metronome. If you mess up, you try again, more slowly. Bit by bit, you're gradually prodded into picking up the tempo, adding the left hand, and piecing the song together. At lesson's end, The Miracle accompanies you with a synthesized orchestra. I may be a grizzled, cynical old reviewer, but that reward is an absolute thrill.

The 120 different songs you can learn aren't some wimpy assemblage of public-domain folk tunes; there are movie themes like *Star Wars*, rock from the Beatles, classical from the usual nineteenth-century greats, and so on. (It's not lost on me that pop songs are expensive to license; on behalf of the kids who will be that much more motivated to play, I thank Software Tool-

works.) Three arcade-style games pop up occasionally; all are done with great graphics and immense wit.

But, here's quibble #1: Since you always work with the metronome, you cultivate a firm sense of rhythm. Fine. But you also never learn phrasing, rubato, feeling, or pedaling. Quibble #2: For some inexplicable reason, the right hand always plays single-note melodies, and the left plays three-note chords. Not only are such pieces atypical of piano music in general, but left-hand triads often sound muddy. Quibble #3: In some of the arrangements the musical interest has been stripped away. (In the *Surprise Symphony*, the surprise chord itself is missing!) There are a few errors in the musical notation ("My Country, 'Tis of Thee" in 6/4 time?). Last quibble: The program is slow to change screens, especially in color, and there are a lot of screens.

Because dynamics and expression are almost completely ignored, relying on The Miracle as your sole instructional source could be dangerous. (The absolutely blockbuster piano method, of course, would be to use The Miracle under the supervision of a real teacher.) Even so, we can applaud The Miracle system for its breakthrough idea: to harness the popularity of the video age for the forces of education, self-improvement, and music. That may be no miracle, but it's a pretty good trick.—DAVID POGUE

Tile Game

Super Tetris 1.0

PROS: Better than Tetris; network and two-player options. **CONS:** Tiles are tiny; no DA. **COMPANY:** Spectrum HoloByte (510/522-1164). **REQUIRES:** Mac Plus; System 6.0.5; Mac II and 2MB of RAM for color. **LIST PRICE:** \$49.95.



HERE'S ONE OF THOSE RARE INSTANCES where a new version of a game truly improves on the original. Super Tetris (ST) is more varied, more challenging, and more forgiving than regular Tetris, and I predict it will easily outdo its predecessor's widespread, cross-platform popularity.

The basic setup and controls are similar to those of Tetris. There is the pit, and there are the falling pieces. Each piece is composed of four squares, arranged in one of seven configurations. As the pieces fall one by one, you maneuver them (using the keyboard or an Advanced Gravis Mouse-Stick), trying to form horizontal lines. When you form a line, it disappears and you get points; when the pile of pieces reaches the top, the game is over. So far so familiar. But ST adds treasures and bombs, which provide strategic opportunities as well as a

few ways to prolong a cliff-hanging game. ST also offers two-player modes (competitive or cooperative on one Mac, or head-to-head on a network).

The pit in ST has a waterline halfway down; the underwater part has a black background and contains rubble—assorted squares—interspersed with spaces that you can sometimes fit pieces into. Nine kinds of treasure squares are scattered among the rubble; you get rewards when you blow them up with bombs. As you complete lines, the pit scrolls upward, and you can see on a little map not only how far you are, but also a hidden picture revealed in the rubble you have eliminated.

My favorite new feature is the bombs. When you make a line, 2 bombs fall; if you make 2, 3, or 4 lines at a time, you get 4, 8, or 12 bombs, respectively. Bombs—which detonate on impact—can blow up one square each; you can use them to pare off the top of a too-tall tower or remove obstructions. With practice you can scoot the bombs about as they fall, taking out a square here, a square there, and carving a space for your next piece to fit into. When you blow up treasures, you get extra space, extra bombs, or extra pieces (unlike Tetris, ST starts you out with a finite number of pieces). You'd think all this extra stuff would be distracting, but everything works together just fine.



Networking in the Nineties Select your opponent from a list of current ST players on the network, and go for it. You don't see your opponent's game in action, but you see his or her score (to the upper right of the pit). The two small rectangles to the lower left and right of the pit show your rubble-clearing progress vis-à-vis your opponent's; note the hidden pictures (smiling pink pigs) taking shape.

It's hard to find things to criticize in ST. The tiles have shrunk; presbyopes (like me) may need reading glasses to play in black-and-white. Much of the screen is taken up with gorgeous Moscow Circus scenes; I'd happily give up a bear or two for slightly bigger tiles. And if you try to play in two-player mode on an SE or a Plus, the game slows way down. Oh, and there's no DA version, as there was with the original Tetris.

But what a great game! I'm giving it four stars (instead of five) only because of the teensy tiles.—FELICITY O'MEARA

Education Game

Where in the World Is Carmen Sandiego?

PROS: Fun educational tool; amusing animated sequences; great sound effects; straightforward interface. **CONS:** Heavy memory requirements; repetitive pictures and animation; already an occasional out-of-date geographical fact. **COMPANY:** Broderbund Software (415/382-4400). **REQUIRES:** Mac II (also runs on LC); 4MB of RAM; 9MB of hard drive space; 8-bit color monitor; System 6.0.7. **LIST PRICE:** \$79.95.



WHERE IN THE WORLD IS CARMEN Sandiego? is already a successful educational game, even branching off into a TV show. A game so good is impressive enough, but Broderbund has succeeded in making a good thing even better with the new Deluxe Edition.

The plot is probably familiar to many—a member of the V.I.L.E. gang, headed by the notorious Carmen herself, has stolen a famous object—say, the first Walkman from Japan or Tolstoy's writing desk from Moscow—and the player must retrieve the object and catch the thief. An almanac, in-

cluded with the game, is an essential tool for understanding the geographical clues and for learning research skills.

The interface is beautifully straightforward, with a single screen consisting of the player's Videophone, notepad, Dataminder, and a scene window. Everything needed appears within that screen, making the game remarkably easy to use and understand. (A couple of players' experiences indicate that it is a good idea to read the directions despite this seeming simplicity.)

You use the Videophone to call your boss at the Acme Detective Agency, Warren (the robot who issues arrest warrants), and occasionally informants, all of whom actually talk to you while a text copy of their words appears in the Dataminder. The Videophone is also used to contact the travel department and the crime net, as well as receive news flashes when a case is completed.

The notepad is a list of tasks for each new location. Click on a task, and you talk to a witness, search a site, or consult the crime net or an informant. A red check mark appears next to the task as clues are revealed.

The Dataminder has buttons that allow you to enter evidence into your database, check the dossiers on the V.I.L.E. gang members, access facts on the various countries, send information to the warrant robot, and start a new case. A button with a flashing red light indicates that more information

is available. Unfortunately, the red light is not all that noticeable, sometimes causing confusion. Clues from the crime net and information on the countries are shown as text in the central box of the Dataminder.

The window shows various scenes, including pictures of the locations (lovely, but static and eventually repetitive) and brief animated sequences with clever, sometimes slapstick humor. The sound effects, from the rumble of the planes to the whistles, shouts, and crashes of the arrests in process, are truly wonderful.

Where in the World Is Carmen Sandiego? Deluxe Edition suffers a bit from the problems that plague geography texts in the 1990s. In the game, Moscow is still the capital of the Soviet Union, and while Burma has become Myanmar, and its capital is Yangon, the first information I read about Myanmar told of a city called Rangoon. Still, without almost daily updating, no geography source can be perfect these days.

This deluxe version has 45 countries to visit, with 20 villains to capture, and 5 levels of difficulty—all a substantial increase over the original. More than 2500 clues ensure plenty of opportunity to learn lots of facts about the world.

This is education that's fun for kids and adults. I learned a tremendous amount by playing it, and enjoyed myself as well. Yes, Broderbund's done it again.—WENDY SHARP

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FIFTH GENERATION SYSTEMS, INC

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Printer Chooser

easyPrint 1.0

PROS: Switches output devices quickly and easily; inexpensive. **CONS:** Documentation on disk.

COMPANY: SF/O (415/328-9906). **REQUIRES:** Mac Plus; printer; System 6.0.5. **LIST PRICE:** \$29.95; 10 copies \$99.95; 50 copies \$399.95.



BACK IN 1989, APPLE COMPUTER promised that System 7 would contain a new print architecture allowing users to, among other things, print by dragging documents onto icons of printers on the desktop. Last May at the Apple Worldwide Developers Conference, that promise was renewed, but the release date was pushed back to "sometime in '93." If you're as sick of the Chooser as I am, wait no more. Instead, pick up a copy of easyPrint, a nifty utility that lets you switch output devices without using the Chooser desk accessory.

The easyPrint utility itself doesn't switch printers; you use it to create small applications (about 50K each) that do the actual job. When you launch easyPrint, a dialog box appears with a pop-up menu listing each device for which a Chooser driver exists in the System Folder, including laser

printers, imagesetters, plotters, label printers, fax modems, slide makers, and more.

Choose the output device from the printer-type pop-up menu. If it's a networked printer, you must specify the name and zone. Under System 7, easyPrint lets you pick from a dialog box that shows the available zones and devices. But under System 6, you must obtain this information using the Chooser, write it down, and then type it into easyPrint.

After selecting an output device, you're prompted to enter a name and location on disk for the application that easyPrint will create. Since you needn't use the same name as that which appears in the Chooser, call the printer whatever you want, whether it's by location, printer type, or nickname. The applications also bear the same icons as the printers they represent.

To switch printers, launch an easyPrint application either by double-clicking on its icon on the desktop or by using a launching utility such as Icon Simulations' On Cue. Under System 7, you can place easyPrint applications in the Apple menu for quick access, or drag documents onto a printer icon to select that device and print the document, too. You can configure the Mac to launch an easyPrint application on start-up so that a particular printer is always the default output device. In addition, there's much less chance of compatibility problems

than if easyPrint were a system extension.

On my Mac IIci it takes three seconds to switch printers using an easyPrint application, during which time an alert box appears informing you of the change. That's faster than it usually takes just to open the Chooser, not to mention make a selection and then dismiss that annoying "You have changed your current printer" dialog box.

SF/O's package is recycled cardboard, and it forgoes the traditional printed manual. Instead, the documentation comes on disk with a HyperCard-like browser. Unfortunately, the directions are riddled with typos and deviations from the *Apple Publications Style Guide & Glossary*. SF/O pats itself on the back claiming "our 'electronicDoc' doesn't use 32,000 pieces of 8.5 x 11 paper." That's true, but printing the documentation requires 100 full pages, with 75 percent of each sheet wasted on white space.

At only \$29.95, easyPrint is a bargain for users who frequently switch between several output devices. But the real beneficiaries are network users. easyPrint greatly simplifies this task, but it doesn't replace the Chooser altogether; you need the Chooser to mount file servers and to toggle background printing. Still, the program is so simple, it's doubtful you'll ever need SF/O's technical support, which is available via a toll call, America Online, AppleLink, the Internet, and U.S. mail.—OWEN W. LINZMAYER

Numerical Mathematics Software

HiQ 1.0

PROS: Amazingly fast at pure crunching; follows the Mac interface; thorough manual; champion at matrix and boundary value problems. **CONS:** A bit formidable for beginners. **COMPANY:** Bimillennium Corporation (408/865-2010).

REQUIRES: Mac SE/30; math coprocessor; hard drive; System 6.0.5. **LIST PRICE:** \$695.

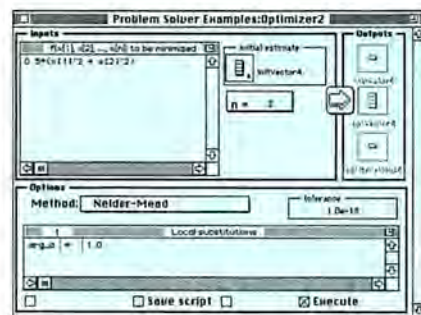


HIQ IS ADVERTISED AS "POWER Computing Software"; and for the tasks it addresses, it is, in fact, the most powerful numerical software for the Mac. This is not a symbolic computation program, as are Theorist, Maple, and Mathematica. It's strictly numerical, strongly engineering-oriented, and it's designed to push the limits of desktop numerical computing. HiQ can do, quickly, matrix problems that make MATLAB (longtime industry-standard matrix software) hang up and report system errors; HiQ can solve, using simple settings in dialog boxes, boundary-value problems for ordinary differential equations that need a lot of code-writing in Mathematica.

Bimillennium gets high marks for designing one of the few math software pack-

ages that isn't obviously derived from a Unix-machine command-line-based ancestor. There's a tool palette for defining objects (data, methods, graphs) on project worksheets, and the worksheets themselves are modeled on standard engineering notebooks. To solve a problem, you first define your symbols (HiQ-speak for scalars, vectors, matrices, graphs, and solvers) and then open one of the solvers to start computation. A typical solver dialog box gives you an editing window for defining variables and equations and a list with a choice of numerical methods, where appropriate.

These numerical methods in the solvers are the heart of HiQ. I am at a loss to explain why HiQ doesn't blow up on problems involving ill-conditioned 100-by-100 matrices. The references for each function detail the sources of the algorithms used, and these algorithms are in many cases the same ones used by other software. Yet no other math software for the Mac can get through such computations. The solvers—for expressions, polynomial and general roots, nonlinear equations, integration, statistics, optimization, and initial-value and boundary-value problems in differential equations—report not only timing and numerical accuracy or results, but generate code for the statement and solution of the problem in a HiQ script window. HiQ script is a simple language with program control commands like those



Math at Work HiQ's clean and efficient interface leads you right to the heart of the program, a highly optimized set of solver routines for a large array of applied mathematics problems.

in C or Pascal but displays an endearing nonchalance about data structures and variable typing, and you can easily customize computations since all the mouse-clicks generate script.

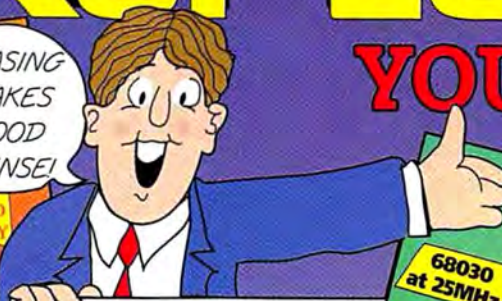
This software is not the first choice for freshman calculus classes, but it's the right choice for serious engineering work, or as a replacement for other packages when severe numerical challenges cause the Mac to crash, take forever, or generate nonsense. HiQ can overpower mainframe-grade calculations and has dazzling graphics, an intelligent interface, and a useful script language you can learn in an afternoon.

—CHARLES SEITER

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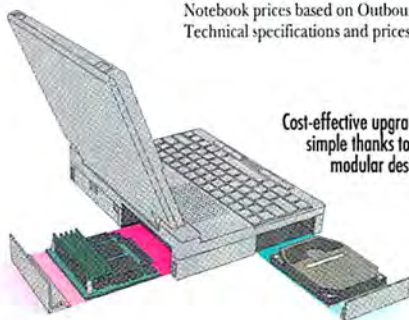
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The specs speak for themselves:

MODEL	OUTBOUND NOTEBOOK 2000	APPLE POWERBOOK 100	OUTBOUND NOTEBOOK 2030	APPLE POWERBOOK 140	OUTBOUND NOTEBOOK 2030E	APPLE POWERBOOK 170
Upgradeable CPU	YES	No	YES	No	YES	No
Internal Floppy Standard	YES	No	YES	Yes	YES	Yes
Processor Speed	68000 20 MHz	68000 16 MHz	68030 20 MHz	68030 16 MHz	68030 25 MHz	68030 25 MHz
Maximum Hard Drive Available	120 MB	40 MB	120 MB	80 MB	120 MB	80 MB
Full size silent keyboard and true notebook size	YES	No	YES	No	YES	No
Maximum RAM Available	4 MB	8 MB	4 MB	8 MB	14 MB	8 MB
Math Coprocessor	No	No	Optional	No	Optional	Yes
Price	\$1899 2000/220 2 MB RAM 20 MB HD	\$1599 100/220 2 MB RAM 20 MB HD Ext. floppy	\$2449 2030/440 4 MB RAM 40 MB HD	\$2999 140/440 4 MB RAM 40 MB HD	\$2771 2030E/440 4 MB RAM 40 MB HD	\$4299 170/440 4 MB RAM 40 MB HD

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Portable Office Magazine

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BYTE Magazine

"Outbound's new Notebook System has the unique ability to grow along with your requirements — and your budget."

MacUser Magazine

★★★★ 1/2

OUTBOUND NOTEBOOK 2030S	NO COMPARABLE POWERBOOK
YES	Not Available
YES	Not Available
68030 33 MHz	Not Available
120 MB	Not Available
YES	Not Available
14 MB	Not Available
Optional \$3509 2030S/440 4 MB RAM 40 MB HD	Not Available

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Circle 23 on reader service card

Construction and Remodeling Software

ConstructionMac 1.2

PROS: Flexible; comprehensive toll-free phone support; extensive list of materials. **CONS:** Complicated; slow; high memory needs; disorganized, incomplete documentation. **COMPANY:** Revelar Corporation (801/485-3291). **REQUIRES:** Mac Plus; 2MB of RAM (4MB with System 7); hard drive; System 6.0.5. Recommended: Color monitor. **LIST PRICE:** \$99.



MAKING FIVE TRIPS A DAY FOR supplies is remodeling or new construction at its worst. ConstructionMac aims to organize your project so you know in advance what you will need, about how much it will cost, and realistically when the project will be finished. The program achieves those goals to a limited extent—and with much work from you.

A project summary window contains a table of estimated and actual cost subtotals for 15 phases of a project. Of these, 11 phases have separate estimator windows for calculating and listing detailed costs. You can type detail items or copy and paste many items at a time from a comprehensive materials window. ConstructionMac intelli-

gently narrows its list of 1200 materials to items relevant in one estimator window at a time, helping ameliorate the program's overall slow scrolling.

Nine of the estimator windows calculate costs for some detail items but not others. In the drywall estimator window, for example, ConstructionMac calculates the cost of drywall and its installation, and calculates the quantity of joint compound and joint tape. You can transcribe the calculated costs into the drywall-cost table, but you must multiply (with a pocket calculator or maybe your brain) the calculated quantities by their unit costs before you can enter the total costs of those items.

You may have to break a project phase into multiple sections. For example, you might separately calculate the cost of ordinary drywall, waterproof drywall, and fire-resistant drywall. Subdividing like this gets complicated, and the documentation doesn't give enough guidance. Also, you must somehow divine numerous detail items, perhaps by scanning the materials window. In the rough carpentry estimator window, for example, you should include nails of various types, framing connectors, joist hangers, and other hardware. You have to speculate on quantities for the miscellaneous items you need and calculate their costs.

ConstructionMac doesn't recalculate whenever you change an input. Instead,

clicking a button in an estimator window updates calculations in that window and posts the total costs of the window's detail items to the project summary window. Buttons at the bottom of each estimator window conveniently lead to the other estimator windows.

Other windows compute square footage, wallpaper quantities, board feet of lumber, and quantities of plywood or other sheathing. Using one of these four windows sometimes scrambles the display of the estimator window beneath it, but closing and reopening the estimator window restores it.

ConstructionMac includes a simple project-scheduling application. It lacks graphic input or output, so you enter a start date, task durations, and optional task costs in a table. Nonstandard keyboard navigation complicates this entry; you press arrow keys (not tab) to move among table cells. To see which cell you've selected you must press the enter key. You can also tediously select cells with the mouse. Clicking a button calculates the start date, end date, and several other statistics for each task.

Revelar is extensively revising ConstructionMac to fix many of version 1.2's shortcomings. For now I can't recommend the program to people who have never done remodeling or construction work, but those with some experience may find it helps organize their next projects.—LON POOLE

Fax Modem with Voice Mail

Ultima Home Office

PROS: Easy-to-use fax and voice software. **CONS:** Voice software is buggy; poor response from technical support. **COMPANY:** Prometheus Products (503/692-9600). **REQUIRES:** Mac Plus; 2MB of RAM; hard drive; System 6.0.4 (System 6.0.7 or System 7 for voice features). **LIST PRICE:** \$649.



THE ULTIMA HOME OFFICE IS A 14,400-bits-per-second data modem, a send/receive fax modem, and a voice-mail system. The fax-modem component operates well, but the data modem and the voice-mail system need work to be acceptable.

In my tests, faxing worked well. I was able to send and receive faxes from a variety of stand-alone fax machines, and between two other fax modems. To send a fax, you select the fax driver in the Chooser and choose Print from within whatever application you're using. Alternatively, you can use Maxfax to install a Fax menu in any application's menu bar.

Data transfer was disappointing. The modem worked fine at 2400 bps connecting to America Online and other services, but it disconnected randomly and unexpectedly at

9600 bps and 14,400 bps when used with a variety of telecommunications software.

The voice-mail system makes this product different from the other V.32bis modems on the market. You use the Maxfax software to set up, on the computer connected to the modem, a separate voice mailbox for each user; users can then call in, play back messages, and delete them remotely. To receive voice messages, the Maxfax application must be open; when a call comes in, Maxfax switches to the foreground and the voice-mail feature takes over the Mac until the call ends.

When you want to retrieve messages, the software has a nifty Tollsaver feature, so that if you call in long distance and have no messages waiting, the modem doesn't pick up for a user-defined number of rings. When you have messages waiting, the modem answers on the first ring (also user configurable). So, if you hear more than one ring, you know there are no messages and you can simply hang up.

You record your greetings for the voice mailbox using the Mac's built-in sound input; with an external sound digitizer such as Macromedia's MacRecorder; or with a telephone plugged into the modem. Voice quality recorded through the modem was only fair; one friend who left a message complained that the outgoing messages sounded as though they had been recorded underwa-

ter. Incoming messages were intelligible, but not as clear as those I get on my 7-year-old analog answering machine. Some improvement in voice quality would be welcome.

Callers were able to leave messages easily, and my wife and I could call in and retrieve our messages from our individual mailboxes without difficulty. Unfortunately, I found some bugs in the voice-mail software. For example, when I had my telephone plugged into the modem and I picked up the receiver to make a call, the voice-mail software interpreted it as an incoming ring and brought the Maxfax software to the foreground. The most annoying bug was that when I deleted message files, the names of those files still appeared in the Maxfax message queue; repeated attempts to delete the names resulted in a message that the deleted files could not be found.

The response from Prometheus technical support was underwhelming. Only half of my calls were answered. Some calls were returned the next day, and my questions were answered promptly and completely.

The Ultima Home Office shows real promise. The Maxfax software, in particular, makes it easy to manage fax and voice messages, but until Prometheus improves its support response, and until the modem can reliably transmit data at high speeds, and the voice software's bugs are fixed, I suggest you steer clear of this package.—TOM NEGRINO



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Circle 303 on reader service card

Paint Program

Kid Pix Companion 1.0

PROS: Adds clever new features to Kid Pix; includes the world's-easiest-to-use QuickTime movie and presentation modules. **CONS:** More complicated than the original program; slowish; requires lots of Mac horsepower. **COMPANY:** Broderbund Software (415/382-4400). **REQUIRES:** Mac Plus; hard drive; System 6.0; Kid Pix. For color: Mac II; 2MB of RAM. For System 7: 2MB of RAM; 4MB of RAM for color. For QuickTime: 4MB of RAM; System 6.0.7. **LIST PRICE:** \$39.95.



TO MY MIND, A PERFECT PROGRAM, worthy of all five *Macworld* stars, brilliant in both design and execution, is as rare as a perfect diamond or a perfect day. Kid Pix is one. It's a colorful, noisy, ingenious paint program supposedly for kids, but captivating for everyone. My test panelists, down to age three, were so in love with the program that they had to be ripped away from it by their mothers.

Kid Pix Companion is a sequel of sorts. The innovative idea (which ought to be picked up by the makers of grown-up software): if you already own Kid Pix, you can graft new features onto your old program.

My worry was that once the Big Bad Marketing People started messing with Kid Pix, they'd disturb the delicate blend of whimsy and simplicity. The description of Companion sure makes it sound that way. It comes on four disks; the author of Kid Pix wasn't involved in the sequel; and the manual says that the program "was designed so that kids . . . can have fun with multimedia technology." Yikes.

Companion is indeed more complex than its predecessor, but not overwhelmingly so. Some of it merely supplements Kid Pix features—for example, it provides 112 new images for the rubber-stamp tool. Alas, many of them are either weird (a heavy emphasis on Middle Eastern culture), a bit intense (gravestone, skull), or so complex that you can't even identify the subject matter. (The figure at right shows three old stamps, on the left, and three of the new ones.)

The new features work much better. If you choose Color Me from the Companion menu, a dialog box appears (do three-year-olds know about dialog boxes?), from which you can choose any of 17 excellent line drawings to color in with the painting tools. Even better is the Draw Me command, where the program suggests something for you to draw, by both displaying a sentence on screen and having a gang of goofy voices read it out loud: "I'm a humungus fungus/ with a hundred toes and a pickle in my nose/ and I rock

the house. Draw me!" The company says that there are "literally thousands" of possible sentences, but in fact you start hearing recycled clauses after only a few times.

The Wacky TV is a QuickTime movie player (the rest of Kid Pix goes away while the TV is open). It's fun to play the 15 included minimovies (an average of about two



seconds long), which you can play forward or backward, speed up, stop, and start. You paste a movie into your Kid Pix painting, where it plays whenever you choose Play Movie from the menu.

The final piece of the Companion kit is a separate program called SlideShow: a presentation program for prepubescents. You assemble up to 99 "slides" (Kid Pix paintings or QuickTime movies) using a storyboard interface. Then you specify a sound, timing, and transition effect (dissolve, cross-fade, and so on) for each.

It's all perfectly charming, but Companion lacks the goof-proof personality of the original Kid Pix; think of it as Preteen Pix. If that's not a problem—to you or to your resident graphic artists—then by all means, convert your offspring into movie-making multimedia moguls.—DAVID POGUE

Removable Hard Drive

Quantum Passport XL 240

PROS: Fast; rugged; available in high capacity; superior software. **CONS:** Expensive compared with a standard hard drive. **COMPANY:** Quantum Corporation (408/894-4000). **REQUIRES:** Mac Plus; System 6.0.5. **LIST PRICE:** External chassis \$469; 240MB drive \$1099.



THE QUANTUM PASSPORT XL IS AN excellent piece of engineering designed to solve, for only a moderately discouraging amount of money, a specific data-transport problem. It solves the problem of how to carry data from one computer to another without buying a PowerBook or resorting to slower magneto-optical drives or lower-capacity cartridges. If you have, for example, a IIfx at work and a Classic at home, you can carry the relatively small Passport XL drive cartridge back and forth between the two sites. You need to buy a drive chassis for each site but only one drive (choices are 50MB, 105MB, 120MB, and 240MB), and the Passport XL is fast enough to use as the only hard drive at each site.

To install the Passport XL, you simply plug in the external chassis as if it were just

another SCSI unit, turn it on, and insert the removable hard drive. An internal motor pulls the drive into the chassis. Quantum provides La Cie's Silverlining software (the best available) for formatting and mounting the drive—installation, remarkably enough, takes less than a minute.

The 240MB Passport XL drive I tested rates near the top of the pack in speed for midrange hard drives in the following tests: SCSI-write rate 1.975MB per second; read rate 1.31MB per second; and transfer rates on real files of 255K per second. Once installed, the drive is indistinguishable from a conventional fast hard drive, except that you can pop out the drive module.

Currently, an 88MB removable-cartridge drive costs about \$800, the cartridges cost \$110, and a 200MB portable external hard drive costs about \$1600. The other large-capacity data-transport solution, the rewritable optical drive, costs \$4000 to \$5000, with optical cartridges costing around \$250.

What can the Passport XL do for you, in the context of this market? The choice of drive-partition components (how much do you leave on the desk and how much do you carry around?) works in the Passport's favor at larger storage capacities. Compared with the 50MB and 105MB Passports, the 88MB SyQuest cartridge is cheap enough that you could buy one for each of two computers at

less than the price of two external Passport chassis and a 105MB drive unit, but at 200MB the Passport starts to yield a lower cost per megabyte. It is also unlikely that for simple home-to-office use you could afford to buy two erasable magneto-optical drives and shuttle the cartridges back and forth. The 240MB Passport unit is not only cost-effective storage, but it also, like all well-designed removables, provides impressive security: other people can't see your hard drive files when you have taken them home in your briefcase. And the shockproof carrier for the Passport appears to be able to survive anything short of a plane crash (I dropped it from a variety of heights onto hard surfaces, with no data loss).

Quantum is the parent company of La Cie, which offers the same hardware (and software) under the Express name; La Cie's suggested retail prices average \$50 less on the chassis and smaller drives, but advertised dealer prices for the two systems are nearly the same. It remains to be seen whether the new fast magneto-optical drive from Pinnacle Micro (fast for a magneto-optical, meaning it's as fast as some small conventional hard drives) will arrive at a price that makes it an attractive alternative to the Passport scheme. The Quantum Passport XL, while not cheap, is a good value in fast, trouble-free, secure hard drive storage.

—CHARLES SEITER

DateBook 1.0

PROS: Easy to use; well designed; flexible views of events; integrates with TouchBase. **CONS:** Printing is buggy and incomplete; not multiuser.

COMPANY: After Hours Software (818/780-2220). **REQUIRES:** Mac Plus; 2MB of RAM; hard drive; System 6.0.5; System 7.0 for integration; TouchBase 2.0. **LIST PRICE:** \$125.



DATEBOOK OFFERS A FLEXIBLE approach to event scheduling and to-do list management. Any item associated with a time is an event. To-do items can be prioritized and can be checked off when completed. Unchecked items can be automatically forwarded to the next day. DateBook has year, month, week, day, and customizable list views of your activities; you can enter data in any view. The Month view and Year view show the calendar and a resizable day-at-a-glance area listing events and to-do items. The Week view shows only events.

DateBook gives you extensive control over entering recurring events. The same event can occur every x number of hours, days, weeks, months, or years; on specific days of the month (such as the third Satur-

day); or on particular dates. You can set the number of occurrences, and the program can schedule recurring events to fall only on business days. If you have conflicting events, the conflicting dates are grayed out, signaling that you need to adjust your schedule. Unfortunately, DateBook enters recurring events in the data file as discrete items, with no links between them, so to change or delete a recurring event you have to modify each one separately.

DateBook has some innovative and unique user-interface features. Clicking on the month name in any view pops up the Date Selector menu. From this menu, you can move to any past or future date with one click. As you enter events, the program shades the appropriate segments of the day.

DateBook also has a small floating window showing the current day and time, along with an Alarm button and a New button. You can enlarge the window to view the date, today's events, and to-do's. You can page through to past and future dates and click on to-do's to mark them as complete.

Using System 7.0, DateBook has a two-way link via Apple events with After Hours' TouchBase address-book manager. Data from the TouchBase file is copied into the Description field in the DateBook entry screen. You can also make changes to data in DateBook, and post those changes back to TouchBase.

DateBook can print in a variety of day-planner formats, including Day-Timer and Filofax. However, printing has many problems and outright bugs. The most glaring problem is that you can't print the Description field. This is especially bizarre when you consider that TouchBase data is stored in this field. Other printing hassles include incompatibility with background printing and inappropriately small scaling of text sizes while printing some day-planner pages.

DateBook also has a crop of other bugs. If you are running DateBook from a disk other than the start-up disk, and an alarm goes off, DateBook crashes. Several users report difficulty using the TouchBase-to-DateBook integration, ranging from simply not working to crashes. And sometimes the screen does not redraw properly after a Find operation, or if you're running in 8-bit color, when you switch views quickly.

Although the manual refers to multiuser operation on a network, DateBook 1.0 works only in single-user mode. Due to last-minute problems, the company decided to release a single-user version; the package includes a note to that effect.

DateBook's printing problems and recurring-events awkwardness prevent a higher rating for now. But if After Hours delivers the promised goods with its maintenance release, DateBook will deserve a second look.—TOM NEGRINO

Nok Nok 1.0

PROS: Maintains log of attempted and successful connections to File Sharing; can determine identity of guest users; can set maximum connection time.

CONS: Expensive for large number of network users. **COMPANY:** Trik (617/933-8810).

REQUIRES: System 7. **LIST PRICE:** \$49.95; five users \$199; ten users \$349.



WHILE SYSTEM 7'S FILE SHARING feature has added new functionality to networked Macs, it has also introduced new security risks.

Nok Nok has four basic functions: alerting you when anyone connects to your Mac through the File Sharing feature; logging all attempts at connecting to your Mac; setting time limits for File Sharing users; and determining a guest's identity. In my tests, Nok Nok performed all these functions well.

If you want to keep track of all users who connect to your Mac, you can configure Nok Nok to alert you on every connection. The notification can be a dialog box showing the name of the user and the name of the user's Mac; a sound played from your System file; an icon flashing in the menu

bar; or System 7's File Sharing Monitor log. The File Sharing Monitor is particularly useful if you want to disconnect the user immediately (if you're getting ready to turn off your Mac, for example).

Nok Nok can also be configured to maintain a log file of all attempts to use File Sharing. This plain-text file stores the name of the user attempting to connect as well as the date and time of each attempt.

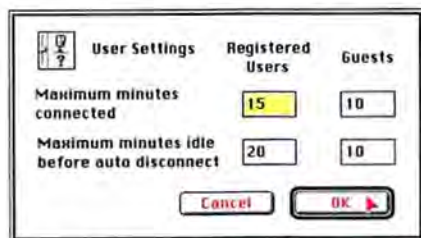
It's a common occurrence that once a user connects to a file server, that user often stays connected to the server until it's time to shut down. With System 7's File Sharing, a user might stay connected to your Mac (which acts as a server) all day even if he or she is not using any of the files on your Mac. That presents a security problem when the user is not in front of the Mac, since another, unauthorized user could use that Mac to access your files, possibly changing or

deleting them. To guard against that situation, Nok Nok lets you set a maximum idle time for any File Sharing connection.

Nok Nok lets you restrict the amount of time File Sharing users can stay connected to your Mac. A connected user is notified two minutes before the maximum time is reached, which is usually enough time to complete the current task and disconnect from File Sharing. If the user is still connected when the maximum time is reached, he or she is disconnected from your Mac. In System 7's File Sharing, you can authorize access to registered users who have access to many files on your Mac, as well as guest users, who have restricted privileges. Nok Nok allows you to set a different maximum connect time for registered users and for guests.

When a guest user logs on to your Mac using File Sharing under System 7, you know only that a guest is logged on; you have no idea who that user is. With Nok Nok, you get the name of the user and the name of the user's Mac. If the user's Mac is running System 6, you only get the Mac's Chooser name. Either way, the information is usually sufficient to determine who's using a guest account to access your Mac's files.

Nok Nok does a good job of plugging the security holes that File Sharing created in System 7. I'd recommend Nok Nok to anyone using the File Sharing feature of System 7.—DAVE KOSIUR



The Nok Nok configuration options include setting different idle times for registered and guest users.

Expert Systems Software

NueX 1.1

PROS: Neural-network simulator is useful as an educational tool. **CONS:** Too slow and incomplete for practical expert-system development; expensive.

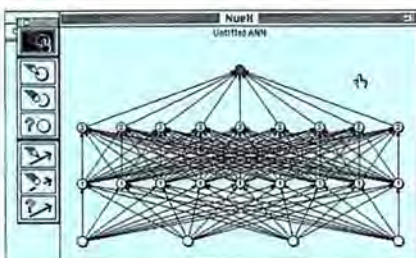
COMPANY: Charles River Analytics (617/491-3474). **REQUIRES:** Mac Plus; 4MB of RAM; System 6.0. **LIST PRICE:** Version 1.2 \$295.



NUEX AIMS TO MARRY ARTIFICIAL neural networks (ANNs) and knowledge-based expert systems (KBs) to let you create "intelligent" applications. Rule-driven KBs use preprogrammed true/false tests to analyze input data and arrive at one or more preordained conclusions. Data-driven ANNs use pattern recognition and weighted probabilities to analyze input data and "learn" to classify that data into categories. Combining the two makes possible sophisticated expert systems that can adapt to varying input data while still analyzing that data using a set of deterministic rules.

NueX is a HyperCard-based shell that provides both ANN and KB functions. The package includes the NueX main stack, a number of simple examples, and a rather thin user guide. Inside the main NueX stack

are several components. The neural-network editor lets you create ANNs that are modeled by a C-based ANN simulator built into the NueX stack. A data editor (Apple's TeachText) lets you enter training data in the form of expected inputs and outputs. The ANN Monitor passes the training data through the network iteratively so the ANN can learn the input patterns and expected results. A logarithmic graph displays the effectiveness of each training cycle, letting you monitor how reliably the ANN produces correct output. The other side of NueX—its KB expert-system component—consists of a rule/fact editor and an inference engine. NueX's rule language uses HyperTalk syntax, although you don't need to understand HyperTalk to use the KB. You use the



Neural Net NueX lets you construct and train both neural networks and knowledge-based expert systems. Shown here is NueX's graphic depiction of a three-level neural network.

rule/fact editor to enter KB rules and general facts; you then run the inference engine to analyze input data using those rules and facts, yielding a predicted output.

While NueX is certainly complex, and even educational, it's not ready for prime time as a serious production tool. First, its HyperCard foundation limits its speed—even on an accelerated Mac IIci, NueX is painfully slow. Second, the two sides of NueX—neural network and expert system—are woefully unbalanced. The ANN tools are fairly complete and easy to use, although relying on TeachText as a data-input editor is a definite cop-out. The KB tools, though, seem to be an afterthought: they're far less sophisticated than those in competing, but much cheaper, expert-system products. The documentation, too, is uneven and incomplete—delving into neural-network theory to the point of discussing differential equations, while glossing over such issues as how to handle symbolic input. Tutorials are simplistic and don't adequately explain various NueX components, such as the ANN training graph. Finally, all of the examples provided are trivial; users of a professional-level product require usable templates.

As a lightweight intro to neural networks and expert systems, NueX has some merit, although its price makes it unattractive for educational purposes. But for practical use, it's impractical.—MEL BECKMAN

Network Calendar Program

Now Up-to-Date 1.0.1

PROS: Fast; easy to learn; colorful displays; surprisingly bug-free for an initial release; good variety of printing options. **CONS:** Lacks to-do list feature; no word wrap in monthly calendar.

COMPANY: Now Software (503/274-2800).

REQUIRES: Mac Plus; hard drive. **LIST PRICE:** \$99; five-user pack \$399; ten-user pack \$599.



THOUGH LESS THAN A YEAR OLD, Now Up-to-Date has become one of the most popular calendar programs for the Mac. It's not hard to see why.

Now Up-to-Date's swift performance and logical structure make it exceedingly easy to use. And while networked users may find setting up the program's public, or shared, calendars a bit complicated at first, solo users probably won't even have to touch the manual.

Up-to-Date has terrific graphic appeal—especially on a color screen. Upon start-up, a spacious monthly calendar appears in a resizable window. You can also open weekly or daily views of your schedule and consult the two views simultaneously. In all the views, you can customize the

calendar's fonts, styles, lines, and colors to suit your preference.

Entering data is fast and hassle-free, thanks to keyboard shortcuts. You can add new events or appointments to the calendar in any view. Double-clicking on the name of an event opens an Event Info window, in which you can set the duration of the event and assign it either to your own personal calendar or to a shared network calendar. There are options for setting alarms, creating recurring events, and adding detailed comments of up to 255 characters.

To mark longer stretches of time on your calendar—several days, or even a week—you can create banners, which can be resized and stretched across your monthly calendar. For general reminders, you can add notes to the calendar.

Over a network, Up-to-Date users can post events, banners, and notes to any number of public calendars, which are stored on the calendar server Mac and shared by other users. Users can assign unique colors and text styles to their views of a shared calendar to make identifying events easier.

Up-to-Date's Appointment Book program provides an outstanding variety of printing options. Daily, monthly, and weekly schedules can be printed out in three different appointment book sizes. You can print calendar views containing up to four months on each page, or you can create tiled

wall calendars up to 3½ by 3 feet.

Up-to-Date has a few deficiencies: there's no word wrapping of event text displayed on the monthly calendar, so appointment listings are always cut off abruptly after the first few words. Events shorter than 30 minutes are unreadable in the daily view because they're scrunched into slivers on the time line. And events in Up-to-Date must always be rounded off to quarter-hour intervals; events can't begin or end at, say, 2:20 or 3:55.

Finally, there's one glaring omission. There's no way to list and prioritize general to-do items—an indispensable part of any comprehensive daily planner. Though Up-to-Date lets you save events without displaying a specific time in the monthly view, it always assigns a default time to them in the daily view. Likewise, when you export Up-to-Date data as a text file, all events are assigned a time, even if you've checked No Time in the Event Info dialog box.

Still, this is an outstanding calendar. And for a 1.0.1 version, it's polished and bug-free. According to the company, version 2.0, due out in the fall, will include a to-do function and a list view that will display to-do items alongside the daily schedule. The company also says that in version 2.0 each date cell on the monthly calendar will have word wrap and be scrollable.

—JOSEPH SCHORR



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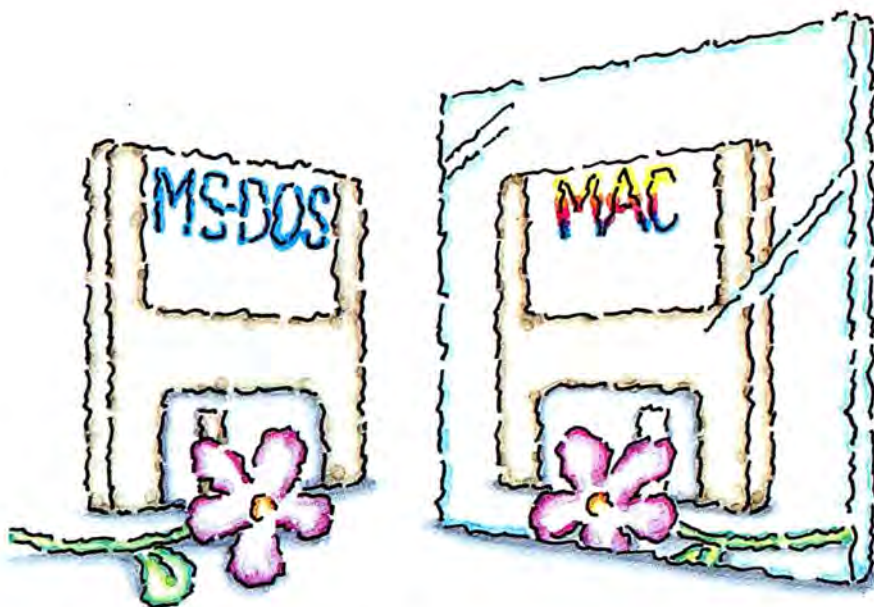
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Network-Administration Utility

RouterCheck 2.0

PROS: SNMP checking; excellent user interface; continuous network polling. **CONS:** Expensive for small networks. **COMPANY:** Neon Software (510/283-9771). **REQUIRES:** Mac Plus; System 6.0. **LIST PRICE:** \$895.



CATORBOXES AND ETHERROUTES and FastPaths, oh my! So goes the lament of the network administrator who must daily face the challenge of monitoring a busy multiple-network system, or internet. Those electronic beasts known as routers break up a large network, into an internet of zones that then use the routers to communicate with one another. This speeds up network processes such as printing, E-mail, and server access by creating a smaller area for data to travel. Routers can also provide translation services between different network protocols (AppleTalk to Ethernet, for example). But keeping track of routers and the traffic they process—especially if the mechanisms come from different manufacturers—can drive you round the bend.

RouterCheck 2.0 is compatible with any Phase 2 AppleTalk router, both hardware

and software. For RouterCheck to collect detailed information (beyond simply the zone list), the router must support SNMP protocol. It provides cross-vendor router accessibility with a much improved user interface over that of its previous version. It also provides real-time monitoring of the network via SNMP (Simple Network Monitoring Protocol), constantly polling the routers to ensure that network traffic stays at an optimal pace. If bottlenecks or other zone problems do occur, you can correct them either by resetting the router via the RouterCheck application or, for more intricate operations, by using the router's native configuration software.

RouterCheck begins by scanning the internet for routers and collecting some basic information such as the internet and zone numbers, and the brand name of each router. It then displays a router list from which you can obtain additional detailed information by double-clicking on the names of listed routers. This information includes vendor-specific data such as software version and PROM numbers, and network-specific information such as zone location, net and node identities, and the routing table (a list of all the networks it sees). This first search can take a few minutes or a few hours, depending on the number of routers in the internet. You can save this router list to track changes to the network.

Version 2.0 adds two excellent polling and monitoring features. You can now set RouterCheck to poll routers to see which ones are working and which ones are down, and to watch for changes in network traffic speed and zone lists. RouterCheck keeps a log of this traffic information, and when suspicious activity occurs (such as a new zone appearing or traffic slowing down), the software can notify you in a number of ways, including an on-screen message, an alert sound, or a pager via Ex Machina's Notify software. Dialog boxes suggesting possible reasons for suspicious activity are another excellent new feature.

At \$895, RouterCheck is too pricey for most tiny internets (one to four routers). That's unfortunate, because the wealth of information RouterCheck provides would be useful for managers of small internets and for newcomers to network management. A lower-price version with an upgrade path would be a great addition. On the other hand, the only limitation to the number of routers that RouterCheck can monitor is the capacity of the administrator's Mac. Larger internets require more memory and disk space to compile and save reports. For mid-size to larger internets, RouterCheck is a must. It keeps your finger on the pulse of your router configurations and internet traffic—and keeps your pulse in check.

—MATTHEW R. CLARK

Foreign-Language Reader

Transparent Language 1.04M

PROS: Simple to use; inexpensive; minimal system requirements; single program reads multiple languages. **CONS:** No word-count feature; no print feature. **COMPANY:** Transparent Language (603/465-2230). **REQUIRES:** Mac 512K; System 6.0. **LIST PRICE:** Three stories in French, German, or Spanish \$139; three stories in Latin \$129.



MANY FACTORS ARE INVOLVED IN learning and retaining a foreign language—first acquiring the accent, vocabulary, and grammar, and then practicing those elements through conversing, listening, and reading. Transparent Language addresses just one part of that process—reinforcing foreign-language skills through reading.

This is a program without an iota of glitz or glamour. And though I'm as charmed as the next person by the Mac interface, I am completely undisturbed by Transparent Language's lack of sound, graphics, color, or even buttons. For a 125K application that enables me to read stories in French, Spanish, German, Latin, and Italian—one program—I'll do without.

If you install stories in several languages, all are available from a single Open New Title command, although you can open only one story at a time. The main screen is simply a scrolling text window containing the story. It is surrounded by five smaller windows giving the meaning of each highlighted word, the phrase in which it appears, the whole sentence or clause, plus any comments or notes the translator chooses to include. For example, the German phrase *die Katze im Sack zu kaufen* (underlined to indicate that it's idiomatic) translates literally to "to buy the cat in the sack," but it correlates with the English expression "to buy a pig in a poke," meaning to accept something sight unseen. In another story the interpreter explains that the Spanish verb *se había turbado* is in the pluperfect tense, formed from the past participle of *turbarse* (to become upset) and the auxiliary verb *haber* (to have). Using the Root Search command, you could look for all verb tenses formed with *haber*, or use Word Search to locate other pluperfects formed with *había*. For help working through long or complicated sentence structures, you can choose Underscore Segment. You can also place and find bookmarks, helpful for studying lengthy works.

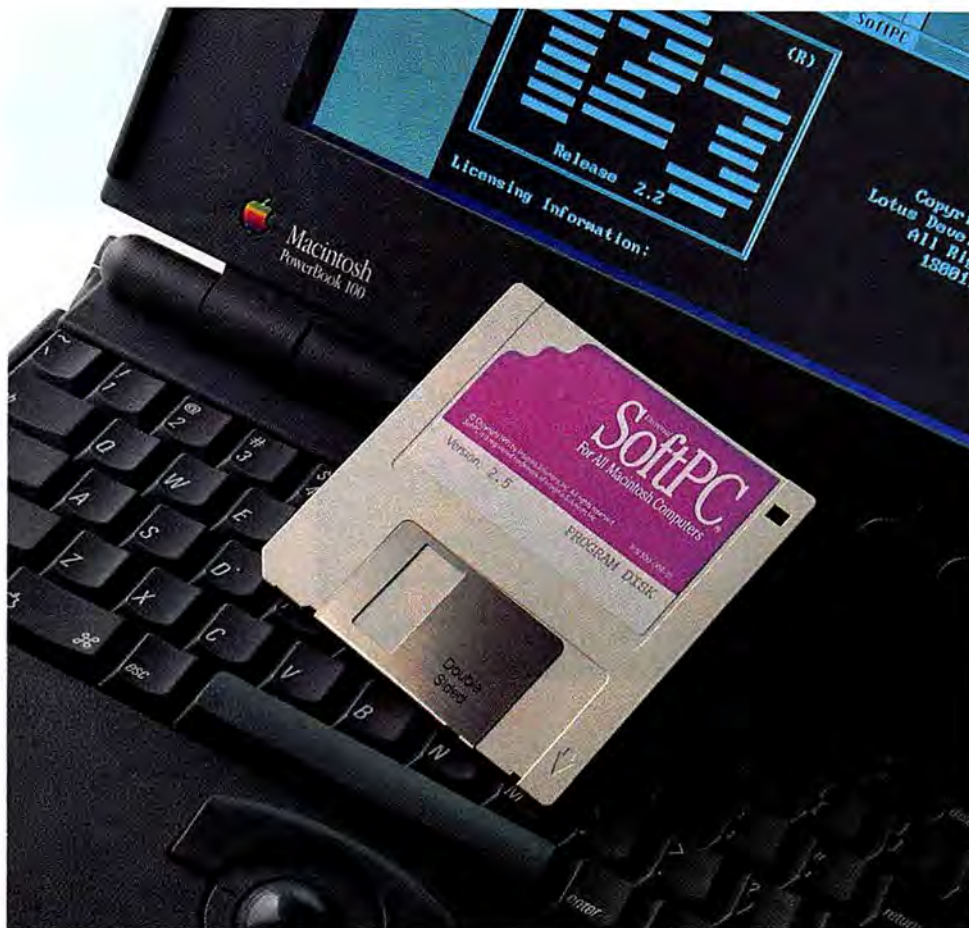
You can move and resize any window, change its font and point size, and close or open it via the pull-down Show menu or keyboard commands. Most of the ⌘-key

combinations deviate from Macintosh standards and are instead mnemonic—⌘-W is the toggle for the Word Meaning window, for example, and ⌘-P is for Phrase Meaning. But since most of the normal Mac commands don't apply (you can't print stories or windows, for instance), this poses no real problem. The commands for Open, Quit, and Help are standard.

The technology underlying Transparent Language works with any Latin character-based language; availability of translated works is the only limitation. The company continues to build its catalog and expects to add new languages in the future. For now, its offerings include works in French by Balzac and Baudelaire, in German by Kafka and E.T.A. Hoffmann, in Spanish by Cervantes, in Latin by Cicero and Catullus, and one short Italian story by Manzoni. Most full-length titles run roughly 25 to 50 printed pages and cost from \$12.95 to \$29.95. Optional audiotapes are also available (from \$5.95 to \$9.95).

The program has no facility to test a student's vocabulary or comprehension, which some may regret. I would have liked a word-count feature to help gauge progress. But these are minor quibbles and not really part of Transparent Language's simple, clear-cut mission. This is a superb tool for bolstering language skills through reading.—MARJORIE BAER

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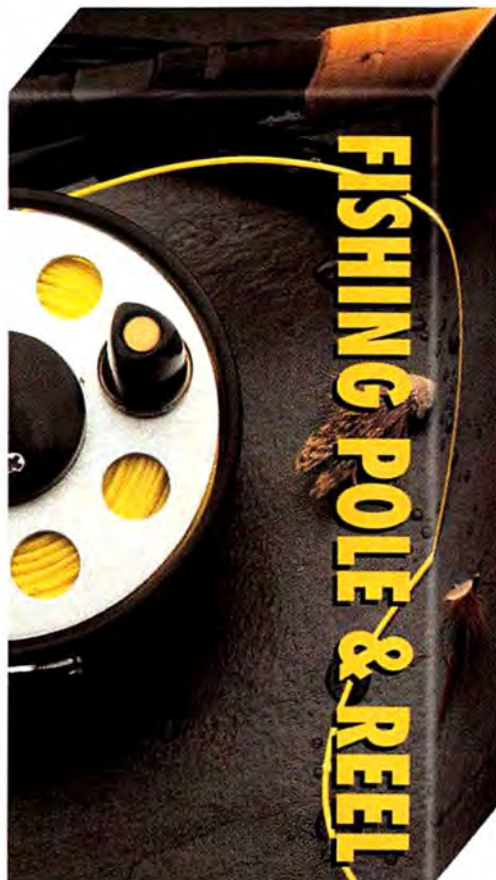
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BY DAVID POGUE

YEAH, YEAH. THE MAC IS THE musician's computer. We all know that every jingle is recorded, and every Broadway show tune published, and every movie sound track assembled, by Macintoshes. The music pros are in heaven. Good for them.

But what about the wannabes? What about the 11-year-olds coming home from school and having to choose between practicing piano and Super Mario Bros. on the Nintendo? Or the 60-year-olds coming home from work and wanting to pick up where high-school band left off? Or the in-between-year-olds who just want to learn a little music without making it a big expensive federal case?

Due to the tragic perception that music on the Mac is a niche market (read: not profitable), most music-instruction products have a decidedly homemade feel. Most are created and marketed by one person. Fortunately for the future of America's choirs, bands, and symphonies, there are still some standouts.

The Miracle Piano Teaching System

IF YOU HAVE SEEN THE ADS ON TV, you already know that this product is not put out by any one-man operation (Software Toolworks, \$499.95). It has its faults and foibles, but it's thoroughly modern, assumes no prior knowledge, and has enough lessons to keep you busy for a year.

The Miracle is an electronic MIDI keyboard that connects to the Mac. The software listens to what you play, gives feedback, points out your mistakes. (MIDI comes up in every discussion of the Mac and music, including this one. MIDI, pronounced *middy*, is the electronic language—and the physical connector—that a Mac and a synthesizer use to communicate. Like PostScript, only musical. A MIDI file is a generic music document, like a word processor's text file.) For more on The Miracle system, see *Reviews* in this issue.

Compose Yourself

THIS ECCENTRIC COLLECTION OF FOUR tools—a manual, two cassettes, some HyperCard stacks, and a *sequencer* (a

program that records anything you play on a MIDI synthesizer)—is dedicated to teaching what's unteachable: how to compose music.

The cornerstone is the manual, a lovingly prepared unveiling of the author's personal observations and secrets for composing (MacBeat, \$99). The beginning chapters make a cursory attempt at teaching music theory, appreciation, and notation—but don't be fooled; it's way over the heads of nonmusicians. If you are a musician, you will indeed find some inspirational nuggets, and I can imagine one or another of the 66 composing ideas described in the Strategies stack bumping even a seasoned pro out of a rut. Bag the crude sequencer, though, and don't bother with the dozens of recorded musical examples on disk—they're improvisatory noodlings, wrong notes and all, more desultory than illustrative.

Jazz Through MIDI 3.5

AT FIRST, YOU MIGHT THINK THAT THIS typewriter-produced, unproofread, cut-and-pasted book is an ordinary Jazz-for-Klutzes textbook, complete with opaque sentences like "To find the Tritone substitution for any chord count three whole steps from any dominant seventh." But then you listen to some of the musical examples—two disks full of absolutely sizzling jazz, blues, and Latin MIDI files—and your jaw begins to drop. Using a sequencer program like EZ Vision, Pro 4, or Performer, you can slow down these exquisitely recorded pieces (piano, bass, drums, and vibes are on separate tracks), and follow the included sheet music, until you understand how the jazz greats do it. It's assumed that you have a good MIDI synthesizer and a sequencer program, and that you already play the piano. If you want to learn jazz, you may get a lot out of this crude but effective Music Minus One for the cellular-phone set (New Sound Music, \$49.95).

The Book of MIDI

IT IS A WHOPPING 3-MEG, 310-card HyperCard stack

that introduces you to MIDI (Opcode Systems, \$39.95). Some of it makes incredibly clever use of HyperCard. For example, in the excellent chapter on classic old synthesizers, you get to hear a two-second snippet of each keyboard being played. And the how-to-wire-your-home-studio section is perfect: animated cables snake through the diagram one at a time, leading you through that hairy process blow by blow.

Ironically, I doubt you'll learn much about MIDI. It's one of those irritating texts that regurgitates technically correct sentences without making them meaningful: "The first bit of a byte defines the byte as either a status or data byte, and is called the Most Significant Bit (MSB)." Um, yeah. I was gonna say that.

There's a little bit of hypertexty stuff—you know, where you click on a boldface term and a definition pops up. Trouble is, definitions in this book don't actually pop; instead, when you click on a term, you're taken to another card in the stack, where the definition contains *other* obscure terms. By the time you have a decent understanding of the original term, you've traversed cards all over the stack, and you've long since lost your place.

MidiSchool

NEVER HAVE THE TECHNICAL BAFFLEMENTS of MIDI been so lushly illustrated—both musically (if you have a synthesizer connected) and graphically (thousands of drawings and cartoons)—as in this gorgeous 219-card HyperCard stack (EduActive, \$119). Unfortunately, the text doesn't live up to the graphics' high standards; while difficult concepts are sometimes cleverly explained ("MIDI has channels, just like your television"), an equal number are tossed out without regard for the beginner ("Use a MIDI cable rather than a 5-pin DIN, or it is likely to cause a ground loop"). And the fact that two of the three main section titles feature AWOL apostrophes foreshadows the punctuation problems that occasionally follow.

continues



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Still, writer/illustrator/programmer/marketing department Paul Keefe has put enough polish into this stack to win it a spot on any music teacher's desk. The program can track the individual progress of many students; there are two interesting (but somewhat lame) built-in MIDI programs, including a sequencer; and the electronic Administrator's Notebook gives the instructor a degree of control over the proceedings. Best of all, it's impossible to get lost in this stack; the navigational controls are crystal-clear.

An Intro to MIDI 1.1

THE LAST IN THE STACK OF STACKS is this 88-card shareware offering (\$15 requested; I found it on America Online). It's not nearly as complete as the commercial MIDI stacks; it has no illustrations, sounds, or MIDI features; and this text, too, is afflicted by CRAMPS (careless-random-apostrophe-mistakes-by-programmers syndrome).

Even if tough MIDI concepts aren't much better explained for the beginner, the writing tone is friendlier than in the other stacks. And this stack costs next to nothing to download (transfer) to your Mac; you may as well peruse it to see if HyperCard MIDI training is your cup of techno-tea.

Adventures in MusicLand 2.0

THIS PACKAGE CONTAINS FOUR CUTE, colorful guessing games that involve music and sound (Dr. T's Music Software, \$79). Two of them are like the old "Concentration" TV show; you have to remember the locations of face-down musical cards. In Picture Perfect, you're shown one small section of a composer's face (or an instrument, or a musical symbol) at a time, and you're supposed to identify it by typing. And Melody Mixup is like that cumulative-memorization game for long car rides: "I'm going on a trip and I'm taking an Armadillo, a Bongo, and a Cucumber... your turn!", except that you have to play back increasingly long sequences of musical notes.

Two problems. First, the novelty wears off fast. In Sound Concentration, for example, there are only eight sounds (dog barks, glass breaking...), no matter how many times you play. Second, I couldn't figure out whom these things are for. Adults? Then there needs to be a gazillion times more variety. Kids? Give it up—no ten-year-old I know could come up with answers like *mordent* and *Mendelssohn*. Oh, sure, some of the games, using certain program settings, might be educational and fun for anyone. But the 20-second credit sequence plays, unstopably, every time you change games.



Listen Up Listen's primary windows include a piano keyboard, guitar fretboard, notation staves, and an instruction/scoring window. As you play each note of a chord, the X or check-mark icons in the instruction window indicate whether you were too high, too low (as shown above), or right on the nose.

Listen 2.1.2

THE LISTEN PROGRAM, SAYS ITS MANUAL, "is not intended to replace a full course in melody and harmony." Precisely so; but if you have a book or a teacher to spell out the basics for you, I can't imagine any better way to practice sight-reading, ear training, and note recognition (Imaja, \$99). As Listen plays each note, you get triple sensory reinforcement: how it sounds, how it looks on paper, and where it is on the keyboard (or fingerboard). You can use either the built-in Mac speaker (and select from dozens of instrument sounds), an attached MIDI keyboard (incredibly useful), or both. This is the only drill program you can control by pressing specific synthesizer keys—which activate various on-screen buttons by remote control—so that you're not continually scooting back and forth from desk to synth.

Every kind of drill is included (intervals, chords, melodies, scales), and everything is customizable (what range of notes to use, whether or not you want a timer, how many notes in a chord, and so on). Too bad there's no rhythm training and not much in the way of note-reading drills. An un-copy-protected version (2.1.3) is supposed to be available by the time you read this.

Practica Musica 2.322

EXCEPT FOR THE MIRACLE, PRACTICA Musica (Ars Nova Software, \$125) is the only self-contained Mac music teacher, thanks to the 200-page textbook that comes with it. (The other drill programs assume that there's a third party presenting the material to begin with.) With a minimum of jargon and myriad examples, this book covers it all: theory, notation, harmony, chords, intervals, tunings, rhythm, composition, and just enough history to keep things spicy. Sprinkled through this concise text are instructions for applying what you've just read to exercises in the software, so that the drills have context.

The program uses either built-in Mac sounds or a MIDI instrument. Unlike Lis-

ten, Practica Musica emphasizes reading music, and its ear-training examples use actual melodies instead of computer-generated note strings. The pitch and rhythm training drills are particularly cooperative: you paint pitches (or rhythms) onto a staff, and the program supplies the rhythms (or pitches) automatically. The program doesn't look as good as it works, though; it has crudely-drawn musical notation, nonstandard scroll bars, and a few other clunky interface elements. (The author says that version 3.0, now in development, will be gorgeous.)

MiBAC Music Lessons 1.1

IN ANOTHER ERA, ON ANOTHER COMPUTER, this might have been a great drill program (MiBAC Music Software, \$119). It shows a piano keyboard and a single staff. The program plays exercises using either the Mac speaker (no choice of sounds) or MIDI. It has 11 drills, from key-signature recognition to scale-naming. It's an easy-to-use, absolutely literal, electronic edition of the ear-training and theory drills you took in college.

But Music Lessons left me disappointed. There's no melody ear training, no chord drills, no inversion tests. When you play answers on the MIDI keyboard, the program marks as incorrect any notes you play that fall outside of a limited keyboard range. The whole thing feels a little leaden, partly because it takes so long for the program to cough up the answers (and the next drill), and partly because there's so little spark or variety.

The Upshot

THERE'S NO QUESTION THAT COMPUTERIZED music lessons are superior (livelier, more illustrative) to the ones in self-study books. They even have certain advantages over classes: you control the pace and the difficulty, for example, and the feedback on drills is instantaneous. But without a teacher, the mighty burden of motivation falls back into your lap. If you think you're self-disciplined enough to stick with it, here's what I'd tell you.

To learn piano, get The Miracle. To learn to read music, get The Miracle or Practica Musica. To cultivate your ear and reinforce your music theory, it's Practica Musica or Listen. To learn MIDI, start with Intro to MIDI; buy MidiSchool if you're still curious. And then remember what the New York City cop told the tourist who asked how to get to Carnegie Hall: "Practice." **m**

Contributing editor DAVID POGUE is the author of *Macs for Dummies* (IDG Books Worldwide, 1992). He has been the MIDI guru, conductor, or music copyist for several Broadway musicals.

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The Latest Macintosh Releases

EDITED BY EVAN COOPER

THIS SECTION COVERS MACINTOSH PRODUCTS FORMALLY ANNOUNCED BUT NOT YET EVALUATED BY MACWORLD. ALL PRICES ARE SUGGESTED RETAIL. PLEASE CALL VENDORS FOR INFORMATION ON AVAILABILITY.

HARDWARE

AsantéHub 1012

An intelligent 10BaseT hub with an RS-232C port that allows for out-of-band network management via modem using included AsantéView software. The product also has an RS-485 port and LED status displays for network monitoring and troubleshooting. It is equipped with 12 RJ-45 ports, a 50-pin RJ-21 connector, and a 3-in-1 port that includes BNC, RJ-45, and AUI connectors. With out-of-band management \$1499; with in-band and out-of-band management \$1999. Asanté, 408/734-4844, 800/662-9686; fax 408/752-8372.



AsantéHub 1012

AT-MR113

A dual-port 10BaseT microrepeater that links two full-length 10Base5 network segments via standard AUI ports. Has full 802.3 repeater capabilities, network status LED indicators, and protection from malfunction for both network segments. The device uses an

Ethernet repeater ASIC designed by the company. Network protection includes an autopartitioning and autoreconnection capability that disconnects a segment showing excessive collisions; a jabber lock-up protection feature isolates nodes that are transmitting packets no longer allowed by IEEE standards. Network status LEDs include indicators for power, collisions, and transmission. \$795. Allied Telesis, 415/964-2771; fax 415/964-1598.

Audiomedia II

A stereo, CD-quality recording system that includes a DSP NuBus board and the company's Sound Designer II software. The board contains a Motorola 56001 DSP chip running at 33MHz for all audio processing functions and has RCA-type analog connectors and S/PDIF digital connectors, making it compatible with consumer DAT recorders. The software's features include nondestructive playlist editing, SMPTE synchronization, real-time digital EQs, and pitch shift with time correction. \$1295. DigiDesign, 415/688-0600, 800/333-2137; fax 415/327-0777.

Cirrus Optical

A 128MB magneto-optical disk drive that takes 3 1/2-inch cartridges and uses a Panasonic mechanism. La Cie says the drive has a 38ms average seek time and a throughput of 640K per second. It has external termination and SCSI ID switches, and includes the necessary cabling, Silverlining hard drive management software, and 5MB of public domain software. \$1699. Additional cartridges are \$99 each. La Cie, 503/

520-9000, 800/999-0143; fax 503/520-9100.

ColorWorks

A family of LCD projection panels that let users show images from a computer using an overhead projector. The devices are available with a 9-inch or an 11-inch panel and can project up to 24,389 different colors with a contrast ratio of 20:1. Panels weigh 6 pounds each and are compatible with the company's Cyclops pointer system. 9-inch panel \$3995; 11-inch panel \$4995. Proxima, 619/457-5500; fax 619/457-9647.



ColorWorks

CP-503

A plain-paper laser plotter that plots A- and B-size drawings and has a 400-by-400-dpi resolution. The company claims the plotting speed is 8 ppm for A-size media and 4 ppm for B-size. An auto-scale feature lets users reduce D- and E-size drawings to A- and B-size without having to reconfigure the software driver. The plotter is compatible with HP-GL, and has 6MB of RAM and RS-232C and Centronics interfaces; it uses a TI34010 controller with a clock speed of 60MHz. \$8495. Mutoh America, 708/952-8880; fax 708/952-8808.

DigiLINK

A high-speed, 128K-per-second digital bridge that can link any number of remote Ethernet networks to each other via ISDN telephone lines. The device has an Ethernet adapter and an ISDN ter-

minial adapter built in and supports 10BaseT and 10Base2 connections for Ethernet, and RJ-45 cables for ISDN connections (an NT1 network terminator is required). The DigiLINK can transmit Ethernet data over one or both B channels of an ISDN line and can be configured via the serial port of a Macintosh; administration software that supports Apple events is included. \$3495. Sonic Systems, 408/736-1900; fax 408/736-7228.

Floptika 20/M

A SCSI optical disk drive that offers 21MB of data storage on a 3.5-inch floptical disk. The drive can also read from and write to 1.44MB Macintosh-formatted disks and 720K and 1.44MB DOS-formatted disks. It has an external termination switch and SCSI ID selector, and it ships with formatting software. The company says the drive has an access time of 80ms and a sustained data-transfer rate of 200K per second when working in the 20MB floptical mode. \$585. Procom Technology, 714/852-1000, 800/800-8600; fax 714/852-1221.

GatorLink

A multiuser device that extends an AppleTalk Ethernet network across dial-up telephone lines and provides access control in the form of zone lists, allowing administrators to select which AppleTalk zones will be visible to users. The device uses a Motorola 68302 processor, which provides three dedicated RISC engines to handle I/O duties, leaving the MC68000 free to provide AppleTalk Remote Access services. The GatorLink also supports Security Dynamics'

ACE/Server security system and does not operate as a router. \$1899. Cayman Systems, 617/494-1999; fax 617/494-9270.

lisi Ethernet Card

An Ethernet board for the lisi that uses Direct Memory Access to transfer data directly into system memory; is available in thick, thin, and 10BaseT configurations; and has two LEDs to indicate network status and link integrity. The board also has a pass-through slot for future options and can be configured with a 20MHz floating-point unit for an additional \$100. The board is based on National Semiconductor's SONIC chip set and proprietary software driver. 10baseT thin and thick \$319; 10baseT thick \$279; thin and thick \$279. TechWorks, 512/794-8533, 800/688-7466; fax 512/794-8520.

Kingfisher

A video-capture board that has composite, S-Video, RGB, and YUV inputs; captures still or video images in 8-bit color or gray-scale. The included software allows users to control brightness, con-



Kingfisher

trast, saturation, and hue; also includes gamma correction, flicker, and noise-reduction filters. \$1895. Graphics Unlimited, 1A Norwich St., Cambridge CB2 1ND, United Kingdom.

MirrorImage 309

A 300-dpi, 9-pages-per-minute laser printer that

uses a Weitek RISC processor and includes Adobe PostScript Level 2 software and 35 Adobe typefaces. The 8 1/2-by-11-inch printer has a SCSI port as well as AppleTalk, serial, and parallel ports; comes with 2MB of RAM, upgradable to 10MB. \$1699. Mirror Technologies, 612/633-4450, 800/654-5294; fax 612/633-3136.

MT30

A 4mm DAT tape drive that provides up to 8GB of storage and ships with the company's Memory-tape Manager software that provides automatic, unattended backup for an unlimited number of Macs. The software has a feature called Tape Rollover that allows a backup to automatically continue to another drive when the capacity of the first tape device is exceeded. Tape Shadowing automatically creates a second backup tape whenever a backup is performed. \$2680. Memorybank, 313/761-2783, 800/562-7593; fax 313/761-3263.

Phaser III PXI

A plain-paper color printer based on phase-change ink-jet technology that now includes Tektronix proprietary TekColor Fine-point technology, which allows the printer to print with fine detail. TekColor Previewer—software that is built into the printer's driver—has also been added and gives users the ability to preview output before it goes to the *continues*



Phaser III PXI

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Battery Status & Clock Display	Yes	No
Sleep Command Within Program	Yes	No
Battery Conservation	Yes	No
Thick Cursor & Insertion Point Preference	Yes	No
EDITING FEATURES:		
Headers/Footers	Yes	Yes
Paragraph Style	Yes	Yes
Footnotes	Yes	Yes
Custom Keyboard Equivalents	Yes	No
Unlimited Undos	Yes	No
Noncontiguous Selection	Yes	No
Rectangular (Vertical) Selection	Yes	No
File Management & Retrieval System	Yes	No
Graphics Layer	Yes	No
SPELL CHECKER:		
Words	135,000	135,000
User Dictionary	Yes	Yes
Skip All	Yes	No
Replace All	Yes	No
Auto Hyphenation	Yes	No
Thesaurus Words	1.4 Million	1.4 Million
FIND/REPLACE FEATURES:		
Find All	Yes	No
Wild Cards	5	1
Font, Size, Style, Color Sensitive	Yes	No
Phonetic Find	Yes	No
OTHER FEATURES:		
Editable Clipboard	Yes	No
Electronic Bookmarks	Yes	No
Swap Paste	Yes	No
Append Copy	Yes	No
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Virtual Memory	Yes	Yes
System 7 Compatible	Yes	Yes

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printer. The printer's inks have been reformulated to adhere to a broad range of media and produce durable prints. \$9995. Tektronix, 503/682-7377, 800/835-6100; fax 503/682-2980.

PMO-650

A 650MB rewritable optical drive that incorporates the company's Optical Hard Drive mechanism, offering speeds the company says are faster than most hard drives. The drive also features an 80188 processor running at 20MHz for strategic data mapping and data queuing on reads and writes. \$3995. Pinnacle Micro, 714/727-3300, 800/553-7070; fax 714/727-1913.

PowerPortrait

A SCSI-based, 15-inch display for compact Macintoshes, PowerBooks, and Mac-compatible portable computers that has built-in QuickDraw acceleration and supports resolutions of 72 dpi, 80 dpi, and 88 dpi; the refresh rate is 97Hz. The monitor does not require a graphics board and has a built-in hardware pan mode that allows users to work on a virtual two-page desktop at up to 1024 by 1024 pixels. An optional anti-glare, antistatic coating is \$50. Platinum model with DB-25-to-DB-25 cable \$995; granite model with HDI-30-to-DB-25 cable \$1095. Sigma Designs, 510/770-0100, 800/933-9945; fax 510/770-2640.



PowerPortrait

QuadraLink DMA

A board for NuBus Macintoshes that provides four serial ports running at 57.6Kbps. The board includes AE Shadow software that enables programs that do not use



QuadraLink DMA

Apple's Communications Toolbox to recognize and use the four extra ports. Optional ShadowLAN software allows users to share any of the four ports—as well as a Mac's built-in serial ports—across an AppleTalk or EtherTalk network. \$499; with ShadowLAN software \$599. Applied Engineering, 214/241-6060, 800/554-6227; fax 214/484-1365.

RGM-1901

A 24-bit, 19-inch color monitor designed for color proofing and correction that resolves 1024 pixels horizontally by 768 vertically. It is built to maintain a white balance and color temperature of 5000 degrees Kelvin, and it has an advanced beam-feedback system for maintaining a constant black level. The monitor uses clear, unfiltered glass and SMPTE Type C color phosphors. \$6995. Sony Corporation of America, 201/930-7796, 800/222-7669; fax 201/930-7837.



RGM-1901

SB-TMO-1000

A 1GB external 5 1/4-inch rewritable optical disk drive that uses a Maxoptix Tahiti II drive mechanism; is backwardly compatible with ANSI/ISO-standard 650MB 5 1/4-inch cartridges; and comes with partitioning, mounting, and password-protection software. MicroNet says the drive has an access time of 35ms and sustained data-transfer rates of greater than 900K per second. \$5345. MicroNet Technology, 714/837-6033; fax 714/837-1164.

TowerFeed 444

A device that can be configured with up to five paper drawers (each with a 500-sheet capacity) for use with Apple LaserWriter II, II, IIx, II, and IIg. A coding system inside each drawer identifies the size and type of paper in that drawer so drawers can be changed without reconfiguring printer or device. The TowerFeed's driver soft-



TowerFeed 444

ware allows users to choose a paper type from any print dialog box. \$1995 to \$3445, depending on the number of trays installed. Rutishauser, 813/254-6878, 800/676-3962; fax 813/254-7891.

UltraDrive 120MO

A 120MB, 3 1/2-inch magneto-optical drive that GCC claims has an average access time of 35ms. The drive comes with one 120MB cartridge, the company's DriveManager disk-management software, and MacTools Deluxe from Central Point Software. \$1899. Additional cartridges \$69 each; three-pack \$177. GCC Technologies, 617/890-0880, 800/422-7777; fax 617/890-0822.

VISIT Video

A desktop video-conferencing application that uses switched-56 digital and ISDN lines and lets users see real-time video images of each other on a Macintosh screen while sharing documents, graphics, and other information. The system includes software, a video circuit board, camera, and communications hardware to access public and private telephone networks. The product also supports a full range of Northern Telecom's digital PBXs, \$2900 to \$3500 depending on network configuration. Northern Telecom, 408/988-5550, 800/667-8437; fax 408/764-2659.

SOFTWARE

Bankruptcy Mac 2.0

A set of FileMaker Pro templates that generate bankruptcy forms for Chapter 7 and 13 filings. The program was designed to produce the new Official Bankruptcy

Forms and contains all forms necessary for filing with the clerk of any U.S. District Bankruptcy Court; additional practitioner forms are also included. The package automatically calculates a summary of schedules as well as computations for the debtor's current income and expenditures. 2MB min. memory. \$119. cpo law, 419/695-8480.

Battle of Britain 2

A color, simulation game that re-creates the Battle of Britain using a plotting map, tote-board system, and other information. The player tracks radar and ground observer reports, analyzes the size and potential threats of enemy forces based on incoming information, and interprets daily intercepts. The player must also cope with changing weather patterns, dwindling resources, and the Luftwaffe's seeming ability to outfox the Allied pilots at every turn. 1MB min. memory. \$54.95. Deadly Games, 212/475-2377; fax 212/475-2377.



Battle of Britain 2

Blackjack Tutor

A blackjack simulation and tutorial package that features extensive game-summary reporting in SYLK file format, card-counting drills, and many different game configurations. The program supports up to seven players and can be set up to compare each play decision against a particular blackjack strategy and also to compare wagers against a wager strategy. Animated graphics show card dealing and collecting; players can save strategy files that contain game decisions. 2MB min. memory. \$99. InSite Systems, 919/554-4736.

ClientTrac

An office- and contact-management software package that keeps a personal scheduler by day, week, or month; has a to-do list; and can create an unlimited number of project and check lists. The program puts an icon



ClientTrac

bar at the top of the screen for navigation and also serves as a word processor. For managing contacts the program can dial phone numbers, has a call-back alert, and stores a variety of client information. It also does mail merges and prints reports, phone books, and large and small mail labels. 2MB min. memory. \$135. Whiskey Hill Software, 415/851-8702.

EISToolKit

A spreadsheet-based tool for developing information systems; allows users to create custom executive information systems without programming. The systems users create feature graphical user interfaces, access to Excel and Lotus 1-2-3 spreadsheets and mainframe databases, password protection, and presentation-quality graphics. Customizable model packages enable users to track, analyze, and understand marketplace dynamics. 2MB min. memory. \$895; with Wingz \$995; run-time version for one user \$299.95; run-time version for ten users \$400. MicroStrategy, 302/427-8800; fax 302/427-8810.

ImageAccess

A relational database that provides data entry, searching, sorting, and organizational functions for images; works directly with Nikon's LS-3510AF film scanner and auto-feeder allowing unattended scanning and cataloging of up to 300 slides at a time. When an image is acquired the program records the file name, date of acquisition, location, size, dimensions, creator, and image type; other data fields can be defined by the user. File formats supported include



ImageAccess

TIFF, PICT, 8BIM, and JPEG; the program also creates thumbnails for each image imported, and can display a scrollable grid of thumbnails. 8MB min. memory. \$495. Nikon, 516/547-4355, 800/645-6687; fax 516/547-0305.

KidDesk

A menuing and desk accessory program that protects data on a hard drive while providing children with a personalized workspace of their own. The program hides the menu bar, gives kids easy access to applications through icons, and requires a code to exit. Users can choose from six desktop themes, including Dinosaur and Executive Desk; each desktop has several desk accessories that can be



KidDesk

accessed by clicking on icons. The accessories include a talking clock, a calculator, a calendar, and a voice-mail system that uses the built-in microphone on Macs that have one. 1MB min. memory. \$39.95. Edmark, 206/861-8200, 800/426-0856; fax 206/861-8998.

Leisure Suit Larry 5

A color, animated adventure game that stars Larry, who in this episode is the Chief VCR Rewinder for "America's Sexiest Home



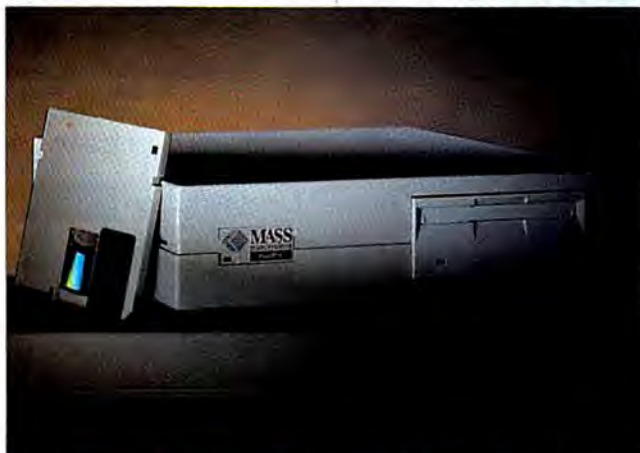
Leisure Suit Larry 5

Videos," a mob-controlled television program. Players must help Larry in his quest to find a hostess for the show. A second plot line runs in conjunction with Larry's story: Patti goes undercover to expose corruption in the entertainment industry. The program also features a *continues*

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stereo soundtrack. 2MB min. memory. \$69.95. Sierra On-Line, 209/683-4468; fax 209/683-3633.

Mac Video Titler

A video character generator for video production that works with Adobe Type Manager and TrueType fonts, supports NTSC and PAL video output boards, and enables users to record titles to videotape or save them as

PICT files. Users can select fonts, sizes, styles, and colors for each individual character and can add drop shadows; titles can also be keyed over a PICT image. 5MB min. memory. \$139.95. McQ Productions, 415/348-1344, 800/659-4755; fax 415/342-0199.

MacAnimator

A video-animation controller for recording PICTS



MacAnimator

animations and PICT file sequences onto videotape; requires any NTSC or PAL video output board and works with most 1-inch and all broadcast-quality 3/4-inch, MII, and Betacam recorders, as

well as professional SVHS recorders. Versions of the software exist for industrial-level recorders that don't provide RS-422 serial remote port. 5MB min. memory. \$249.95. McQ Productions, 415/348-1344, 800/659-4755; fax 415/342-0199.

MacEnvelope Professional

An envelope-labeling and addressing package de-

signed to take advantage of the United States Postal Service's automation technology to speed delivery and save postage. The program has a database that stores up to 300,000 records and saves dates, comments, flags, and carrier routes. The package also prints wide-area bar codes, pre-sort orders, carrier lines, and package and sack reports with automation totals. It has an optional CASS certified ZIP+4 lookup feature for retrieving addresses from CD ROM. 2MB min. memory. \$250. Synex, 718/499-6293, 800/447-9639; fax 718/768-3997.

memory. \$129. No Hands Software, 415/321-7340.

Nutri-Calc Plus

A diet-analysis program that lets users assess foods, recipes, and meals for nutrient content. The package includes a database of over 3500 foods, including prepared foods, fruits, vegetables, and fast foods; users can also add foods to the database. The application analyzes foods for 33 nutrients and compares the information to RDA averages and a user's dietary goals. 1MB min. memory. \$169. CAMDE, 602/926-2632.

ScreenShare

A network utility package that enables an instructor to demonstrate computer programs and techniques to students by broadcasting an image to all computer screens with the ScreenShare software installed. When the instructor takes control of the screens, the program temporarily suspends programs running on students' computers and disables students' keyboards. 1MB min. memory. \$329 per lab site. White Knight Software, 604/290-4855; fax 604/430-0144.

SoftPolish

An application that examines an individual file, a folder, or an entire volume; looks for conflicts with Apple's user-interface guidelines, finds misspelled words, and detects missing resources. The program performs over 50 tests on resources that contain visible elements of the Mac interface and several hundred tests for resource validity problems that can cause applications to be incompatible with other software. The program generates a log and includes an English spelling dictionary; nine international spelling dictionaries are available for \$49 each. 2MB min. memory. \$295. Language Systems Corp., 703/478-0181, 800/252-6479; fax 703/689-9593.

Super QuickDex

A package of three utilities for storing information and contacts, printing envelopes using the stored data, and printing a variety of address books. QuickDex II is a desk accessory that works



MacEnvelope Professional

MacParcel

A desk accessory that calculates United Parcel Service rates and zones to give users costs for shipping UPS parcels and letters in the United States and Puerto Rico. A user inputs the destination zip code, weight, and declared value for a shipment; the program then calculates the shipping zone and total cost for shipment, including C.O.D., insurance, and any user-defined handling charges. 1MB min. memory. \$39.95. Computer:applications, 919/846-1411; fax 919/846-1412.

Magnet

A utility that uses three steps to perform a variety of actions including finding files, scheduling backups, automatically filing items on the desktop, changing the views in the finder, and keeping shared files current. The user first identifies the kind of files the software should look for, then determines when to find them, and finally, decides what Magnet should do with them. The software can also reconcile files between two Macs, updating older files with more recent versions. 1MB min.

Anti-virus software that's tough on viruses, not on you.

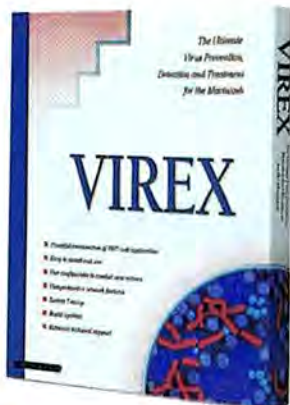
Computer virus problems within your organization can be a nightmare. New Virex® 4 is a network manager's dream. Its powerful network features enable Macintosh network managers to configure and update individual user machines from a single Mac. Network managers can also gather information about virus attacks within the organization. And Virex has always been the easiest anti-virus product to use. With Virex, you won't be tied up with lots of user questions about your anti-virus software.

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as a free-form database and autodialer; QuickElope is a single-envelope-addressing desk accessory with type auto-sizing, centering, and printing; PrintDex is an application that prints information from QuickDex II in multiple address book forms. 1MB min. memory. \$89.95. Casady & Greene, 408/484-9228, 800/359-4920; fax 408/484-9218.

CD ROMS

Darwin

A collection of the works of Charles Darwin that includes the complete text and illustrations from *The Voyage of the Beagle*, *Origin of Species*, and *The Descent of Man*, as well as Michael T. Ghiselin's book *Triumph of the Darwinian Method*. The text from the five-volume set *Zoology of the Voyage of the Beagle* is also included. The CD contains a bibliography of over 1000 primary and secondary references, a timeline detailing significant events in Darwin's

life, and more than 650 color and black-and-white images. \$99.95. Lightbenders, 415/621-5746, 800/432-3766; fax 415/621-5898.

PrimeTime

A collection of media clips that includes over 100MB of animated actors, background props, and sound clips for use with the company's Promotion and Addmotion II animation processors. The CD ROM also contains buttons for use in the programs and in QuickTime movies. The clips can also be used in a variety of animation and presentation packages from other vendors. 4MB min. memory. \$99.95. Motion Works, 604/685-9975; fax 604/685-6105.

Resource Library Volume I

A collection of public-domain color pictures and QuickTime movies taken from sources such as NASA and the U.S. Department of Agriculture. Subjects include animals, people, plants, space, weather, farms, and

ranches. 2MB min. memory. \$49.95. Bliss Interactive Technologies, 405/439-2247.

Total Baseball

A multimedia-based history of baseball that includes more than 2600 pages of statistics and articles dating back as far as 1871; more than 500 images of players, teams, and ballparks; and sound clips of some of the game's memorable moments. The product has over 120 years of detailed statistics, standings, and images. Includes batting, pitching, and fielding registers for major league players; the top 100 all-time, lifetime, and single-season leaders in a variety of categories; and full team rosters. 2MB min. memory. \$69.95. Creative Multimedia Corp., 503/241-4351, 800/776-9277; fax 503/452-5930.

ACCESSORIES

Macky Sac

A 5-inch neoprene-and-cotton beanbag for use as

a wrist rest to provide support to user's wrist, elbow, and upper arm. Macky Sacs have Velcro fasteners that let users connect several of the devices together. The product comes in blue, purple, pink, and black. \$6.99. WYSI Z WYG Design, 619/488-6852, 800/748-6236.



Macky Sac

Paper Partner

A paper-out sensor that works with a variety of printers—including the Apple LaserWriter II series, Hewlett-Packard LaserJet II and III series, and the Canon LBP 8II and III series. The sensor is placed in an open slot at the rear of a printer's paper tray and beeps when the printer runs out of paper. The Paper Partner is powered by an alkaline battery pack, which is only used when the device is beeping. Installa-

tion requires no modification to the printer. \$69.95. Action Laser Products, 714/491-1983, 800/289-1983; fax 714/491-0501.

BOOKS

Macintosh Programming Secrets, Second Edition

A collection of tips, techniques, and diatribes on how to program the Macintosh that is fully updated to cover System 7 and other new Mac features. The book's first section explores the underlying concepts of Mac programming and details bits of its history; the second section focuses on designing applications and includes exercises that demonstrate the capabilities of dialog boxes, QuickDraw, the mouse, windows, and other features. Written by Scott Knaster and Keith Rollin. \$29.95. Addison-Wesley Publishing Co., 617/944-3700, 800/447-2226; fax 617/942-1117.

The Macintosh Hard Disk Companion

A guide to using hard drives on a Macintosh under System 6.X or System 7 that covers a wide range of topics including start-up failures and data-recovery techniques. *The Macintosh Hard Disk Companion* is 400 pages long and contains a detailed troubleshooting guide. Written by J. Russell Roberts. \$26.95. Sybex, 510/523-8233, 800/227-2346; fax 510/523-2373. **m**

To have your product considered for inclusion in *New Products*, send an announcement with product name, description, minimum memory, peripherals required, pricing, company name, and phone number to New Products Editor, *Macworld*, 501 Second St., San Francisco, CA 94107. *Macworld* reserves the right to edit all product announcements.



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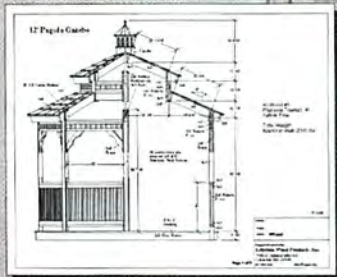
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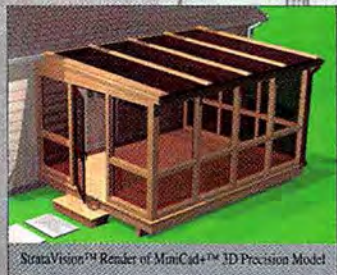
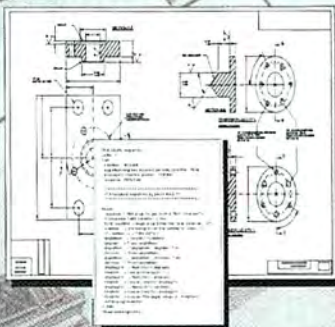
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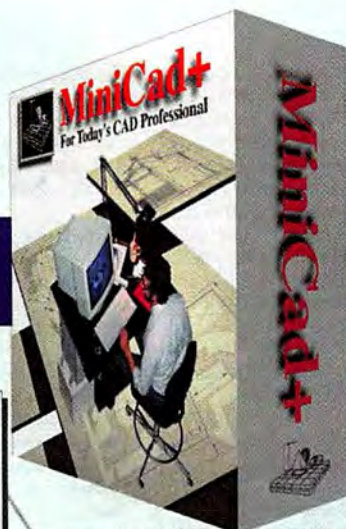
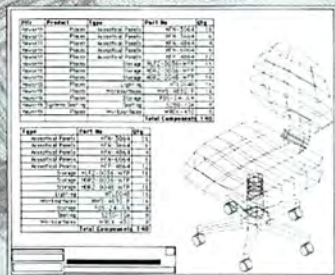
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Questions and Tips from Macworld Readers

BY LON POOLE

IN THE APRIL ISSUE A READER inquired whether she'd be better off taking her U.S. system overseas (specifically, Germany) or buying a replacement system there. My response included a table of electrical power requirements collected from various Apple documents. John O'Toole of Benton Harbor, Michigan, spotted an error in the table, and I found a couple more. The Mac IIsi works with any voltage from 100 to 240 (not just 120 volts); The AppleCD SC requires 100V to 120V power (the AppleCD SC Plus works with 100V to 240V); and the StyleWriter is not recommended for use with 50Hz power.

D. Smith of Aachen, Germany, was surprised my response didn't address the reader's "fiscal and mental *Gesundheit*." Smith says compared with the price and service benefits of the super-competitive U.S. market, the cost of European Macs and the support that accompanies them are appalling. In Germany, the price you pay for most hardware is between 50 and 100 percent higher than the list price in the United States (and you rarely pay full list price in the U.S.). A 10 to 15 percent import duty and a 15 percent value-added tax explain part of the higher prices. You can forget trying to negotiate a better deal; dealers' reactions range from surprise to offense. And the concepts of service, products in stock, trade-ins, courtesy, and free delivery (indeed, free anything) haven't yet been translated into the European Apple desktop lexicon. Software costs are similarly outrageous—try \$210 to upgrade from Word 4 to Word 5, or \$300 to go from More 3.0 to 3.1! Fortunately, most well-known U.S. mail-order companies ship to Europe, and savings are usually significant even after freight and duty are paid. Smith's advice for Macintosh fanatics moving overseas is to take your Mac with you.

Control Panels, DAs, and Memory

Q Under System 7, do control panels and desk accessories use RAM when they're not open?

Mitchell Rose
Los Angeles, California

A DAs use memory only when you open them. Under System 7, each open DA gets 20K of memory. If a DA needs more memory than that, it increases the system software's memory size between 10K and 200K (depending on its individual memory needs). You can observe this in System 7 by checking the system software size with the Finder's About This Macintosh command before and after opening a DA. When you open DAs under System 6 with MultiFinder, they get all their memory by increasing the system software size; without MultiFinder they steal memory from the open application program.

A control panel uses memory when it is not open if it includes a system extension (also known as an INIT or start-up document). The Mac loads the system extension portion of the control panel into memory during start-up, increasing the system software size by 10K to 300K per control panel. Many control panels display icons during start-up if they contain built-in system extensions, but not all do. Two of the standard control panels contain system extensions and increase the system software's memory size—Easy Access (about 12K) and Memory when it's used on a PowerBook (about 38K). To find out which of your control panels contain system extensions and how much some of them increase the system software size, you can use the Profiler module of Now Utilities from Now Software (503/274-2800). Profiler reports the increase in system software size only if you have installed the StartUp Manager module of Now Utilities. You can use Now's StartUp Manager or the free program Extensions Manager 1.6 by Ricardo Batista (available from user groups and online services) to determine which control panels load. You can also prevent a control panel from loading by dragging its icon to the desktop or to a folder other than the System Folder, Extensions folder, or Control Panels folder.

To temporarily suspend loading of all extensions and block opening of items in the Startup Items folder, press the shift key while starting up or restarting the Mac. If you wait to press shift until you see the Finder's menu, then all extensions will load, but the items in the Startup Items folder will not be opened.

Control panels do not get their own slices of memory when you open them. When you open any System 7 control panel, it uses part of the Finder's memory. With System 6, you open one control panel device at a time inside the Control Panel desk accessory.

TrueType and LaserWriter Incompatibility

Q I can't print TrueType fonts on my original LaserWriter. Apparently TrueType fonts are converted to PostScript Type 1 format before being downloaded to an original LaserWriter, but that model has insufficient memory to image those downloaded fonts. Do you know if upgrading to a LaserWriter Plus will let me print TrueType fonts? My Apple dealer can't tell me if a Plus has more RAM or just more ROM to supply additional fonts. Is the RAM in a LaserWriter Plus expandable?

H. Edwin Simmers
Bellingham, Washington



*Using TrueType
on old Laser-
Writers, scoring
big in Lumatic
Fringe, making
custom icons,
and more*

A Both the original LaserWriter and the LaserWriter Plus came with 1.5MB of RAM. The Plus's 1MB ROM has more PostScript fonts and better memory management than the LaserWriter's 0.5MB ROM. The original LaserWriter's memory-management methods (in the printer's ROM) can't make space in the printer's RAM during a print job to allow automatic downloading of TrueType fonts (actually the PostScript derivatives created by the LaserWriter's ROM).

continues

Writer driver). My best information is that neither model uses SIMM chips, so increasing RAM wouldn't be practical.

Apple claims you can use the LaserWriter Utility program that comes with System 7 to manually download a TrueType font to an original LaserWriter, enabling you to print documents containing that font. Because the LaserWriter Utility program downloads the font to the printer before the print job begins, the LaserWriter's limited memory management doesn't have to cope with a change during the print job. However, you will probably be able to manually download only one TrueType font at a time.

Like the original LaserWriter, the Plus can't print TrueType fonts directly, but its improved memory management can make space in RAM for a font automatically downloaded during a print job. So the Plus should be able to work with the automatically downloaded PostScript Type 1 fonts that the LaserWriter driver software on the Mac derives automatically from the TrueType font.

Performance is slow, particularly when converting and downloading multiple TrueType fonts for one document.

Don't get swept away by TrueType hype. If you've got an original Laser-

Writer or LaserWriter Plus, you're better off sticking with PostScript fonts. You can replace TrueType fonts by converting them to PostScript format with the FontMonger program from Ares Software (415/578-9090), and you can use Adobe Type Manager (ATM) to see smooth PostScript fonts at any size on screen. You can get a copy of ATM and four Adobe Garamond fonts for \$7.50 by calling 800/521-1976, ext. 4400. Outside the United States and Canada you can get an International English version of ATM for \$30 by calling 303/799-4000, ext. 4600.

Upgrade or Not

Q. Three years ago I bought a Mac Plus with a 20MB hard drive and am considering upgrading it from 1MB to 4MB of RAM so I can use software that requires large amounts of memory. With so many new Mac models coming out, is the Plus worth upgrading? I don't want to invest in something useless.

*Andrew McCurdy
Randolph A.F.B., Texas*

A. A Mac Plus with 4MB of RAM is no speed demon but is far from useless. In fact you can accomplish quite a lot with a 2.5MB Plus and one of the

newer integrated software products such as ClarisWorks or Symantec's GreatWorks. A 2.5MB or 4MB Mac Plus is also adequate for word processing, accounting, telecommunications, basic drawing, uncomplicated spreadsheet calculation, and modest data management tasks. With 4MB you can keep at least two application programs open concurrently using System 7 or System 6 with MultiFinder. With 2.5MB you can count on having only one application program and the Finder open at the same time. Use System 7 if you need one of its special capabilities such as file sharing; otherwise stick with System 6 for its faster Finder, whose extra speed is especially noticeable on a Plus.

You should move up to a Classic II, LC II, or faster model when you start thinking about doing page layout, extensive graphics, slide presentations, complicated spreadsheets, involved database management, or other demanding work. To figure out where you are on the continuum between basic and complex graphics, spreadsheet, or database work—and consequently whether or not to get a faster Macintosh—take stock of how much time you use your Mac and how much of that time you spend waiting for it. The more you use it and the more

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you wait, the more you would benefit from a faster Mac.

When upgrading your software, you will need not only more RAM but also more storage space. You can buy a larger external hard drive now, use it with your Mac Plus, and later use it with a faster Mac model. When you get the drive, make sure it's formatted properly for a Mac Plus. The interleave ratio, which determines how the drive staggers blocks of saved data, should be 3:1 for best performance on a Plus. If you move the drive to a faster Mac, you must back up the drive and format it on the new Mac. For best performance on anything besides a Plus or an SE, set the interleave ratio to 1:1.

Self-Service

Q I have been a Macintosh user through my college years and am now a teacher and my school's computer coordinator. The school has decided to put in a new Mac lab—a prospect that really excites me. I would like to become a licensed Mac technician so I can maintain, upgrade, repair, and service Macs. Is there a manual or some software that could get me started?

Daron VanderHeiden
Austin, Minnesota

A You can probably install RAM, internal hard drives, and internal expansion boards without any formal training. Most of these products come with complete installation instructions (RAM and internal hard drives from Apple being notable exceptions). One author, Larry Pina, has written several books about repairing and servicing Macs. *The Dead Mac Scrolls* (Peachpit Press, 1992; 510/548-4393 or 800/283-9444) helps you diagnose common problems in Macs up to the II and SE/30, ImageWriters, and LaserWriters up to the IINTX. The book suggests general repair procedures but includes no detailed instructions. Pina's other books tell you how to fix the problems. *Macintosh Repair and Upgrade Secrets* (Howard W. Sams, 1990; 317/573-2500 or 800/545-5914) covers Macs through the SE. *Macintosh II Repair and Upgrade Secrets* (Brady Books, 1991; 317/573-2500 or 800/428-5331) covers all Mac II models and Apple's 12-inch monochrome and 13-inch color monitors.

You can become authorized to service your own equipment through Apple's Dealer Sponsored Servicing Owner (DSSO) program. An Apple dealer sponsors your enrollment in mandatory Apple-certified training classes, sells you service

modules and parts, and answers your technical-service questions. For more information, ask your dealer for a copy of the DSSO Product Sheet, which the dealer can get from his or her local Apple customer service manager. If you own or manage more than 100 Macs, you can apply for the DSSO program at a local Apple sales office (call 800/767-2275 for the location of the office nearest you).

Custom Folder Icons

TIP If you have too many look-alike folders cluttering your desktop and you use System 7, you can liven them up by superimposing a relevant application icon (see "Look Lively"). First copy a folder icon from its info window, which you view with the Finder's Get Info command, and paste it into a paint program. Then open the folder that contains the application whose icon you want to use, set the window view to By Small Icon, and take a screen snapshot (press ⌘-shift-3). Open the screen snapshot file (named Picture 1, Picture 2, or something similar on your start-up disk) with the paint program or with TeachText, copy the small application icon from the snapshot, and paste it over the previously pasted

continues

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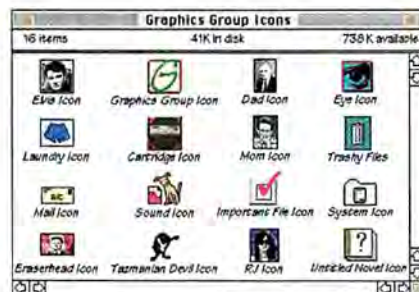


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Look Lively If you use System 7, you can replace plain folder icons with livelier composite icons. Copy a small application icon from a screen shot, paste it onto a plain folder icon in a color paint program, copy the composite, and paste it into the folder's info window.



Icon Store System 7 users can store hundreds of icons on a floppy for later use as custom icons. Howard Wright of Grand Rapids, Michigan, makes aliases of files with icons he wants to save and copies the aliases to a floppy named Custom Icons. Whenever he wants to customize a file, he copies the icon from the alias's info window and pastes it into the file's info window.

folder icon. Finally, copy the composite icon from the paint program, paste it into the custom folder's info window, and close the info window.

*Alex Johnson
Cincinnati, Ohio*

The custom icons obscure any subsequent changes you make to the folder's color from the Finder's Labels menu, or to the folder's file-sharing status using the Finder's Sharing command.—L.P.

SIMM Compatibility

TIP I read in the January issue about some SIMM incompatibilities [1MB SIMMs that have only two chips instead of eight chips may not work on a Mac Plus, an SE, a Classic, a Mac II, or a IIx; and some third-party 2MB SIMMs do not work on a Mac LC or IIsi—L.P.]. I recently discovered another memory problem, much to my chagrin. The Mac II and IIx are not compatible with standard 4MB SIMMs, but require special SIMMs with

PAL (programmable array logic) chips. In addition, the Mac II cannot be upgraded to more than 20MB with 4MB SIMMs because the bank-A SIMM sockets work only with 1MB SIMMs.

*Maurizio Maggiore
Milan, Italy*

Macintosh Technical Note 176 explains that the original Mac II ROM limits the four SIMMs in bank A to a maximum of 1MB each. You can put four 4MB SIMMs or four 16MB SIMMs in bank B for a total of 20MB or 68MB. You may also be able to install 2MB SIMMs in bank A; the booklet *Macintosh Memory Guide* (distributed free by Connectix, 415/571-5100 or 800/950-5880), says you can. You can work around the bank-A limitation by installing the \$449 Mac II SuperDrive upgrade kit (part M6051/C), which includes a set of Mac IIx ROMs along with an internal SuperDrive and the SWIM chip (Super Woz Integrated Machine, named after Steve Wozniak, who invented the circuitry used for all Apple floppy disks except 1.4MB disks). This upgrade raises the Mac II's RAM limit to 128MB, the same as the limit for the SE/30, IIx, IIcx, IIsi, and IIfx. To use more than 8MB of installed RAM on any Mac, you must either use System 7 and turn on 32-bit addressing in the Memory control panel or use Connectix's Optima software with System 6.0.7. To use System 7's 32-bit addressing on a Mac SE/30, II, IIx, or IIcx, you must install Connectix's Mode32 software (available free from Apple dealers or by calling 800/776-2333). Whether you use Mode32 with System 7 or Optima with System 6, you must also install a 68881 PMMU (Paged Memory Management Unit) chip to use more than 8MB of RAM on a Mac II.

Tech Note 176 also explains that the special PAL chips prevent the Mac II and IIx from unwittingly activating a test mode built into the RAM chips used on 4MB SIMMs. These chips came into being after Apple designed the Mac II and IIx; the previous generation of memory chips, which are used in 1MB SIMMs, do not have the problem-ridden test mode. Although only the II and IIx require the 4MB SIMMs with PALs, those SIMMs are compatible with the SE/30, Classic II, LC, IIsi, IIcx, IIsi, and Quadras (but not the IIfx, which has unique SIMMs).

Tech Notes are available from some user groups and online information services. You can also order a complete set of notes and a year's update subscription on disk for \$65 or on paper for \$100 from APDA (408/562-3910 or 800/282-2732, 800/637-0029 in Canada).—L.P.

Lunatic Fringe Mania

TIP Just when I thought it was safe to reboot—I spent most of last year at the Betty Ford Center trying to extradite little Lode Runner men from my nightmares—I happened upon my roommate firing at little purple bubbles on his new Mac. Five months, many one-upped high scores (don't ask, but it's Level 67), and innumerable games later, I have decided to come clean on my tricks and tactics for that sneaky little option in Berke-

ley Systems' After Dark screen-saver program, Lunatic Fringe by Ben Haller.

1. The faster you kill, the faster you advance levels. It takes four levels to get to the first real threat, the puffer, and two more to reach the deep threat, the slicer, at level 6. This may take 15 minutes. So kill fast, making use of the special weapons (they reappear somewhere in the grid as soon as you use them up). An option is to set the starting level as high as you can, for example, to level 10.

2. The hammerhead is easier to kill after it has released its mace and, as is true for each alien except the slicer, after it has bumped into an asteroid. Aim for the nose of the alien's ship. If you're a pufferphobe, circle it and shoot repeatedly at its backside.

3. You can use the turbo thrust to kill. If you are near death but still have a turbo thrust, aim your ship at the pursuing alien and hit the turbo thrust button. This works most satisfyingly with the slicer. You are invulnerable while you are thrusting, and can bump the alien to death. Although turbo-thrust-killing (like killing with the power shield) brings only half the normal number of points, it's almost always a more attractive option than dying.

4. With the triple gun, get as close to the alien as possible and blast it to smithereens in one shot.

5. If your turn jets are damaged and you are spinning wildly through space, hold down both the Turn Left and Turn Right buttons. This stops you from rotating and allows you to pilot yourself, albeit in fits and starts, in a specific direction.

6. Long sweeping passes through the entire grid often turn up hiding places of special weapons, turbo thrusts, power shields, and so forth.

7. In the high levels, avoid the hammerhead if you haven't any special weapons. Be content with killing sludgers and slicers instead.

*Alex Pugsley
Toronto, Canada*

We pay from \$25 to \$100 for tips published here. Send questions or tips on how to use Mac computers, peripherals, or software (by mail or electronically) to *Quick Tips*, Lon Poole, at the addresses listed in *How to Contact Macworld* at the front of the magazine (include your address and phone number). All published submissions become the property of *Macworld*. Due to the high volume of mail received, we're unable to provide personal responses. **m**

LON POOLE answers readers' questions and selects their tips for this monthly column. His two most recent books are *Amazing Mac Facts* (Microsoft Press, 1991), a collection of the best published tips; and *Macworld Guide to System 7* (IDG Books Worldwide, 1991).

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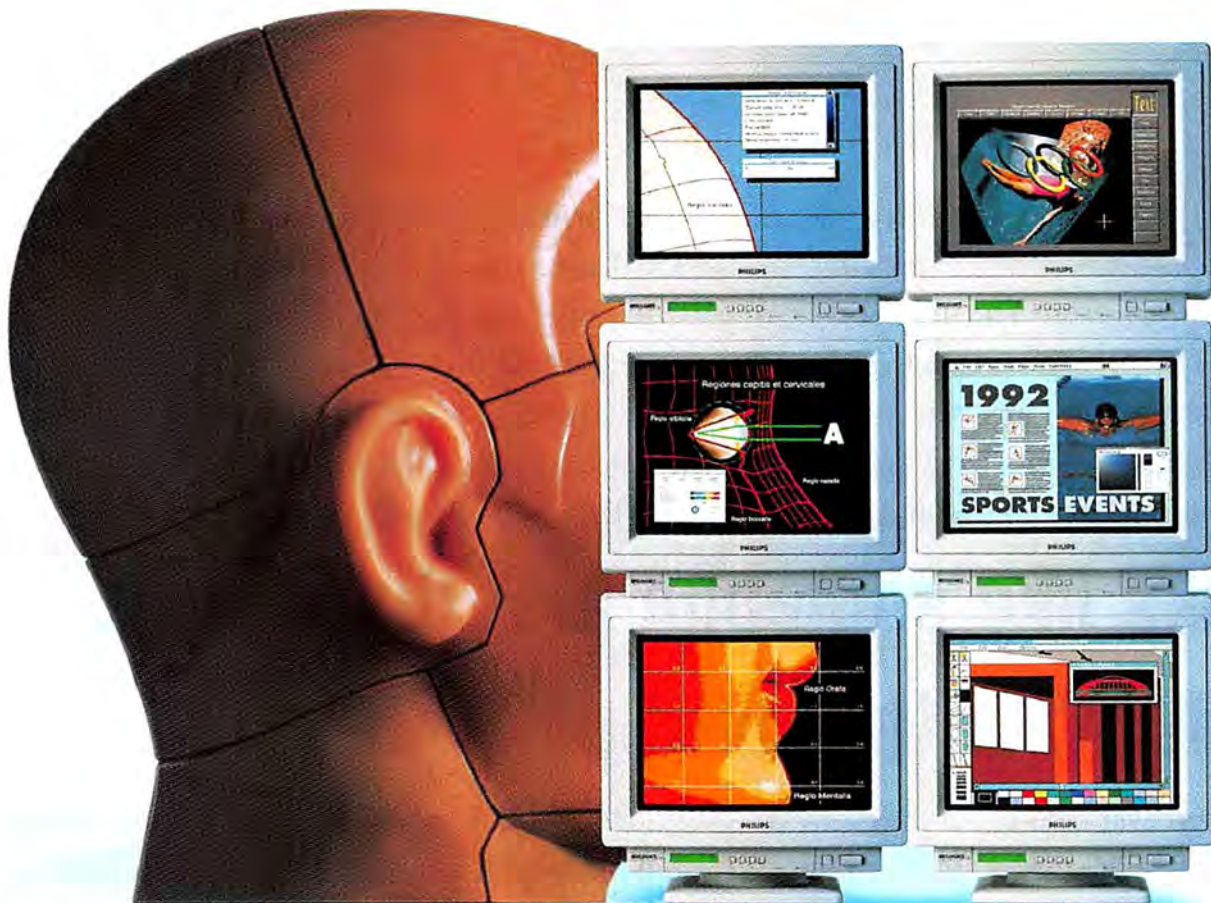
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* Actual refresh rate may be limited by video controller card or software.

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Font-Customizing Techniques

BY JIM HEID

THE MAC'S ABILITY TO SET TYPE in a variety of fonts, sizes, and styles has always been the cornerstone of its personality. The Mac's typographic features have improved dramatically in recent years, as *outline* fonts have become the dominant font technology in the Macintosh world. In an outline font, characters are described by mathematical equations; by processing these equations, the Mac can create characters of virtually any size—as if characters were created using rubber bands that can be stretched and resized.

The other major approach to describing fonts—the *bitmap* approach—isn't nearly as efficient or flexible. In a bitmap, or *fixed-size*, font, characters are described by an arrangement of bits. A separate arrangement is needed for each size; most bitmap fonts include descriptions for the common type sizes: 10-, 12-, 14-, 18-, and 24-point. (A *point* is a printer's unit of measurement; there are 72 points in an inch.) If you specify a point size for which no arrangement exists, the Mac *scales* an existing size to fit, resulting in misshapen, chunky-looking characters.

Instead of restricting you to specific sizes, outline fonts enable you to format text in any size—29-point, 17.5-point, 589-point. This makes it easy to fit headlines into a particular width, and it simplifies *copyfitting*—choosing the point size that enables a certain amount of text to fit in a certain amount of space.

Two outline font technologies are prevalent in the Macintosh world today: PostScript fonts are the veterans (and by far the most popular), and TrueType fonts are relative newcomers. PostScript printers such as Apple's LaserWriter IIx and IIg contain a selection of PostScript font outlines; you can supplement these *resident* fonts with *downloadable* fonts, which live on the Mac's hard drive and are transferred to the printer's memory during a print job. The most common and preferable format for PostScript downloadable fonts is *Type 1*; *Type 3* is a less common format that generally delivers inferior results on laser printers. If you use the Adobe Type Manager (ATM) utility, you can print Type 1 PostScript fonts on non-PostScript printers such as Apple's

StyleWriter or Personal LaserWriter LS.

Because of their flexibility, outline fonts are naturals for special typographic effects. Stretching a font more vertically than horizontally creates a skinnier, *condensed* version of the original typeface. Stretching it more horizontally than vertically gets a wider, *expanded* font. Attach an outline font to a curved line to create wavy-looking text, or stretch it to fit an irregular shape. You can even alter the characters themselves to create logos, special symbols, and fractions.

Numerous programs are available that let you perform these and many other font-customizing jobs. Altsys's Fontographer and Letraset's FontStudio let you alter fonts and create new ones from scratch. Ares Software's FontMonger, Type Solutions' Incubator, Design Science's ParaFont, and Altsys's Metamorphosis Professional are best suited to modifying existing fonts—converting them from one outline format to another, expanding or condensing them, or creating fractions.

Type-effects programs such as Letraset's LetraStudio and Broderbund Software's TypeStyler let you twist, stretch, squeeze, mold, mirror, and otherwise modify type. Both excel at *display type*—fancy headlines, product labels, logos. They let you do with a mouse what used to require hours of labor over a layout table or in a darkroom.

This month, I show how to perform several font-customizing jobs using these and other programs. You need to know how to install fonts in your system; instructions are in your Mac manual.

Expand and Condense

EXPANDING OR CONDENSING, or *horizontally scaling*, a typeface can give it a new, distinctive personality. A condensed font looks more delicate and allows more text to fit on a page; an expanded font has a weightier look (see "Expanding and Condensing").

The Aldus PageMaker and QuarkXPress publishing programs let you expand or condense text formatted in existing fonts; drawing programs

such as Aldus FreeHand and Adobe Illustrator do too. But wouldn't it be more convenient to have fonts that are expanded or condensed to begin with? That way, you could use them in programs that don't have horizontal-scaling commands, such as word processors. You can scale fonts in advanced programs such as Fontographer, but it is often easier in the basic (and more economical) font-customizing programs.

How to: ParaFont Choose New from the File menu, and then choose the font you want to scale from the Base Font pop-up menu. Select the Bold and Italic check boxes if you want to scale those styles, too. Choose Font Attributes from the File menu and type a name for the new PostScript font—for example, TimesCondensed or TimesFat. (A PostScript font name can't have a space in it.) From the Edit menu choose Select All and then Transform. Type the desired scaling percentage in the Horizontal Scale text box. Finally, use the File menu's Make Screen Fonts and Make PostScript Font commands to generate the bitmap and PostScript outline fonts to install in your system.

How to: Incubator Choose the TrueType font you want to modify from the Font menu. (Incubator works only with TrueType fonts.) Use the Width scroll bar to condense or expand the font, watching Incubator's sample-text display and preview window until you get the desired results. Finally, create the new font: click on Create, type a name for the font, click on OK, and then on Save. Install the resulting font file.

Because horizontal scaling distorts the proportions of a typeface, it compromises the original type design. Avoid scaling by more than 25 percent or so in just one direction unless you're after a particularly dramatic or gaudy effect.

Adobe's new Multiple Master font technology enables you to horizontally scale fonts without compromising the original type design. Besides being able to expand or condense a font, you can also

continues



*Mold, shape,
and refine the
Mac's cast of
characters with
today's top font
programs*

create any font weight, from extra light to extra bold. For details on this breakthrough font technology, see "Understanding Multiple Masters," *Macworld*, September 1992.

Let's Get Fractional

IF I HAD A DIME FOR EACH TIME I SAW a phony fraction such as 1/2 in an otherwise good-looking publication, I'd be rich enough to run for president. You can create your own fractions the hard way by reducing the type size of the numbers and then, if your word processor or publishing program allows, shifting the numerator up by a few points. Some fonts contain ready-made fractions; best of all are the *expert sets* some font vendors sell, whose *true-cut* fractions match a specific typeface, with the small numerals tweaked for better legibility.

You can also customize an existing font to create your own fractions—even oddball ones like $\frac{15}{128}$. It's easiest in FontMonger and ParaFont.

How to: FontMonger Use the Open command to open the font for which you want to create a fraction. When the keyboard display appears, select the key to which you'll assign the fraction. (To use an option-key or shift-option-key sequence, click the appropriate modifier key[s] in the keyboard display.) After selecting a spot for the fledgling fraction, choose Alter Character from the Keyboard menu. When the Alter Character dialog box opens, select the kind of fraction you want and then type the numerator and denominator in the appropriate text boxes (see "Making Fractions"). Click on OK, and then save the new, customized font using a different name to avoid replacing the original.

How to: ParaFont From the Base Font pop-up menu, choose the font for which you want to create fractions. Choose Fractions Only from the Key Layout pop-up menu, and then click on OK. ParaFont creates a font containing common fractions. You can double-click on a fraction in the keyboard display to specify your own numerator and denominator. Use the File menu's Make Screen Fonts and Make PostScript Font commands to generate the bitmap and PostScript outline fonts you'll install.

When creating a fraction, ParaFont extends numerals slightly to make them more legible—a nice touch. The results still don't quite compare to the true-cut fractions of expert font sets, but they're close. ParaFont's other customizing options use similar techniques; for example, the program can simulate *old-style figures*—numerals with ascenders and descenders, usually available only in expert

Times Roman. Thin and elegant. Stretch out.

Expanding and Condensing Expanding or condensing a font can give it a new personality. The original Times Roman (top); condensed 20 percent (middle); expanded 30 percent (bottom).

sets—by condensing certain characters and moving them up or down.

Turning Text into Pictures

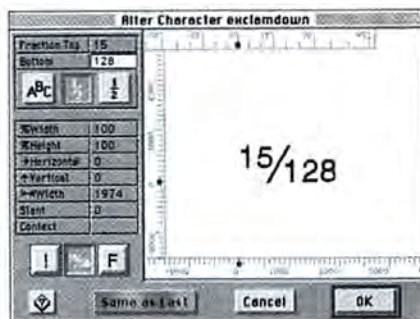
MANY COMPANY LOGOS CONSIST OF text that has been stylized, reshaped, shaded, or otherwise modified. Using Altsys's Metamorphosis Professional (Meta Pro, for short), you can convert a passage of text into an object-oriented PICT graphic you can paste into a graphics program and polish as you please.

How to: Metamorphosis Professional In Meta Pro's main window, click on the Convert Text button and choose the PICT to Clipboard option from the Format pop-up menu and the Type Your Own option from the Text pop-up menu. Choose the desired font, style, and size from their respective menus (a large size such as 100-point gives the best results—you can scale it down later). Type the text you want to convert in the text box and then click on Convert (see "Prose to Picture"). After the conversion is complete, switch to a graphics program and paste. If you paste into Claris MacDraw II or MacDraw Pro, you can reshape an individual character by selecting it and then choosing Reshape from the Edit menu. Keep in mind you won't be able to edit or reformat the text once it's a graphic. If changes are required, you'll have to return to Meta Pro and start over.

Meta Pro can also save converted text in a PICT or encapsulated PostScript (EPS) file that you can open using an object-oriented drawing program or import into a publishing program. Meta Pro can also convert fonts themselves from one format to another. If you have Type 3 PostScript fonts, for example, you can convert them to Type 1 format for use with Adobe Type Manager. Meta Pro can even convert fonts for or from an IBM PC or Next computer. If you have a Mac and a PC, you can convert Mac fonts into ones usable by Microsoft Windows.

Turning Pictures into Text

ANOTHER CUSTOMIZING TASK INVOLVES adding graphics, such as a scanned image



Making Fractions FontMonger and ParaFont make it easy to create fractions. Type the numerator and denominator in FontMonger's Fraction Top and Bottom boxes (top). The window's title indicates that the upside-down exclamation mark character (!) is being modified. Choosing ParaFont's Fractions Only keyboard layout creates a new font based on the existing font but containing only common fractions (bottom).

or an image from a clip art collection, to an existing font.

You might start by scanning an original—your signature or company logo, perhaps—and then saving the resulting image. Scan a large original if possible (if you're scanning your signature, write big); you'll get more detail in the resulting font. Import the scan into Fontographer or FontStudio and use the *autotrace* feature to trace the image. If you've worked with PostScript illustration programs such as FreeHand or Illustrator, you might prefer to trace the image by hand. In either case, the result is an outline character of the art you scanned.

How to: FontMonger First, put the scanned image on the Mac's Clipboard: using a graphics program or your scanner software, select the image and choose Copy from the Edit menu. Then start or switch to Fontographer and open the font you want to modify. Select the character position for the new character and double-click on it to open the character-editing window. To remove the character already in that position, choose Select All and then Clear from the Edit menu. Choose Paste from the Edit menu—the image appears in gray. Choose Trace Background from the Path menu and click on OK. Fine-tune the resulting outline if desired. Use the File menu's Generate Fonts command to make the font you'll install in your system.

How to: FontStudio FontStudio does not accept scans from the Clipboard; you need to save an image in TIFF, PICT, or

MacPaint format and then open the image in FontStudio as a *template*. Use the File menu's Unpack Suitcase command to open the font you want to modify. Double-click on the appropriate bitmap or outline-font icon in the Family window, and then double-click on the character you want to replace. To remove the character already in that position, choose Select All and then Clear from the Edit menu. Now choose Open Template from the Character menu and double-click on the name of the previously saved original image. Select the autotrace tool and then click within the character-editing window. Fine-tune the resulting outline if you like, then generate the font.

This scan-and-trace process is how font developers work: a designer hand-draws large masters for each character, scans them, and then traces them. You can apply these techniques yourself to create an entirely new font. Create a font of your own hand-printed letters (great for architects; not recommended for physicians). Or make a font from a sample in an old type-specimen book—many books containing old display type and a variety of ornamental *dingbats* are available from Dover Books. To get good results, you need to do a great deal of fine-tuning and print a ream or two of test output to check spacing in all sizes and character combinations. When done, you'll have a new appreciation for the skill and patience of a professional type designer.

Type on Display

THE FONT-CUSTOMIZING PROGRAMS I have covered so far let you create and modify fonts that you then install in your system to use with other programs. Letraset's LetraStudio and Broderbund's TypeStyler are designed to let you create special typographic effects using fonts already in your system. (Both programs also provide their own proprietary outline fonts.) The result is typically a PICT or EPS file that you import into a publishing or illustration program.

With either program, start by typing text and then formatting it in the desired font. Next, you might fine-tune the character spacing; instead of requiring you to use awkward ⌘-key sequences to adjust spacing (as do publishing programs), both programs let you simply drag characters left or right—a more efficient and direct technique. After you tweak the spacing, you might draw a shape and resize the type to fit within it (see "Styling Type"). Nothing illustrates the flexibility of outline fonts like watching characters recast themselves to fit a shape you draw.

Both TypeStyler and LetraStudio work with PostScript and TrueType fonts



Prose to Picture Metamorphosis Pro can convert typed text into a PICT graphic that you can modify. Converting the text (top); the PICT image pasted into MacDraw Pro, where the T was reshaped and a gradient fill applied (bottom).

and also include a few display typefaces. If you work with display type frequently, investigate Letraset's Fontek library of over 100 display typefaces. Each Fontek package includes both TrueType and Type 1 PostScript versions of the first-rate display type that Letraset has been selling for years.

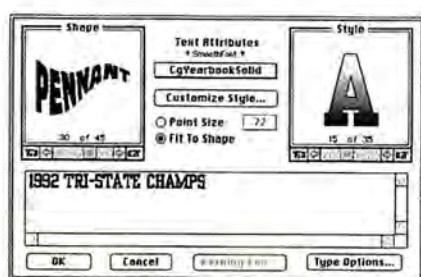
A simpler effects program is PostCraft International's Effects Specialist, which lets you apply 120 special effects to text you type. Effects Specialist doesn't let you fit type to irregular shapes or manually kern by clicking and dragging characters. But it does provide more special effects than TypeStyler and LetraStudio do, and you can modify those effects in a dizzying number of ways.

For those who think big, there's Broderbund's BannerMania. This fun program lets you create, yes, banners—choose one of the 50 built-in designs, type your text in any of 19 built-in fonts (or use any Type 1 PostScript font), apply one of the 34 built-in special type effects and 134 built-in color schemes, print, and then assemble the resulting pages. You can also customize designs, type effects, and color schemes. It's a sign maker's playground.

Font Futures

THERE ARE ENOUGH OPTIONS OUT there to keep a font customizer busy for years, but there are even more on the horizon. Apple has announced enhancements to the Mac's system software that will simplify the creation of three-dimensional fonts and give TrueType technology features similar to those of Adobe's Multiple Master fonts.

If you want to create stunning three-dimensional type, investigate Pixar's *Typistry*, which should be shipping by the



Styling Type To create display type with TypeStyler, specify the text and the desired font, effect, and shape the text will fit into (top). The resulting effect appears at bottom.

time you read this. *Typistry* lets you create 3-D text from existing fonts. After typing some text, you can apply a variety of surfaces—from wood grain to marble to chrome—to it as well as simulate various lighting effects. You can also animate the text and create QuickTime movies of the results (see last month's column for an introduction to QuickTime).

Note that there are some legal issues behind font customizing. Specifically, you can't legally modify a copyrighted, commercial font (or use it to create fractions) and then distribute the resulting font or post it on an online information service—even if you change the font's name. Doing so is as much a form of software piracy as copying a word processor for a friend.

You should note that some font-customizing tasks—for example, fitting text to a shape, stretching and condensing a font, applying special PostScript effects and gradients—lengthen printing times, especially to a PostScript-based image-setter. If you're creating a document laden with effects, prepare to wait—and to pay more if you use a service bureau that charges by the hour.

If your patience and budget don't restrain you from going overboard, let your sense of good taste do so. Don't go crazy with glitzy effects. Good font customizers work like jazz musicians—they improvise and customize, but they also preserve the essence of the original. **m**

See *Where to Buy* for contact information.

Contributing editor JIM HEID looks at a different aspect of Mac fundamentals each month. His latest books are *Macworld Guide to Microsoft Word 5* (1992) and *Macworld Complete Mac Handbook* (1991), both published by IDG Books Worldwide.

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Insights

BY LON POOLE

Tips to Power Up Your Presentations

People use everything from HyperCard to MacDraw for creating presentations on a Mac, but Aldus Persuasion has been one of the most popular presentation tools since it first appeared. It's a mature, stable product and is available directly from Aldus (206/628-2320, 800/685-3540; fax 206/343-3360). The most notable improvements in its latest revision, version 2.1, include System 7 capabilities such as publish and subscribe and the ability to play QuickTime movies. Some of the tips that

follow come from Tim Davenport in Aldus technical support by way of Jill Miller in Aldus public relations. Ravi Khalsa, who runs the video service bureau Khalsa Productions in Phoenix, provided most of the information about printing presentations to videotape.

Reshaping Free-Form Graphics

Few humans can devote the long hours of study and practice required to master drawing free-form graphic objects

correctly with a mouse the first time. Persuasion 2.1 offers a crutch that earlier versions lack—the editing of free-form shapes. Select a free-form shape and choose Reshape Poly from the Draw menu. A handle appears at each vertex of the shape, and you can drag a handle or a line to change the shape. To add a handle, click anywhere on a line. To delete a handle, drag it on top of another handle. To finish editing the shape, click somewhere away from it in the window.

Chart Spacing

Persuasion has no commands for adjusting the spacing of bars in a bar chart or columns in a column chart, but you can spread out bars or columns (see "Spread Out"). Just insert rows or columns in the data sheet as though you were inserting additional categories between the existing categories. Do not leave the values of the new categories blank, or Persuasion will plot the blanks as zero values. Instead, type a blank space in each empty cell of the new categories. Click the Toggle box to reselect all the chart's cells, and then click the Replot button to have Persuasion interleave blank bars or columns among the non-blank bars or columns.

If your chart includes a legend, Persuasion adds a key for each new blank category. To remove bogus keys from the legend, ungroup the chart,

select and delete the extra keys, adjust the position of the remaining legend parts, and regroup the chart. Do this only as a final step. If you later must replot the chart, you'll have to remove the extra keys again.

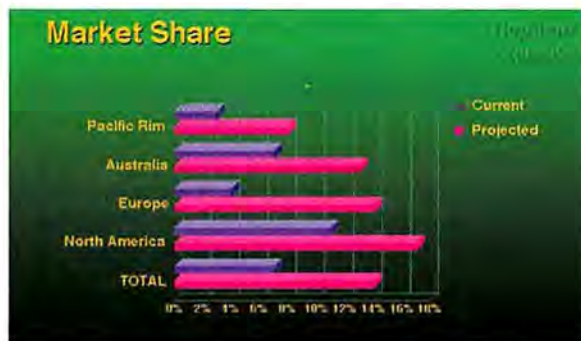
Embossing Text and Graphics

You can create the effect of raised or embossed text and graphics by forsaking Persuasion's Shadow command and adding a highlight and a shadow of your own (see "Raised Text"). Working at full size, add the highlight by duplicating the original, changing its color to a lighter shade of the original's color, dragging it to a position 1 pixel above and to the left of the original, and sending it to the back. Then add the shadow by duplicating the original, changing its color to a darker shade of the original color, dragging it to a position 1 pixel below and to the right of the original, and sending it to the back. For text larger than 30-point and large graphic objects, you may prefer the look of a shadow offset 2 points below and to the right of the original. The embossing effect is most convincing if the original object is a color similar to that of its background, the highlight is two or three steps lighter in Persuasion's color grid, and the shadow is two or three steps darker. If the origi-

continues

Spread Out

	1	2	3	4	5	6
1			Projected		Current	
2	TOTAL		0.14		0.07	
3	North America		0.17		0.11	
4	Europe		0.14		0.04	
5	Australia		0.15		0.07	
6	Pacific Rim		0.08		0.05	
7						



By inserting blank columns in the data sheet (top), you can spread out the bars in a bar chart (bottom) or the columns in a column chart (not shown).

nal color is light, you can make the highlight white. If the original color is dark, you can make the shadow black.

Selecting Overlapping Objects

Avoid insanity when you're selecting an object that lies behind another object, such as the highlight or shadow of an object you embossed according to the previous tip, by holding down the option key and clicking through the stack of objects. Each time you option-click, you select the next object back. To move a buried object, option-click till you select the object immediately in front of the object you want to move and then hold down the option key, press the mouse button, and drag away. Click once without pressing the option key if you want to select the frontmost object.

Merging Presentations

Sometimes you want to tailor a presentation for a new audience by merging parts of several finished presentations. You can select slides in the slide sorter of one presentation, cut or copy them, and paste them into the slide sorter of another presentation. You can also copy and paste single or multiple slides between the outlines of different presentations, but working in the slide sorters is easier. When you paste slides, Persuasion maintains all outline and data-sheet links. To select multiple slides, you either drag a selection rectangle (a marquee) around them or press the shift key while clicking each one in turn.

Don't Plot Zero

A line chart, area chart, scatter chart, or high-low chart normally shows all the values in the range of cells you have selected on the data sheet. If you have missing data or want a discontinuous plot, enter a space or dash in the cell of each point you want Persuasion to skip when it plots the



Raised Text Adding a highlight and a shadow to an object gives it an embossed or raised look. The highlight is a few shades lighter than the original, and the shadow is a few shades darker. Both are duplicates of the original object and are diagonally offset in back of it.

chart. If you leave a cell empty, Persuasion plots it as a zero. In a line chart, for example, the line would zig down to zero and zag back up to the next data value.

Widening a Text Block

As you type, type, type, you realize you need to widen the text block. Don't disrupt the flow of your typing by switching to the pointer tool to resize the text block. Instead hold down the ⌘ key and drag the right or left edge of the text block with the text tool.

Wrong PostScript Fonts

During the printing process, Persuasion scans the presentation and prepares a list of fonts it includes so the printer driver software can make sure the printer or film recorder contains the fonts. Persuasion does not look for fonts inside EPS (encapsulated PostScript) graphics placed in slides by the Import or the Subscribe To commands, and the printer or film recorder substitutes a standard font, often Courier, for unlisted fonts it finds in EPS graphics. You can work around this limitation by manually downloading the fonts with Apple's LaserWriter Utility (which comes with System 7) or with Adobe's Font Downloader program (which comes with Adobe fonts). You can also get Persuasion to include them on its list so they are automatically downloaded during printing. Simply type some invisible text on the master slide, including one character for each font used in the imported EPS graphics. (To make text invisible, set it to the color of the slide background.)

Printing to Video

Slides, overhead transparencies, and projection monitors are not the only presentation media available. You can also record your presentation on videotape or even use Persuasion to make titles for a video production. You can't simply plug a video recorder or television into the Mac because the Mac's video signal isn't compatible with television equipment. You need an encoder like the \$395 TV Encoder from Computer Video (617/937-0888; fax 617/937-0893) to transform the Mac's video signal into a standard NTSC composite or S-video television signal. The TV Encoder is compatible with video boards from RasterOps, SuperMac, and others, but works particularly well with the Apple 8•24 and 8•24GC video boards or with the built-in video of a Quadra. The Apple video sources, when set for 256 colors in the Monitors control panel, automatically filter out the flickering you would otherwise see in thin lines when they appear on television. To filter flicker with other video sources, you must use an expensive scan converter instead of an encoder. You cannot correct flicker with the tools in Persuasion.

When creating presentations for video, set the slide size to be the size of the screen. To do this, you choose the Page Setup command and dismiss the first dialog box by clicking OK. In the second dialog box, named Presentation Set-up, set the Slide Shape option to Screen and click OK. In the third dialog box, Adjust Graphics, set the options according to how you want Persuasion to adjust the

slides in your presentation, and click OK. This creates a slide that fills the screen when you view the presentation with the Slide Show command.

Televisions overscan their picture tubes, enlarging the picture so it does not all fit on the screen. You must fit your presentation inside the NTSC safe zone, or objects near the edge may be cut off when they appear on television. To be safe, keep everything about ¼ inch from the edges of the Mac's screen.

Bigger is better; that's the general design rule for television. Make text 24-point or larger and use sans serif fonts. Small text and the detail in serifs become blurry on television. The same goes for thin lines in graphics, so use lines at least 2 pixels thick and avoid detailed line and fill patterns.

Saturated colors, especially red and orange, *bloom* on television—bleed beyond their boundaries. Use subdued colors, preferably from the top three rows of Persuasion's color grid, and keep the contrast low between adjacent colors.

Put enough black slides at the beginning and end of your presentation to provide 10 seconds of leader and trailer. You can use this time to operate the video recorder. To record a presentation, start it with the Slide Show command (set the Slide Advance option to Automatic and the slide-timing options to durations suitable for your presentation). When the black leader appears on screen, press the record button on the video recorder. Stop the video recorder during the black leader at the end of your presentation.

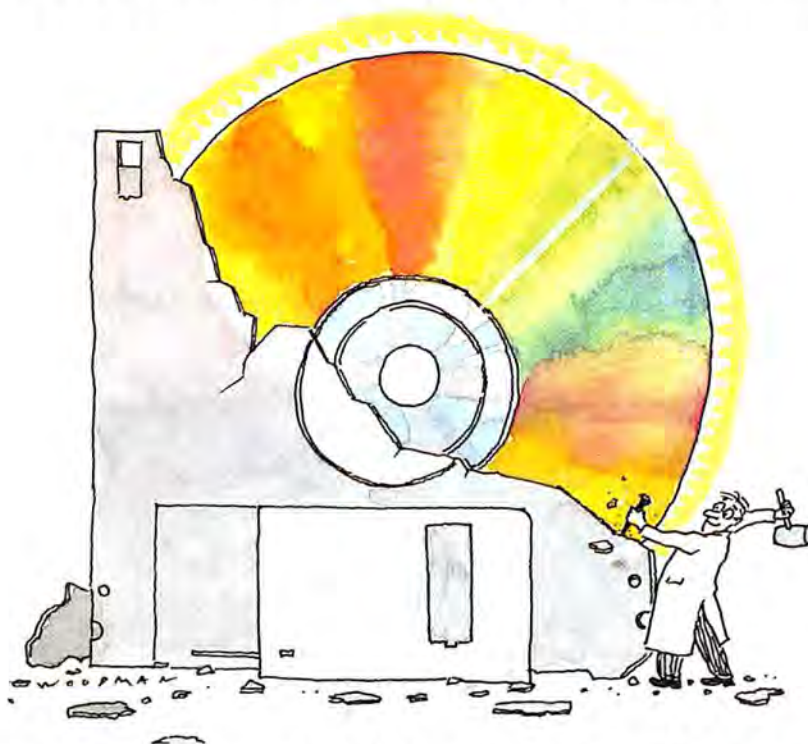
Contributing Your Tips

Do you have a technique or shortcut not mentioned here? Share it with *Macworld* readers by sending it to *Quick Tips*, *Macworld*, 501 Second St., San Francisco, CA 94107. **m**

Contributing editor LON POOLE answers readers' questions and selects their tips for the *Quick Tips* column each month.

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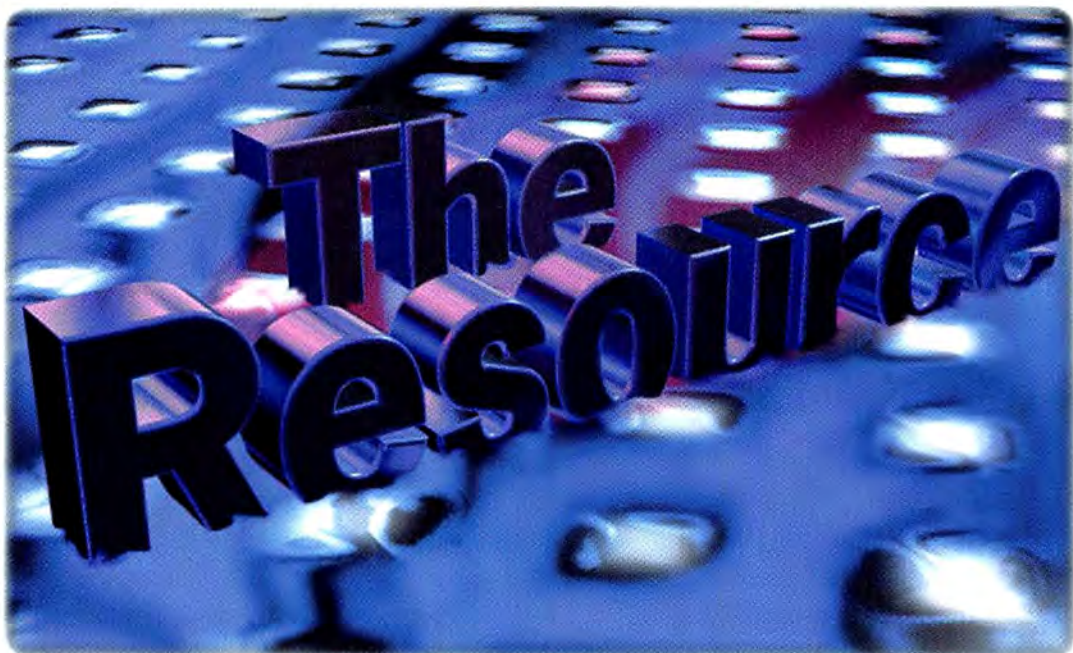
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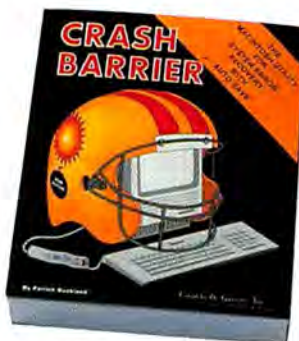
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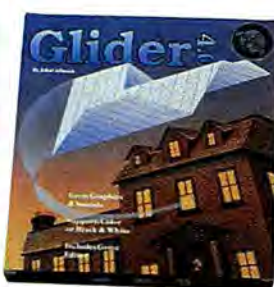


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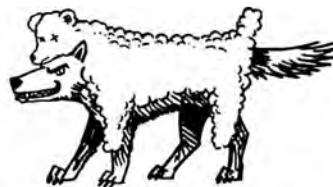
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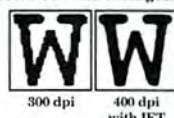
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TokaMac 040 Accelerators
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MacWeek - 10/22/91

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80mb	GoDrive	2.5" Low Profile	9ms	80mb	\$419
105mb	LPS105Δ	3.5" Low Profile	9ms	100mb	\$335
120mb	LPS120	3.5" Low Profile	10ms	116mb	\$409
120mb	GoDrive	2.5" Low Profile	9ms	120mb	\$499
240mb	LPS240	3.5" Low Profile	10ms	234mb	\$649
425mb	PRO425	3.5" Half Height	8ms	406mb	\$899

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5 YEAR WARRANTY

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520mb	M2624SA	3.5" Half Height	9ms	496mb	\$1189
645mb	M2263	5.25" Full Height	16ms	640mb	\$1259
1.2GIG	M2266	5.25" Full Height	14.5ms	1029mb	\$1899
2.0GIG	M2652SA	5.25" Full Height	11ms	1665mb	\$2899

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Fujitsu 5.25" high performance SCSI Winchester disk drives features:
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Maxtor®

Unformatted Capacity	Model	Product Description	Actual MAC Capacity	Internal	External
120mb	7120XT	3.5" Low Profile	15ms	121mb	\$349
207mb	LXT-213	3.5" Half Height	15ms	202mb	\$595
330mb	LXT-340	3.5" Half Height	15ms	324mb	\$969
535mb	LXT-535	3.5" Low Profile	12ms	510mb	\$1219
645mb	XT-8760S	5.25" Full Height	16.5ms	639mb	\$1349
1.2GIG	PO-12S	5.25" Full Height	13ms	997mb	\$1799
1.7GIG	PO-17S	5.25" Full Height	13ms	1433mb	\$2299

Maxtor 3.5" Disk Drives include a **ONE Year Warranty**. Maxtor 5.25" Disk Drives include a **TWO Year Warranty**. * Internal Full Height Drives fit the Mac II, IIfx, and Quadra 900 only.

Seagate

Unformatted Capacity	Model	Product Description	Actual MAC Capacity	Internal	External
248mb	ST3283	3.5" Low Profile	12ms	235mb	\$659
420mb	ST1480N	3.5" Half Height	14ms	406mb	\$1059
525mb	ST1581N	3.5" Half Height	14ms	500mb	\$1198
1.2GIG	ST11200N	3.5" Half Height	10.5ms	1000mb	\$2119
320mb	ST4385N	5.25" Full Ht W-R	10.7ms	315mb	\$1249*
645mb	ST4766N	5.25" Full Ht W-6	15.5ms	632mb	\$1285*
645mb	ST4767N	5.25" Full Ht W-R II	11.9ms	634mb	\$1549*
1.2GIG	ST41200N	5.25" Full Ht W-7	15ms	989mb	\$1729*
1.6GIG	ST41651N	5.25" Full Ht W-8	15ms	1350mb	\$2169*
1.6GIG	ST41600N	5.25" Full Ht E-1	11.5ms	1307mb	\$2429
2.1GIG	ST42100N	5.25" Full Ht W-9	12.9	1900mb	\$2949
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Seagate Drives include a **ONE Year Warranty**.
* Internal Full Height Drives fit the Mac II, IIfx, and Quadra 900 only.

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3-5GIG	WangDAT 3200	DAT, DDS-DC	4mm	10-15 MB/sec	\$1549
2.0GIG	HP 35470A	DAT, DDS	4mm	10-15 MB/sec	\$1389
3-5GIG	HP 35480A	DAT, DDS-DC	4mm	10-15 MB/sec	\$1819
2.2GIG	Exabyte EXB-8200	Digital/Helical	8mm	10-15 MB/sec	\$1949
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CMO-3600	Ricoh	594/652mb	5.25" Full Height	28ms
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*Price does not include Cache Adapter Card

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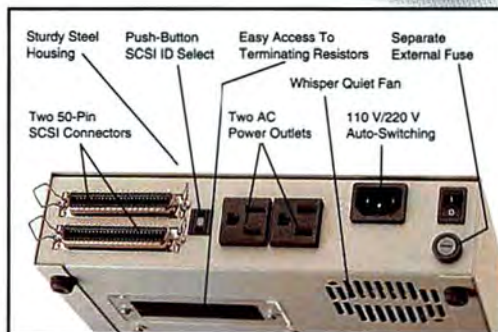
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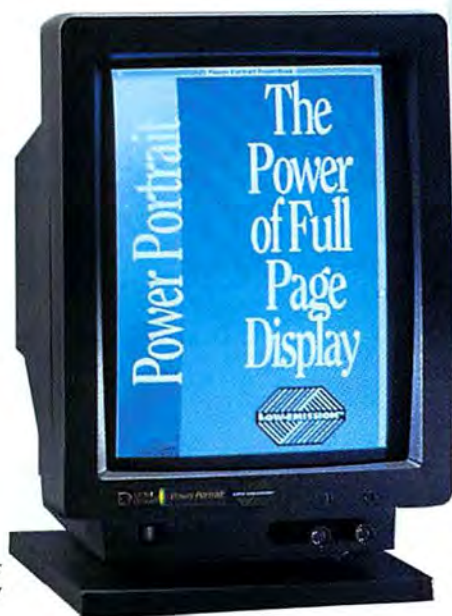
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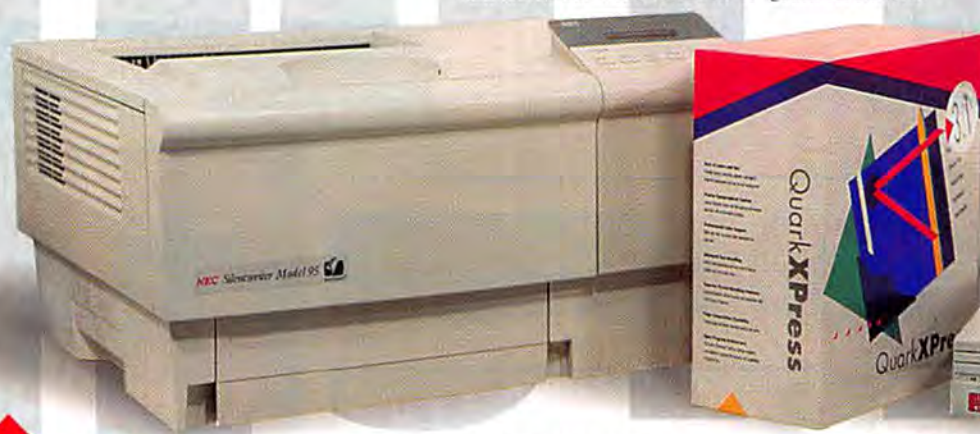
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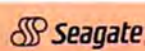
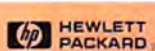
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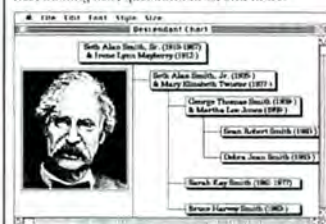
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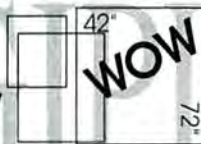
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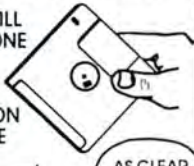
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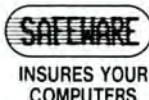
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NEC CDR-74	280ms	64K	Dip Switch	Dial	Music Box DA	2	Included	Not Terminated	Yes	220 Volts	300K/Seconds	25,000	2 Year	\$639	1970
CD Tech CD-T3301	325ms	64K	Push Button	Dial	CD Remote DA	2	Not Included	Not Terminated	Yes	250 Volts	150K/Seconds	50,000	2 Year	\$599	1981



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Comparison chart was completed in May, 1992.

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Best-Sellers

OCTOBER 1992

Months on chart
Last month
This month

Business Software

89	2	1	Microsoft Word <i>Microsoft Corporation</i>
11	3	2	Microsoft Office <i>Microsoft Corporation</i>
80	1	3	Microsoft Excel <i>Microsoft Corporation</i>
41	4	4	WordPerfect for the Macintosh <i>WordPerfect Corporation</i>
10	5	5	MacDraw Pro <i>Claris Corporation</i>
41	6	6	FileMaker Pro <i>Claris Corporation</i>
67	8	7	Microsoft Works <i>Microsoft Corporation</i>
3	9	8	ClarisWorks <i>Claris Corporation</i>
76	11	9	Aldus PageMaker <i>Aldus Corporation</i>
10	7	10	Aldus Persuasion <i>Aldus Corporation</i>
27	10	11	Quicken <i>Intuit</i>
64	15	12	MacDraw II <i>Claris Corporation</i>
4	13	13	1-2-3 for the Macintosh <i>Lotus Development</i>
28	—	14	Adobe Illustrator <i>Adobe Systems</i>
65	14	15	MacWrite II <i>Claris Corporation</i>

Education Software

56	1	1	Reader Rabbit <i>The Learning Company</i>
42	3	2	Where in the World Is Carmen Sandiego? <i>Broderbund Software</i>
23	2	3	Where in Time Is Carmen Sandiego? <i>Broderbund Software</i>
27	4	4	Where in the USA Is Carmen Sandiego? <i>Broderbund Software</i>
67	5	5	Math Blaster <i>Davidson & Associates</i>

Months on chart
Last month
This month

Entertainment Software

29	2	1	Tetris <i>Spectrum HoloByte</i>
1	—	2	King's Quest V <i>Sierra On-Line</i>
54	1	3	Microsoft Flight Simulator <i>Microsoft Corporation</i>
1	—	4	Space Quest III <i>Sierra On-Line</i>
18	3	5	Crystal Quest <i>Casady & Greene</i>

Network/Data Communications

35	1	1	PhoneNet <i>Farallon Computing</i>
58	2	2	AppleShare <i>Apple Computer</i>
4	3	3	AppleTalk Remote Access <i>Apple Computer</i>
65	—	4	TOPS <i>Sitka Corporation</i>
12	5	5	SmartCom II <i>Hayes Microcomputer Products</i>

Add-In Boards

18	1	1	Macintosh IIsi NuBus Adapter Card <i>Apple Computer</i>
4	3	2	Macintosh II FDHD Upgrade <i>Apple Computer</i>
22	2	3	Macintosh Display Card 8+24 <i>Apple Computer</i>
19	5	4	Pivot <i>Radius</i>
18	—	5	Radius TPD Interface <i>Radius</i>

Months on chart
Last month
This month

Utility Software

17	1	1	After Dark <i>Berkeley Systems</i>
23	2	2	Norton Utilities for Macintosh <i>Symantec Corporation</i>
28	4	3	SAM <i>Symantec Corporation</i>
7	5	4	More After Dark <i>Berkeley Systems</i>
18	3	5	Virex <i>Microcom</i>

The AmCoEx Index of Used Macintosh Prices

Machine/RAM/ Hard Drive	Average Sale Price	Monthly Change
Mac Plus/1MB/none	\$325	\$0
Mac Plus/2MB/20MB	\$475	-\$75
Mac SE/2MB/20MB	\$800	-\$25
Mac Portable/1MB/40MB	\$850	-\$300
Mac Classic/2MB/40MB	\$750	-\$25
Mac SE/30/2MB/40MB	\$1675	+\$25
Mac LC/2MB/40MB	\$950	-\$100
Mac IIsi/4MB/40MB	\$1775	\$0
Mac IIsi/3MB/40MB	\$1825	-\$25
Mac IICx/4MB/80MB	\$2350	-\$75
Mac IICI /4MB/80MB	\$2850	-\$100
Mac IIfx/4MB/80MB	\$3700	-\$200
Apple 12-inch B&W display/board	\$225	-\$25
Apple 13-inch RGB display/board	\$600	-\$25
LaserWriter Plus	\$1050	+\$50
LaserWriter IINT	\$1700	-\$50

Index provided by the American Computer Exchange of Atlanta, Georgia. It reflects sales during the week of July 20. Configurations include keyboard and exclude monitor and display board for noncompact models.

Source: Exclusive Audits & Surveys research from more than 250 Macintosh retailers and selected mail-order vendors. Covers sales during June 1992.

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240 MB (Q)	\$739	\$799
330 MB	N/A	\$1,199
425 MB	N/A	\$1,299
425 MB (Q)	\$1,289	\$1,349
595 MB	N/A	\$1,599
1 GB	N/A	\$2,099
45 MB Portable Drive	\$269	
50 MB (Q) Portable Drive	\$299	
105 MB (Q) Portable Drive	\$449	
240 MB (Q) Portable Drive	\$769	
128 MB Optical Drive	\$1,399	
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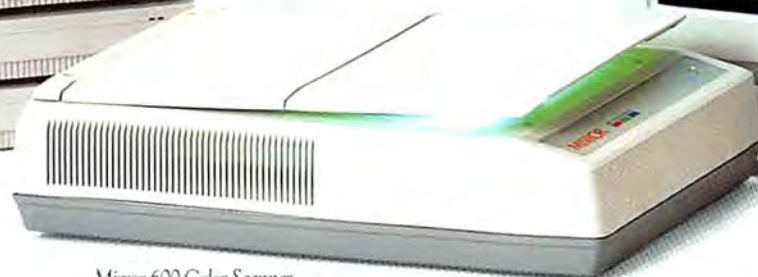
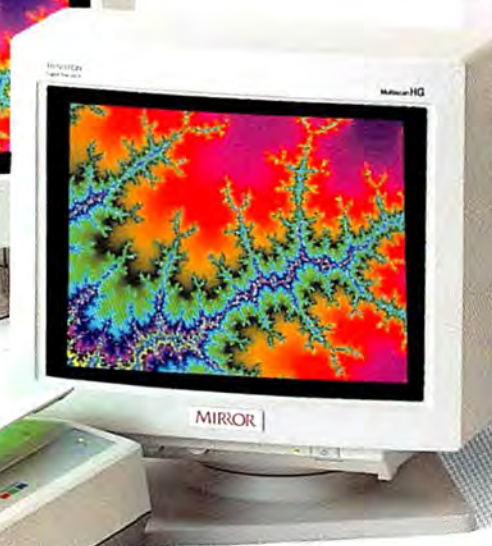
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But wait till you
see it jump.

Turbo Mouse Control

Trash



While the cursor may hop or skip with some trackballs, Turbo Mouse® has always been known for its ultrasmooth movement.

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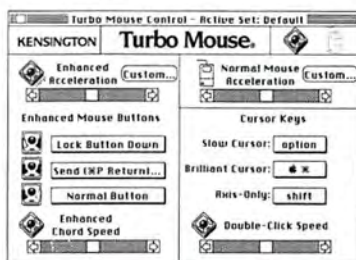
Then there's the award winning Turbo Mouse hardware. Hardware that has won more awards than any other input device. Hardware that has consistently been voted "Best Input Device" by Macintosh

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Introducing Turbo Mouse 4.0

With the all new Brilliant Cursor™ technology,
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