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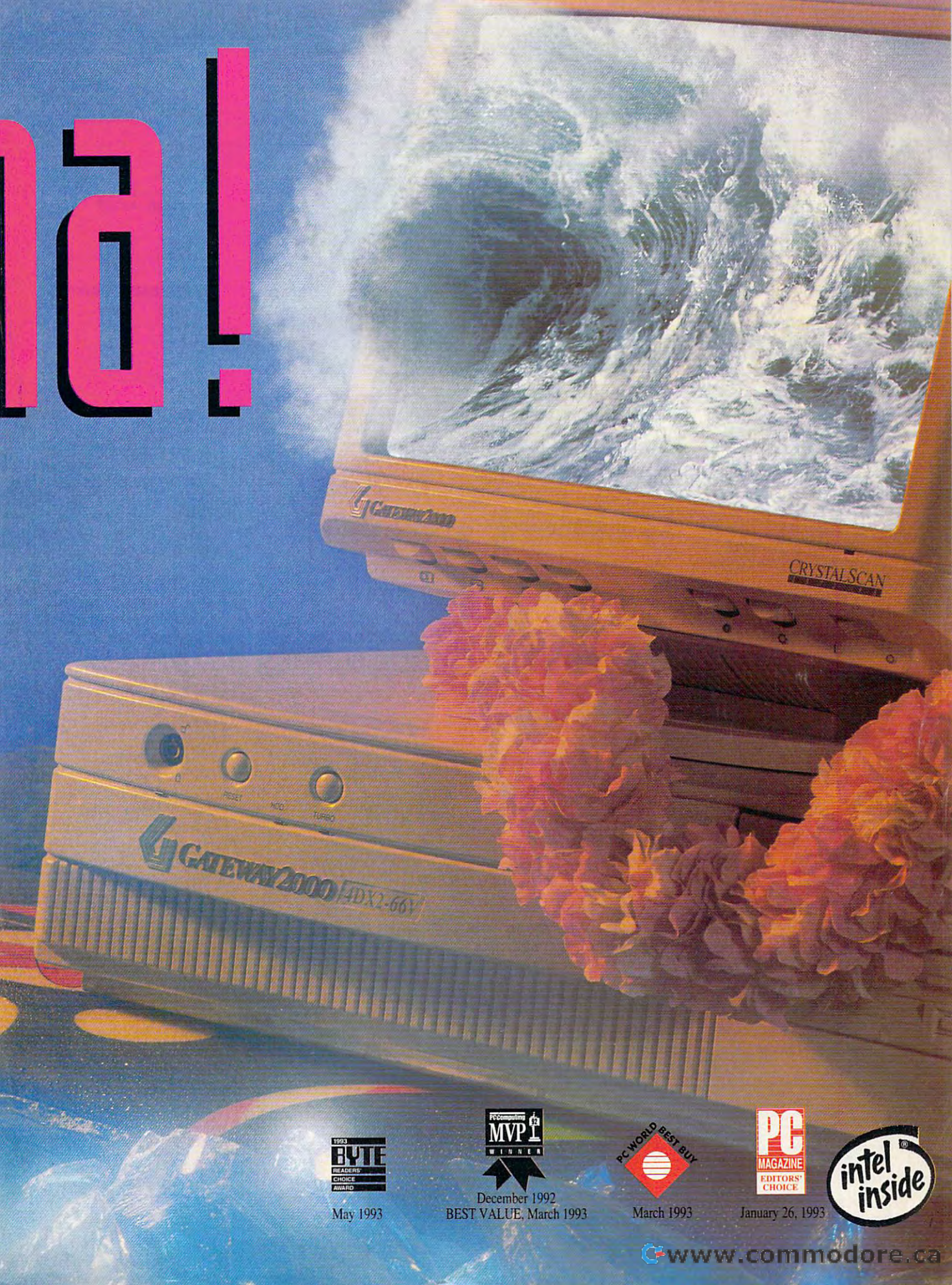

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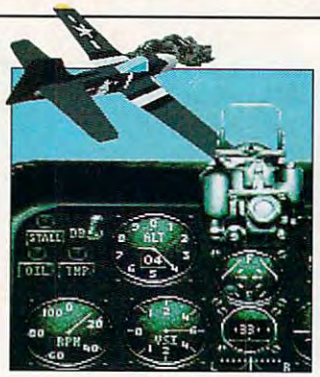

Cover photo by Mark Wagoner. Computer from Gateway 2000.

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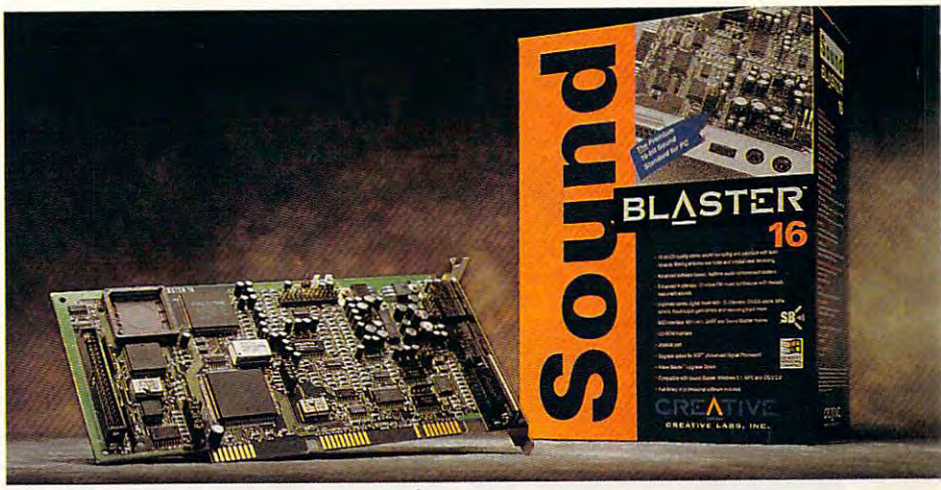

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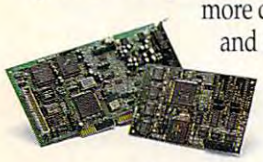

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Clifton Karnes

What's ahead for Windows and DOS? That's a question we all ask ourselves, and those of us in the business of following the PC industry ask it more often than anyone else. This past April, at the Windows Developers Conference in Boston, we received an answer.

At the conference, Microsoft made a presentation that focused on two things: OLE 2.0 and 32-bit Windows. However, the talk ranged over topics that included NT, Windows for TVs, and Chicago (Microsoft's newest hush-hush project).

It's clear that OLE is an extremely important technology to Windows' future.

First off, Microsoft sees three Windows families. The first family is Modular Windows, which includes Tandy's VIS (the only shipping product built on Modular Windows to date), the as-yet-to-be-developed WinPad operating system for PDAs (Personal Digital Assistants), Windows for TVs (a joint venture with Intel and General Instruments), and Windows Telephony (another joint venture with Intel). You could call this family consumer Windows, because that's clearly the market Microsoft is going after.

The next family is called personal Windows, and this group includes Windows 3.1, Windows for Workgroups, and the yet-to-be-announced Chicago project.

The last Windows family is Windows NT, which most of us have heard a lot about in the last year. NT, which stands for *New Technology,* is the corporate branch of the Windows family tree.

One thing that's worried some of us is the future of Windows 3.1. Will it be replaced by NT? From the evidence at the conference, it doesn't look as if it will be. Microsoft said that 89 percent of its future business is planned to come from its personal Windows products—Windows 3.1 and its successors—with the rest divided between Modular Windows and Windows NT.

So if personal Windows is so important, why the emphasis on 32-bit Windows? Most of us think of NT as the 32-bit version of Windows. Although that's true now, NT won't be the only 32-bit Windows around by 1994. Windows 4, planned for release next year, will be a full 32-bit operating system. Interestingly, DOS 7 will be part of Windows 4. And the Chicago project, mentioned above, consists of both Windows 4 and DOS 7. And what about Windows for Workgroups? Microsoft plans to include all the networking capability of WFWG in Windows 4, so WFWG will disappear as a separate product, just as Multimedia Windows did when 3.1 included multimedia support.

As you might expect, DOS 7 will be a full 32-bit operating system. It may even come close to the "DOS NT" columnist Mark Minasi talked about in his May "Hardware Clinic" column.

One thing's for sure: The difference between personal Windows and Windows NT won't be the difference between 16- and 32-bit operating systems. It will be the difference between an end-user version of Windows and a high-performance, security-intensive workstation version.

This is good news for all of us. It means that in order to move up to high-performance 32-bit computing, we can simply upgrade to Windows 4.

And what will Windows 4 be like? It's certain to be more object-oriented than its predecessors. And here, *object-oriented* means "easier to use." Drag and drop will be the primary vocabulary, and perhaps most important, the emphasis will switch from applications to documents.

As documents become more integrated (containing text, graphics, sound, and video), each document will be created by a suite of applications. The document, then, will become the focus of our attention, and the applications that create it will become more transparent.

This application transparency is one of the goals of OLE 2.0, which I discussed six months ago. With the new OLE, as you work in a compound document and as you move from application to application, your document stays the same, but the frame window changes (usually as little as possible) to reflect the proper editing environment for the current part of your document. This is a powerful tool, and something we can look forward to in the very near future.

Interestingly, this emphasis on OLE 2.0 doesn't come from some ivory tower philosophy cooked up at Microsoft's Redmond headquarters, but from user surveys. According to figures presented by Microsoft, end users have told the company that what they really want from Windows applications is better integration. And with Windows 4, DOS 7, and OLE 2.0, we'll all have it. ❐

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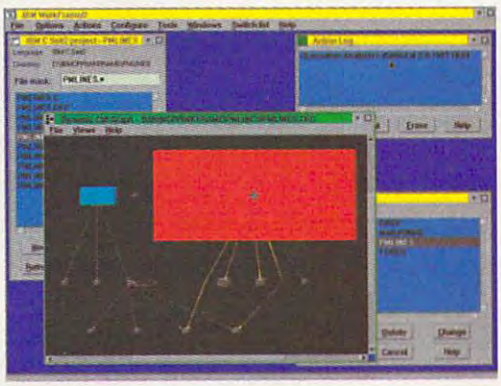

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Power users name the top Windows applications and tell how they put them to use.

By Kimberly Havlena

WIND

Looking for the Windows applications that offer the most in terms of tools, speed, and intuitiveness? Here are the experts' opinions to help you in your search for the programs that will best meet your needs.

The experts whose opinions we solicited have reviewed hundreds of programs and identified the ones that they like best. Whatever sparks your interest—word processing, spreadsheets, databases, or graphics—here are the Windows application programs that will provide the greatest ease, efficiency, and enjoyment.

Getting the Words on Paper

Word processing took a long time to come to Windows. Once it arrived, the word-processing arena suddenly filled with contenders. There is hardly a major word processor that doesn't have a Windows version available. With all that software to choose from, which programs are the most popular among users who spend hours a day making their living by writing?

Leslie Eiser has been writing in

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TOP 10 TOOLS

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COMPUTE and elsewhere about educational computing for ten years. Eiser says Microsoft Word for Windows is her pick as the best word processor. She likes it not only because it's powerful and easy to use, but also because it's helpful in a school environment. It has well-integrated tools, such as a style checker and thesaurus, that make it a great help to teachers. Another advantage is that it's a word processor equally powerful—and popular—in its PC and Macintosh versions. And in comparison to WordPerfect, Word for Windows is much easier to use, Eiser finds.

Tom Campbell owns and operates the South Bay Company, which develops software; he writes the "Programming Power" column for COMPUTE. Campbell uses Word for Windows because it's the best word processor he can find for large documents. He uses it for creating everything from brochures to 800-page manuals.

Desktop publishing expert William Harrel has written five books about publishing and hundreds of articles for COMPUTE and other magazines. When it comes to word processing, Harrel prefers Ami Pro. "As a reviewer, with my extensive knowledge of the three top Windows word processors, Ami Pro is the most sophisticated and the most useful," says Harrel. Ami Pro, a full-featured word processor, excels in its page layout features. While it can be used as a simple word processor for typing and creating documents, it can also handle "relatively sophisticated page layouts, such as newsletters," says Harrel. The advantage of using your word processor for layouts is that you don't have to do any extra work to transfer text between your word processor and your layout program.

George Campbell is a contributing editor for another computer magazine and a shareware author. Campbell is also a fan of Ami Pro; he thinks that it makes the best use of the Windows environment and offers outstanding tools for page design. Campbell feels that Ami Pro is easier to use than its competitors (specifically Word for Windows and WordPerfect for Windows). He uses Ami Pro for everything from basic correspondence to high-end desktop publishing.

Word processing is more than getting words down on paper, though. What kinds of word-processing add-ons do our experts rely on?

Regular COMPUTE contributor Richard Mann is a certified public accountant as well as a writer. Mann recommends Microsoft Bookshelf as an add-on for word processing. This electronic library comes with handy reference tools, including a dictionary and an encyclopedia. Bookshelf is a CD-ROM product. In fact, Microsoft Bookshelf now comes as a premium with Multimedia Word for Windows and Bookshelf. If you find a quotation in the dictionary or encyclopedia that you want to use in your text, you merely highlight it and, with the click of a button, it's inserted into your Word for Windows document. In addition to this, an automatic footnote is inserted to tell which reference book the material came from.

Steven Anzovin spends most of his time writing books, but he's also a freelance writer, an editor, a computer consultant, and a database programmer. Anzovin uses MacLinkPlus as his principal word-processing add-on. MacLinkPlus transfers files between the Macintosh and PC over a modem connection, automatically translating between various PC and Mac file formats.

Tony Roberts operates a desktop publishing business and is a COMPUTE contributing editor. To Roberts, helpfulness means OmniPage Direct. OmniPage Direct allows him to place a typewritten page on the scanner and read it into a word-processing file. With OmniPage Direct, you can do the scanning from within your own applications without having to exit to another program.

It's so easy to lose the cursor on your computer screen. ArrowSmith is a cursor enlargement program that will be sure to catch your eye and add some fun to computer input. Not only does it enlarge the cursor, but it allows you to choose what form you want the cursor to take. You could choose an ordinary arrow or opt for something with a little pizazz such as a syringe, a heart, a flag, or a magnifying glass. ArrowSmith also allows you to modify the wait symbol to a picture of a stop sign, a stoplight, a don't-walk sign, a snowflake, a smiley face, even a computer in jail. "I like ArrowSmith because it's the best cursor enlargement program I could find. Plus, it's lots of fun to use," says Tom Campbell.

Crunching Numbers

Spreadsheets were an early port to Windows. First and foremost was Microsoft Excel. Recently, publishers have been creating and porting spreadsheets to Windows in increasing numbers. Which are the cream of the crop?

Richard Mann says that Excel and Quattro Pro are both excellent spreadsheets for Windows. Because Quattro Pro has the newest version, it currently does a few more things than Excel. But the features race will continue.

Quattro Pro gives you a three-dimensional spreadsheet which allows you to work not only in rows and columns but also in stacks of pages. The 3-D metaphor resembles a three-ring binder with tabs at the bottom of each page that you can click on to move back and forth between all the pages in your spreadsheet. Quattro Pro also has graphic tools for drawing and making slides that give a professional touch. "It's not only a spreadsheet, but it's a little presentation-building package as well," says Mann.

George Campbell thinks that Excel is the best Windows application. With its intuitiveness, it simplifies complications, and the final output is easily made to look presentable.

The World of Publishing

Is ease of use your prime consideration when you're looking for a desktop publishing and layout program? William Harrel says that in his opinion, Aldus PageMaker is the easiest desktop publishing software to use. It has a pasteboard metaphor that Harrel likens to working on a layout table. Anybody familiar with laying out pages on a drafting table or a paste-up table would be more comfortable with PageMaker than with some of the frame-based programs. If price is more important than ease of use, Harrel recommends Microsoft Publisher or Express Publisher.

Tony Roberts uses PageMaker in his desktop publishing business to create newsletters, brochures, and books. He prefers it to other desktop publishing software because of its many options. Roberts says that he has never liked Aldus PageMaker's keenest competitor, Ventura Publisher, in any other incarnation (Macintosh and DOS) and that he is going to stay away from it in Windows.

Ever the contrarian, Robert Bixby, features editor of COMPUTE and author of "Art Works," COMPUTE's desktop publishing column, prefers Ventura Publisher because it keeps the text closer to its original condition, easily editable by a DOS or Windows word processor. He finds PageMaker unintuitive and difficult to use.

Using Data

When it comes to managing data, the options for Windows users have multiplied over the past few months with the introduction of Microsoft Access and Microsoft FoxPro for Windows. How does our panel of experts rate these packages?

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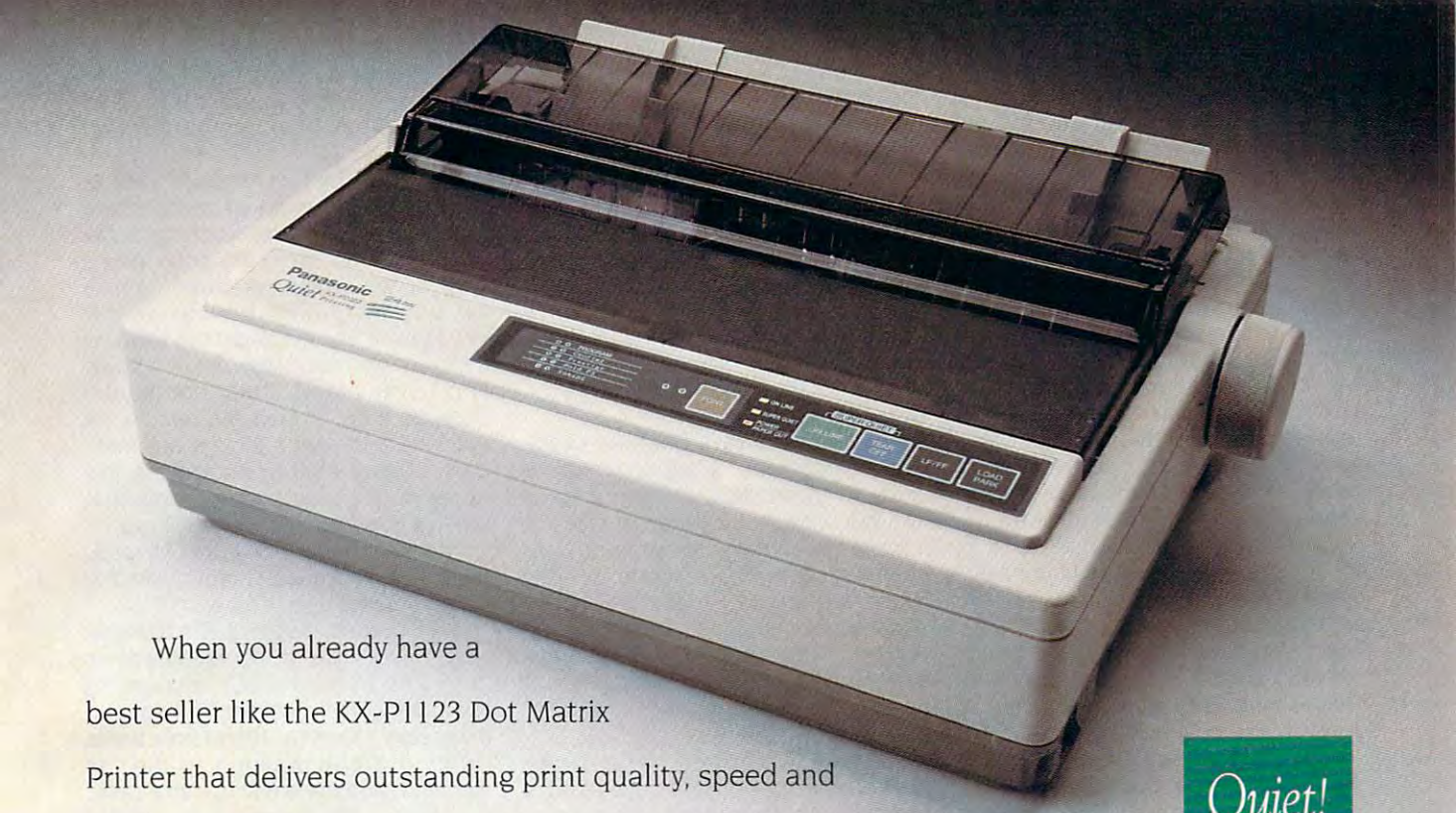

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George Campbell uses Access to manage his data. In addition to being easy to use and having powerful output, "it uses a subset of the Visual Basic language for development, which . . . makes it easy to work with," Campbell says.

Tom Campbell uses Access for the databases to run his business. One reason he likes it is that it has a programming language similar to ones that he already knew. He warns, however, that Microsoft tries to market Access as a product that is supposedly so easy that even a beginner could start working with it right away. "I think Access is a tremendous program—I'm even writing a book on it—but it is not for beginners," says Campbell. "FileMaker Pro 2.0 from Claris is much better for beginners than Access or FoxPro for Windows. Instant Database from Asymmetrix is another easy and inexpensive alternative. FoxPro is great if you're already familiar with FoxPro for DOS or dBASE, but it doesn't do things in an intuitive way for a seasoned Windows user."

Why isn't Access Campbell's first choice for beginners? "When dBASE II came out, it was a lot easier than anything else available, but it took a lot of work to learn to use it. It's the same in the case of Access. I simply don't think it's as easy to use as FileMaker Pro when you first start using it. If you're willing to work to learn Access, though, your efforts will be richly repaid. If your time is limited, stick to FileMaker Pro or Instant Database."

Making Contact

Windows has always been an excellent environment for telecommunications. In these days of instant faxes and high-speed interchange of data, it makes even more sense to do your communicating in Windows. William Harrel stands by Procomm Plus for Windows because he's found it to be powerful and easy to use. He says that Procomm is the telecommunications product that has something for everybody.

George Campbell joins in the praise for Procomm. He says that it's easy to script for logging on and other functions. It also has a good dialing directory that's easy to set up and works well at high communication speeds.

Robert Bixby recommends WinFax Pro as the foremost product in the field of direct faxing. Sending a fax with Winfax is exactly like printing to a local printer. When you select Winfax as your printing device under Windows, it pauses to get the sending information (recipient, fax number, and cover page), then formats the page as a fax. It dials the remote fax machine and sends the file automatically. Many similar programs are appearing, including programs that receive faxes and convert their graphic information into ASCII text for easy editing and compact storage. Among these is Caere's FaxMaster.

Keith Ferrell, editor of *Omni* magazine, says, "RapidFAX for Windows [from The Complete PC] handles my fax material more efficiently than anything else I've tried. It certainly beats printing it out, walking to the fax machine, and transmitting it manually. Seriously, the program is almost effortless to use, resides nicely in the

Just for Fun

Fun and Windows don't seem to go together for most people. But the fact is that some of the most innovative educational and entertainment software is beginning to appear ready to run in the formerly all-business Windows environment.

Parents quickly learn the names of good children's stories and their authors. Brøderbund's Just Grandma and Me and Arthur's Teacher Trouble are two computer programs based on the popular children's stories of the same names. "These are well-known, well-respected children's stories, which makes them very appealing to the parents," says Leslie Eiser.

Just Grandma and Me, by Mercer Mayer, is designed for children who are learning to read. A page of the storybook comes up on the screen, and the computer reads the story in beautiful, accented voices. Behind the pictures on the screen, animated sequences are hiding. Once you think you know what to expect, the animated sequences change.

The animation of Just Grandma and Me resembles the author's illustrations and style. "For children, one doesn't use the same graphics [as in adult productivity software]. Children are not little adults . . . they need to be . . . talked to differently," says Eiser. These programs approach children in a completely different way from a lot of other children's software.

Arthur's Teacher Trouble, written by Marc Brown, is for older children. It focuses on human relationships rather than reading skills. The plot that moves the program is that Arthur is having problems with his teacher at school and is contemplating how to solve his dilemma without upsetting everyone.

THE ANIMALS!, developed by the San Diego Zoo, is another especially appealing children's program. It's an encyclopedic view of animals. Its interface uses the multimedia extensions that come with Windows to provide a colorful picture of the zoo. When you click your mouse on a certain section of the zoo, you are given information on the animals living in that habitat. THE ANIMALS! is meant to be used in a classroom situation with children who are either planning to visit the zoo or are putting together projects on animals. (THE ANIMALS! is reviewed elsewhere in this issue.)

Windows has always been aimed at productivity, but important Windows entertainment software for grownups has begun to appear. "A lot of [Windows] games are just rehashes of DOS games," says Paul Schuytema. But Microsoft Golf, a version of the Links golf games, utilizes the Windows format and comes complete with digitized sound and excellent graphics. Instead of cramming everything into one window, as a lot of the DOS games do, Microsoft Golf uses full windowing to show you such things as your power bar and information on how far your clubs can hit. (See "Hitting the Links" elsewhere in this issue.)

Maxis has recently released a Windows version of SimCity—The City Simulator. It's another game that follows the Windows format of opening and closing windows and being able to pile them on top of each other. By doing so, it gives a new perspective to SimCity. It's easy to switch back and forth between a world view and a city view, and graphs can also be brought up. "Once you've played SimCity on Windows, you can't go back to the DOS version because it's just so good," says Schuytema.

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background, and is something upon which I have grown quite dependent."

Out in Public

Presentation software is one of the fastest-growing areas in Windows. What do our Windows pros like when it comes to taking information to the people?

For presentations, William Harrel prefers Microsoft PowerPoint because it's both feature rich and easy to use. Harrel says that the approximately 20 Windows presentation programs available right now all work with basically the same idea. You create an outline, and from the outline the program automatically generates slides. PowerPoint, however, imports Word for Windows outlines. Linked to Excel and Lotus 1-2-3 spreadsheets, PowerPoint creates graphs and charts. "It's just all-around versatile," says Harrel.

Aldus Persuasion is Tony Roberts's choice among presentation programs. His desktop publishing business uses Persuasion extensively to create slides, overheads, and presentation material for speeches.

Every Picture Tells a Story

Creating graphics of all kinds was the earliest use of graphical environments. Windows and the Macintosh operating system made it easy to create a standard interface and a standard set of graphics tools, and the mouse—though not perfect—was still a very good drawing tool. While over the past couple of years Windows software has taken great strides beyond drawing and painting, and now includes virtually every kind of software, graphics remain the heart of the Windows experience and the principal attraction of the graphical user interface for many users. But which graphics programs are the best?

Steven Anzovin considers Adobe Illustrator the standard in the field of graphics: "It may not have every tool that you want, but it has the great advantage of being a standard that many other artists are familiar with and use." Adobe Illustrator is geared to the professional artist, and so is Fractal Design Painter, which Anzovin says is an excellent paint program. It gives you tools that don't exist in other programs, such as watercolor, oil paint, and charcoal. For the best effects in painting, Anzovin says Painter is the only choice. Anzovin also admires the program Arts & Letters Graphic Editor for its extensive typeface and clip art libraries.

When asked for his choice of the best graphics program, William Harrel comes out strongly in favor of CorelDRAW!. "The reason I use it is [that] I'm not a graphics artist, and it has a lot of features that make me look like one," says Harrel. CorelDRAW! is a vector drawing program that excels for nonillustrators because it has a lot of automatic features for creating 3-D objects, for mirroring objects, and for wrapping text along a path; it can also give an object perspective to make it look more three-dimensional. CorelDRAW! comes with about 250 typefaces and 14,000 pieces of clip art, along with a charting application, a bitmap application, a slide-show application, and other utilities. "So it's not only powerful—it's a great value," says Harrel.

Tom Campbell joins in the praise for CorelDRAW!, mostly for technical illustration. "I have to admit [that] it's kind of fun to play with, too," says Campbell. His reason for choosing CorelDRAW! is that it has the best combination of features and price.

Tony Roberts uses Aldus FreeHand and PhotoStyler in conjunction with PageMaker when he draws maps or diagrams or scans in photographs. The programs work hand in hand in production of Roberts's books and brochures.

You may have noticed that the programs Roberts uses are generally Aldus products. He says that that has something to do with why he has chosen to use these applications. PageMaker was the first Aldus application he owned, and he felt so comfortable with it that when he began to add drawing tools and tools for scanning and photo manipulation, he decided to go with the Aldus products as they came out. The programs are designed to work together. Roberts says, "I felt confident that if I was working in one program, I would be able to use the output of it in the other without too much trouble. And that's been fairly true."

"CorelDRAW! and Arts & Letters Graphic Editor are fine products," Robert Bixby says, "but if you're looking for a complete professional vector graphics package with a robust tracing program, Micrografx Designer is second to none. It has most of the tools of the other programs, plus that incredibly powerful trace that no one else can match. It suffers slightly from having an outdated interface, but those who use it swear by it."

Programming

COMPUTE was built on programming. When there were few commercial programs available, COMPUTE printed listings that would enable readers to create their own word processors, spreadsheets, databases, and graphics programs. Now that programming is largely the province of professionals, what tools do the pros like to use?

George Campbell chooses Visual Basic 2.0 for programming. According to Campbell, it's easy to use, powerful, and by far the best way to create Windows applications.

Tom Campbell uses Borland C++ to write programs. The reasoning behind his programming choice is that Borland C++ happens to be the only C compiler that currently has a Windows-integrated environment, which makes it easier and more pleasant to use. And when it comes time to test one of his Windows programs, he's already in Windows, so he doesn't have to take the time to start up the environment.

Windows Productivity Suite

Windows has come a long way. The environment that once utilized only applications designed for graphics and spreadsheets now supports software of virtually every variety. In fact, there are so many applications available today that it's sometimes difficult to decide which one to buy. That's why experts were called in to help narrow the selection.

The programs most recommended include Microsoft Word for Windows, Ami Pro, Microsoft Excel, Quattro Pro, Aldus PageMaker, Microsoft Access, Procomm Plus for Windows, Microsoft PowerPoint, Aldus Persuasion, and CorelDRAW!, with minority support for Microsoft Bookshelf, MacLinkPlus, OmniPage Direct, ArrowSmith, Ventura Publisher, Instant Database, FileMaker Pro, Microsoft FoxPro for Windows, Aldus FreeHand, Aldus PhotoStyler, FaxMaster, WinFax Pro, RapidFAX, Adobe Illustrator, Fractal Design Painter, Arts & Letters Graphic Editor, and Micrografx Designer. When it comes to programming languages, our experts like Visual Basic and Borland C++.

How can you choose between such powerful programs as Word for Windows and Ami Pro or between Excel and Quattro Pro? If you have some specific application in mind, look for the program with the feature set that most closely matches your needs. Word for Windows is better for writing, while Ami Pro is better suited to publishing (though it's also very good for general writing). If you choose any one of the best products in a category, you can't go wrong. ❑

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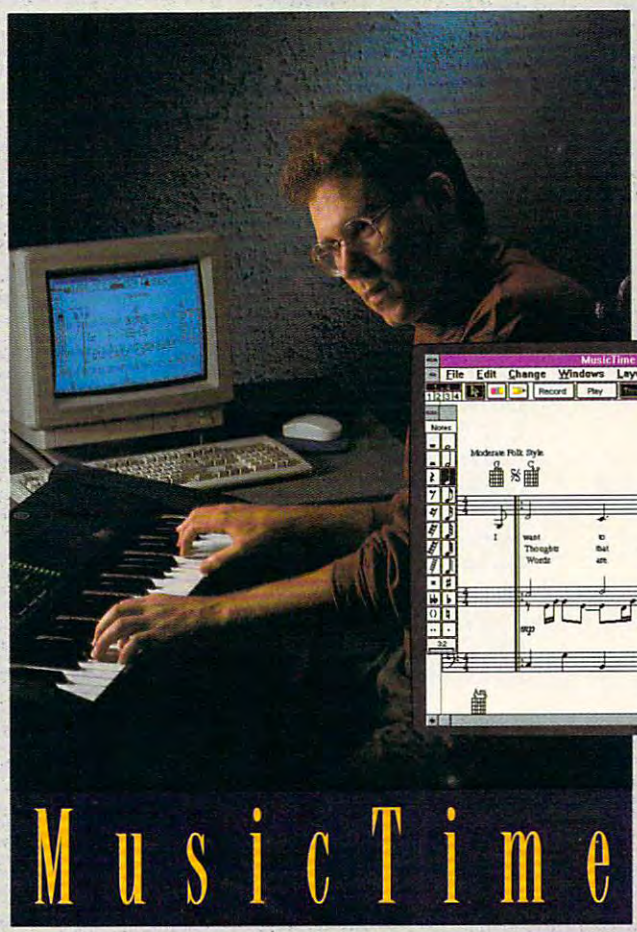

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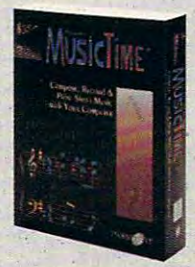

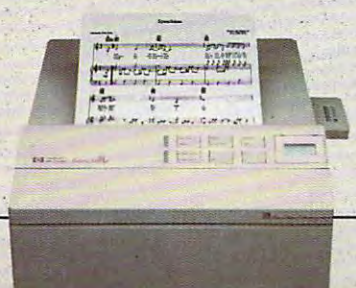

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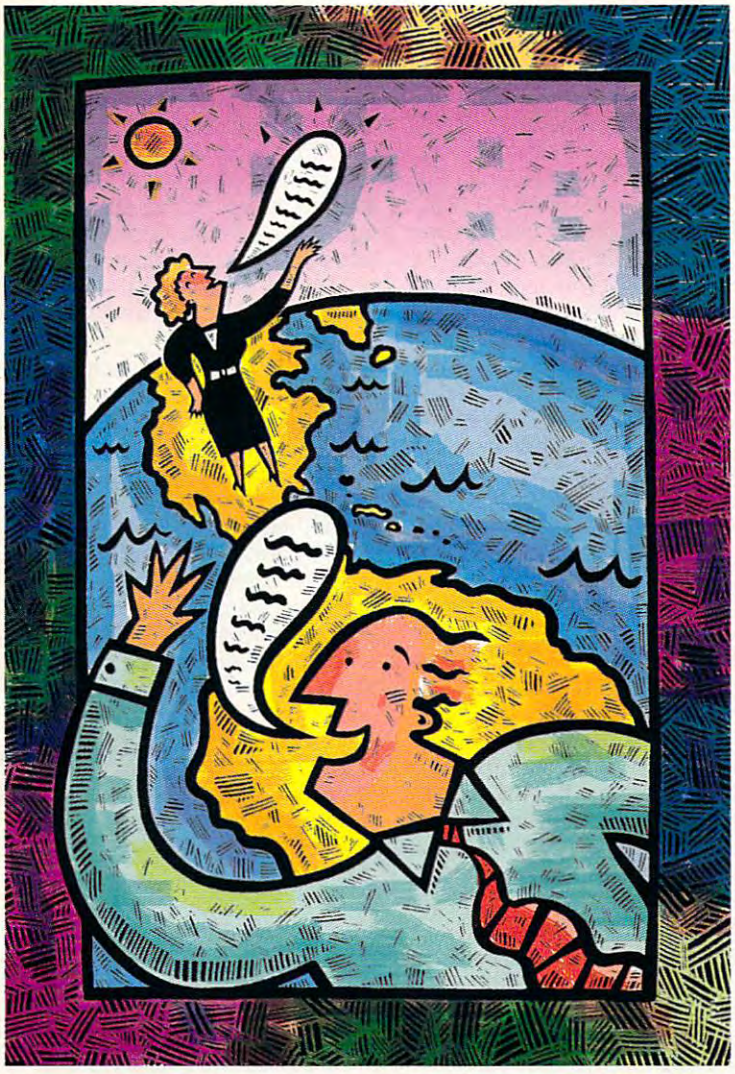

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TEST LAB

Edited by Mike Hudnall
Reviews by Tom Benford

Combine the blazing speed and colossal computing power of Intel's 486DX2/66 with the latest local-bus technology, and you've got a computer ready for the most demanding applications. Windows programs that seem sluggish on older computers are downright snappy on these systems, so you can spend less of your time waiting for the Windows hourglass and more of it taking care of business.

Not inexpensive by any means, these systems nevertheless deliver lots of value, especially when you consider what you could get for the same price a year ago, how much time you can save, and how expandable they are.

You may be asking yourself whether you really need this much power and speed right now—a fair question. Here at COMPUTE, we see today's cutting-edge technologies as tomorrow's consumer technologies, and with the current dizzying pace of change in the computer industry, tomorrow will probably be here sooner than you think. Already, Intel has announced its new Pentium chip, which by all accounts significantly outperforms the 486DX2/66 but is likely to cost significantly more, and I suspect that by the time this issue hits the stands, most computer companies will offer VESA local bus as a standard feature rather than as an option.

In setting up this month's lineup of systems, we asked for Industry Standard Architecture (ISA) because it's less expensive than Extended Industry Standard Architecture (EISA) and because most of our readers won't need EISA's performance benefits. We asked for 8MB of RAM because many of the systems include 8MB as the standard complement and because some of the more demanding applications that would benefit from the extra horsepower of 486DX2/66 chips also require more than 4MB. We also asked the manufacturers to install whatever cache was part of the standard configuration, since many COMPUTE readers will opt for standard packages. Because these high-powered computers are likely to handle high-powered applications and mountains of data, we requested hard drives of at least 200MB, not at all an unusual size for these machines.

All ten of the systems in this month's Test Lab come with Windows 3.1 and DOS, and they're all, of course, 486DX2/66 systems with local-bus video. Beyond those common elements, you'll find a variety of prices and features. While most of these computers, for example, use standard VESA local bus, some companies use proprietary local-bus video. At least a few include a local-bus drive controller along with the local-bus video adapter. And in some cases the video card is accelerated for optimized Windows performance.

For the specifics of configuration, expandability, and other features, you should find the features grid helpful. Whether or not you understand the differences among local-bus video standards, you'll appreciate the benchmark graphs, which provide not only Norton index data but also real-world performance data—how long a particular computer required to find and replace text in a word processor, index and sort a database, play back video, and so forth. These systems were so fast that our lab had to redesign the benchmark test suite to produce more statistically significant data. In fact, we had to drop a planned spreadsheet benchmark because even a Windows spreadsheet proved too small a challenge for these machines. Tom Benford's reviews home in on significant features of these computers, whether it's their strategies for handling the heat given off by their microprocessors, their memory expansion capabilities, their case designs, their use of caching, or their ability to accept upgrade chips.

Whether you're ready to buy one of these systems now or just want to see the kind of system you could be buying before long, Test Lab has information to help you understand the technology and make a more informed purchase.

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The CompuAdd Express 466/DX2 is the current top-of-the-line model in the company's series of "scalable" computer systems designed with upgradability in mind.

Scalable is, for all intents and purposes, another word for *modular* in that the Express lets you change the configuration by simply replacing the CPU and changing the jumper switch settings. The company offers six varieties of the machine, ranging from a 40-MHz 386DXL-based system to 486SX models and the 466/DX2 model reviewed here.

You'll find many of the essential system functions integrated right into the motherboard itself: the IDE controller, the floppy drive controller, the parallel and serial ports, the keyboard connection, and local-bus video for faster video performance.

The full-profile case occupies a baby-AT footprint and provides three bays accessible from the front: two half-height 5¼-inch bays and a vertical 3½-inch bay. A hidden 3½-inch bay is also available. To power any additional drives you might install, just use the three available connectors from the 200-watt power supply.

A Western Digital Caviar 2340 (333MB formatted) hard drive provides the mass storage for the system, while a combination 3½-inch/5¼-inch half-height unit occupies the uppermost bay and provides floppy disk I/O.

Because the Express integrates so much into the motherboard, all of its full-length 16-bit slots are available. A proprietary slot holds a proprietary video adapter card and is, apparently, the local-bus connection; Tseng Labs manufactures the video BIOS. I found no other local-bus slots.

The high-speed, high-powered 66-MHz i486DX2 CPU generates an enormous amount of heat, the archnemesis of electronic components. The CompuAdd folks, however, have taken some serious measures to ensure that heat won't be a problem with this system. A high-volume fan mounted at the front of the case less than six inches from the CPU pulls in outside air through the case vents. A deeply finned heat sink and a miniature fan mounted atop the CPU itself also help; under this arrangement, the heat sink dissipates the chip's heat and the fan keeps cool air circulating over the heat sink to further aid in keeping the interior case temperature "comfortable" for the components. The design apparently works well, as I didn't experience any problems or anomalies during the time I spent using this system for the review.

A three-button mouse supplied with the system has a switch that lets you select either a Microsoft (two-button) mode or a Mouse Systems (three-button) mode. While the mouse itself resembles a Microsoft mouse in style, feel, and shape, the clicking action could best be described as erratic; frequently, several rapid clicks were required to enter a Windows command or function.

I wasn't entirely satisfied with the keyboard (made by Lexmark here in the USA), either. I found the action quite stiff, there was no audible click, and it had a straight cable (which looked very similar to RJ-14 telephone cable) rather than the heavier, coiled cords usually found on keyboards.

Aside from the mouse and keyboard difficulties, the CompuAdd Express 466/DX2 local-bus system provides good performance, features, and expandability.

Circle Reader Service Number 371

DELL SYSTEM 466/M

Dell has built its reputation on high-quality, dependable PC systems that are popularly priced. Maintaining that reputation, the Dell System 466/M proves itself to be a sterling performer.

The baby-AT-sized desktop case provides a surprising amount of expansion room, thanks to large-scale integration of components on the system's motherboard. Components critical to the system, including the video adapter, input and output ports, and disk controllers, are all integrated rather than requiring separate expansion cards. As a result, you have five full-length 16-bit expansion slots available for user-installed peripherals, in addition to a single three-quarter-length 16-bit slot for shorter boards.

Looking for room to add drives? The system has two available exposed half-height bays and an internal 3½-inch bay. Dual floppy drives are provided as standard equipment on the system, but rather than being individual units that require separate bays, the two floppy drives are integrated into one half-height combination drive—a nice touch that conserves space and improves expansion capabilities.

A 240-watt power supply provides more than enough power for the system and sports three "pigtail" connectors available for powering any additional drive devices you might install in the system.

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An extra-large finned heat sink on the 66-MHz Intel 486DX2 CPU helps dissipate the heat this fast chip generates. To aid the heat sink in its cooling functions, a high-volume fan mounted almost directly in front of the CPU provides excellent air flow inside the case.

Dell uses a proprietary local-bus standard which is not VESA compliant, and there is no local-bus slot available for user-installable cards, since the local-bus features are integrated into the motherboard's circuitry. Dell handles video through this local bus, using the popular S3 accelerated video chip set, which can generate 1024 × 768 noninterlaced resolution with a maximum color palette of over 32,000 colors.

The integrated IDE interface features a 32K cache buffer, which helps to keep things moving at a brisk pace in the system. You can also get an optional 128K internal system cache.

Knowing that users naturally upgrade their systems as their needs for power and speed grow, Dell offers a motherboard with a 238-pin (low insertion force press-pin) socket that can accommodate future upgrades, such as higher-speed 486 chips or the P24T (Pentium Overdrive) when they become available. The flash memory Phoenix/Dell BIOS is disk upgradable, another feature which ensures the system's longevity.

The review system contained 8MB of RAM, but you can upgrade the memory to a maximum of 64MB using 16MB SIMMs in the four sockets provided on the motherboard. Dell also included a Maxtor LXT-340A 320MB IDE hard drive and a Dell UltraScan 14C SVGA monitor as part of the standard equipment.

A Microsoft two-button mouse supplied with the system plugs into the built-in PS/2-style mouse port. MS-DOS 5.0, Windows 3.1, and an enhanced keyboard round out the system and ensure that it's ready to go to work as soon as you plug it in.

Dell has an excellent system here in the 466/M, and it deserves your serious consideration if you're in the market for a 486DX2/66 local-bus system.

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DIAMOND 486DX2/66

Smart styling, good expansion potential, and snappy local-bus performance make the DT 486DX2/66 system from Diamond Technologies a pleasing package.

A full-height baby-AT case provides expandability while maintaining a reasonably small footprint for the desktop. For adding drives, this system includes two half-height bays accessible from the front of the machine. No additional unexposed bays are available, but since the Diamond comes equipped with dual floppies, two bays should suffice for the vast majority of users. The 200-watt power supply is also adequate for such expansion, although it comes with only one extra "pigtail" connector for powering another drive.

The i486DX2/66 CPU, mounted in a standard press-pin socket, has a deeply finned heat sink to minimize heat buildup and the problems associated with it. Since the AT-sized case affords plenty of internal "breathing" room for air to circulate, this arrangement works well, keeping the CPU and other components cool and thus contributing to system reliability.

The motherboard, a fairly compact unit manufactured by S&A Labs, uses an American Megatrends, Inc. (AMI) BIOS. Eight SIMM sockets on the motherboard accept either 1MB or 4MB SIMMs, yielding a maximum configuration of 32MB on the motherboard itself.

The system came with two local-bus slots on the motherboard, both occupied; a Diamond Viper SVGA card is installed in one, while the IDE caching disk controller resides in the other. Five of the six full-length 16-bit slots are available for adding expansion boards (the sixth slot contains the multi I/O card, which provides the parallel and serial ports).

At the front of the case, above two flush-mounted push-button switches for changing to and from turbo mode and resetting the system, you'll find three LEDs for signaling power on, hard drive activity, and turbo status. The 3½-inch high-density drive is vertically mounted next to the 1.2MB 5¼-inch drive which occupies the topmost bay in the case. Look for the power switch on the rear panel of the case at the right side.

A comfortable enhanced keyboard (no audible click) comes as part of the standard package, along with a three-button Microsoft-compatible serial mouse. While considerably larger and bulkier than a Microsoft unit, the mouse is still quite serviceable.

The system delivers excellent video performance, thanks to the combination of the Diamond Viper board equipped with 2MB of vid-

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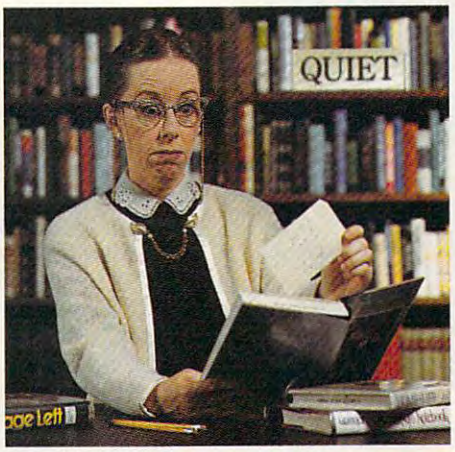

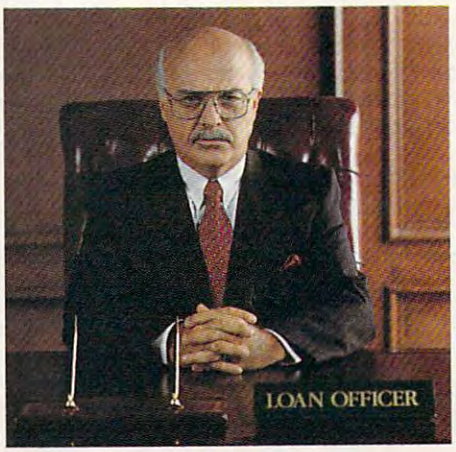

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eo RAM and the local-bus slot. If your eyes tire easily from staring at a screen, you'll appreciate the CTX CMS-1561 SVGA monitor that came with this review system; the monitor can display 1024 × 768 noninterlaced resolution with 256 colors. This combination of a high-powered SVGA card, a local bus, and an excellent monitor is hard to beat if you do lots of graphics-intensive work.

Word processing, desktop publishing, database operations, and spreadsheet work all benefit from the overall power of the DX2/66 CPU and the local-bus architecture, resulting in overall performance that is above average in all respects.

MS-DOS 5.0 and Windows 3.1 are supplied already loaded on the system, which enables you to get off to a productive start immediately. I found the system and software manuals thorough and well organized.

The Diamond DT 486DX2/66 puts lots of muscle into a baby-AT-sized case and certainly merits your serious consideration when shopping for a 486DX2 local-bus system.

Circle Reader Service Number 373

DECPC 466D2 LP

The design of Digital Equipment Corporation's DECpc 466d2 LP exemplifies how good expansion possibilities can be incorporated in a diminutive case.

The footprint of the PC approximates that of a baby AT, but the case has a much lower profile than that of a standard desktop,

THE NORTON OVERALL INDEX

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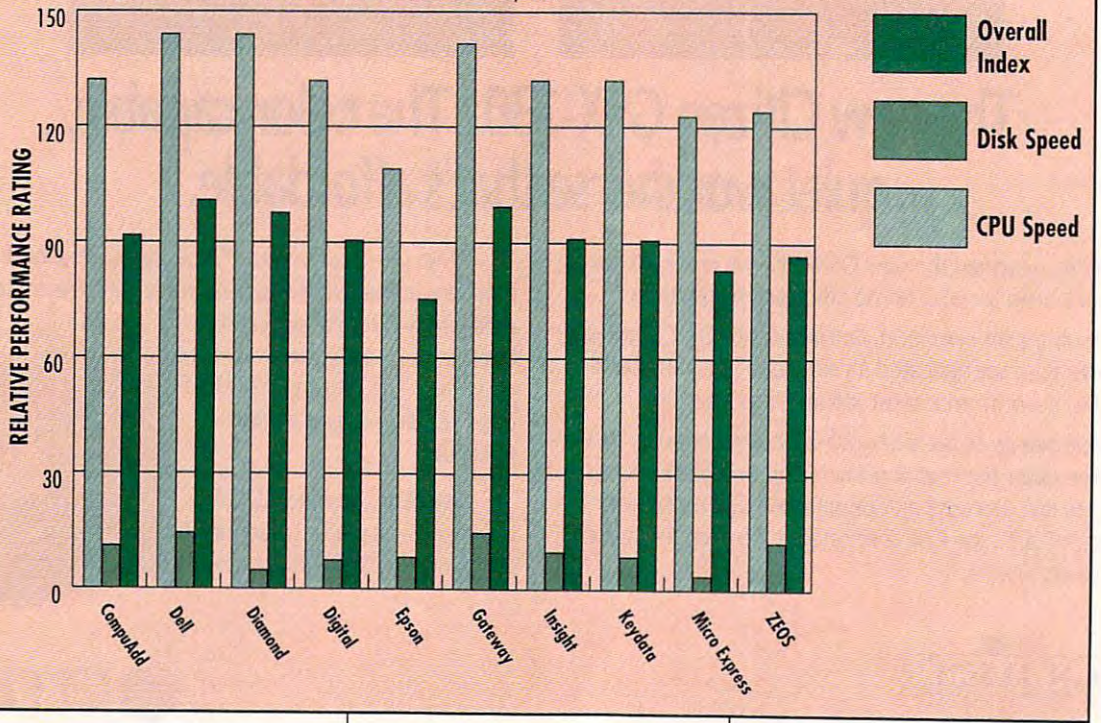

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measuring less than four inches from the top of the desk to the top of the case. On the front of the machine, you'll find recessed LEDs for power, hard drive activity, and turbo status. The reset button and power switches, similarly unobtrusive, contribute to the streamlined appearance of the machine.

A single 3½-inch high-density drive comes installed as standard equipment on the DECpc 466d2 LP, but there's a front-accessible 5¼-inch half-height bay available underneath the drive for accepting another device of your choice. By virtue of its dual-sized plastic bay cover plate, this bay can also accommodate a 3½-inch drive. DEC has provided a hidden 3½-inch bay inside the machine, and two power connectors are available for powering any user-installed drives.

DEC has integrated the parallel, serial, mouse, and keyboard ports; the video adapter; and the floppy and hard drive controllers into the motherboard itself to keep the design compact and leave as many expansion slots free as possible. An extension card inserted vertically into the system board provides three full-length 16-bit expansion slots for any peripherals you choose to install. There are no 8-bit or local-bus slots provided in the system.

The 66-MHz 486DX2 CPU and related performance components reside on a separate board (referred to as a *CPU module* in DEC's manual) attached via an interlocking connector to the main system board. This module permits quickly changing the system's configuration, presumably allowing upgrades. The module's vacant 238-pin socket certainly seems to support such a conclusion. The CPU itself resides in a press-pin socket on the module board.

I was somewhat surprised to find that the only means of dissipating heat generated by the CPU was a deeply finned heat sink attached to the top of the chip. There was no cooling fan to circulate air within the case interior which, compared with the other systems reviewed, was much less spacious. However, heat buildup didn't seem to be a problem; the system performed as expected during the review period.

The system's integrated local-bus video adapter, based on the popular S3 accelerated chip set, comes with 512K of video RAM installed. Even though the review unit came with an additional 512K of video RAM installed (yielding 1MB total), I was unable to initiate or use Windows in 1024 × 768 256-color mode. Since running in 800 × 640 256-color mode wasn't a problem, that's the mode I used. DEC provided a Digital PC7XV-DE monitor with the review unit, and I suspect that the monitor, and not the video card, prevented accessing the 1024 × 768 mode successfully.

DOS 5.0 and Windows 3.1 come supplied with the system, as does a copy of Diagsoft's QAPlus software.

If your expansion requirements aren't too demanding and you like the idea of a slimline case, this DEC machine may be worth a closer look.

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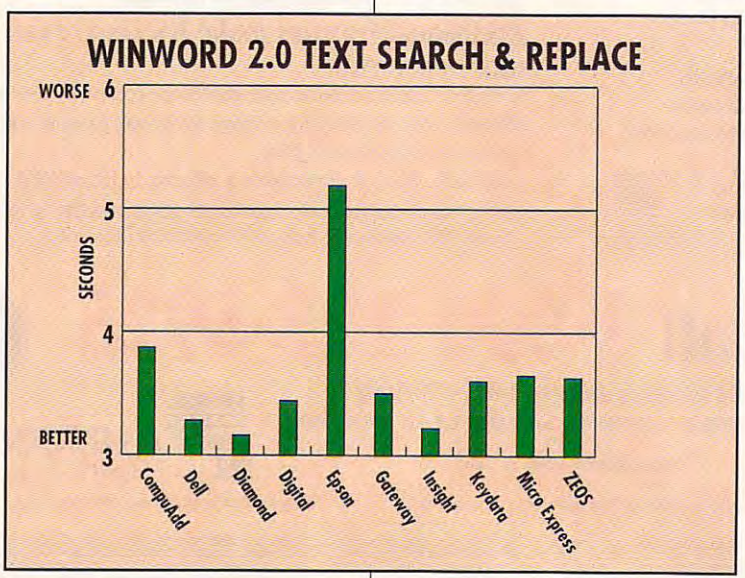

A NOTE ON PRICES

With computer products changing more rapidly than ever and with options more plentiful than ever, computer prices can be a tricky business, indeed.

It pays to keep the following points in mind:

Street and direct prices can be considerably lower than list prices. Shopping around helps you find the best price.

Because computer technology evolves rapidly, a product may have changed by the time our review sees print. A manufacturer may decide to change the video card or the hard drive, for example.

Because consumers are more sophisticated than ever about what they want in computer products and because manufacturers have responded with more options and configurations than ever, one computer model may be subject to dozens of variations, each with a slightly different price.

At COMPUTE, we make every effort to verify prices and differentiate between the price for a review configuration and the price for a standard configuration. It's still a good idea, however, to call the manufacturer or vendor to make sure that the configuration you want matches the price you have in mind.

—MIKE HUDNALL

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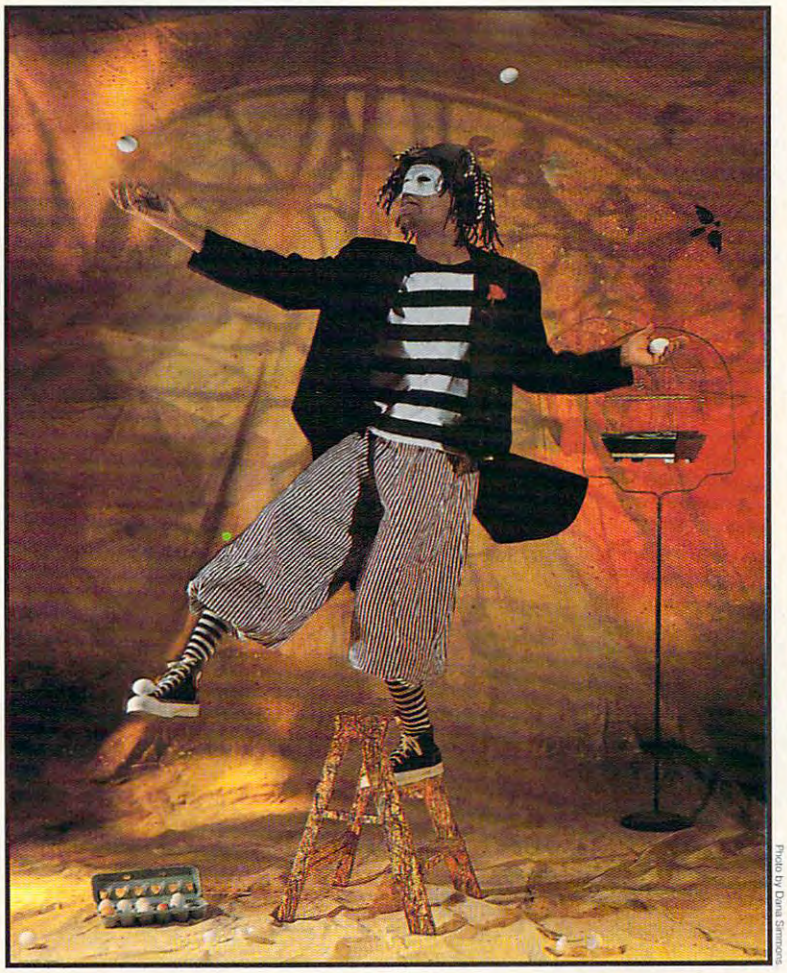
If you think this is "juggling eggs,"



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Epson has taken a modular approach with its Progression series of computers, and the Progression 486DX2/66 PC model is representative of this design trend.

The Progression's full-height baby-AT case provides room for expansion without requiring lots of desktop real estate. The review unit came with a single one-third-height high-density 5¼-inch drive, leaving three front-accessible bays (one one-third-height and two half-height bays) available for additional devices. Two half-height internal bays are also available for upgrading the system.

There's lots of room for expanding RAM beyond the system's standard complement of 4MB. With four SIMM sockets, you can expand up to a maximum of 128MB using 16MB SIMMs. The review unit came equipped with 12MB of RAM; the lab removed one 4MB SIMM so that this system could meet the 8MB configuration requirement for the benchmark testing. During the review, however, I used the full 12MB configuration and found performance to be respectable for all types of general computing work.

The i486DX2/66 CPU resides on a separate card which plugs into a special slot on the motherboard. Under this modular arrangement, someone with a Progression 486SX/25 or 486DX/33 machine could upgrade to a 486DX2/66 simply by replacing the CPU card rather than changing the chip itself. Future upgrades to more powerful CPUs as they become available will also be easy to perform under this design scheme.

The review system's CPU, installed in a low-force press-pin socket, has a deeply finned heat sink. A vacant ZIF (Zero Insertion Force) socket is located adjacent to the i486 chip on the CPU card itself, presumably for future upgrade options. The proprietary slot that accepts the CPU card looks like a local-bus slot, but it is not one; it is a slot designed to accept the modular Epson CPU cards only.

You'll find all of the I/O ports (parallel, single serial, mouse, video, keyboard) integrated into the motherboard. This leaves six full-length 16-bit slots open and available for use. A 200-watt power supply provides the essential operating voltages for the system.

Instead of the local-bus architecture found in other systems covered in this issue, the Progression uses its own Wingine Graphics Acceleration Technology for improved video performance. The heart of the Wingine is a CHIPS and Technologies display controller equipped with 1MB of video RAM (upgradable to 2MB) and a BrookTree RAMDAC. Rather than using an expansion card, Epson's Wingine integrates the video controller into the motherboard itself.

Another unusual aspect of Epson's Wingine technology is that the total amount of system RAM can also affect the video performance. For example, with only 8MB of RAM installed, the system could not support 1024 × 768 256-color noninterlaced resolution in Windows; 800 × 640 was the highest video mode that would operate with the monitor supplied for review, a 14-inch Epson T1183A extended VGA model. Curiously, Epson lists the 17-inch Professional Series monitor as the standard unit for this system.

A two-button mouse and a comfortable enhanced keyboard provide the means for inputting data and controlling system and application functions.

The Progression provides a workable alternative to the local-bus technology of this month's other systems, and it provides some appealing features that make it worthy of consideration.

Circle Reader Service Number 375

GATEWAY 4DX2-66V

Gateway 2000's 4DX2-66V is a local-bus PC in an attractive, standard-sized AT desktop case with reasonable expansion options. A vacant front-accessible half-height bay beneath the dual floppy drives is ready to accept a CD-ROM drive or tape backup unit, and two additional half-height bays are available at the front of the case adjacent to the drives, if you want to mount additional internal devices. *(Editor's note: A CD-ROM drive now comes standard.)*

In this system, Gateway uses a standard-sized, highly integrated motherboard that incorporates the floppy drive controller and a local-bus IDE hard disk interface. The motherboard can support up to 64MB of RAM direct-

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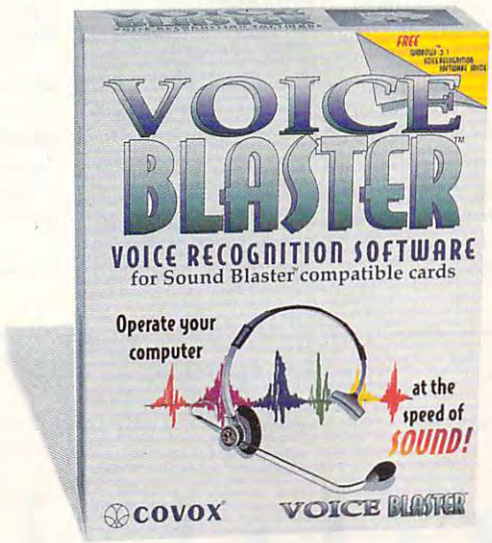

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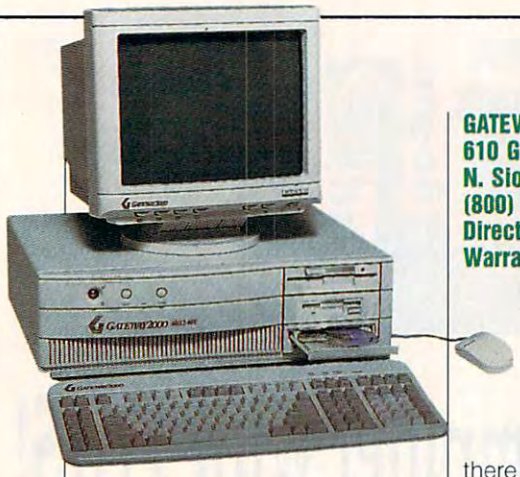

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Direct price: $2,995
Warranty: one year, parts and labor

ly using 16MB modules in its four SIMM sockets.

The 66-MHz Intel 486DX2 CPU resides in a standard press-pin socket and is fitted with a heat sink with crosshatched fins to dissipate its heat. An upgrade socket next to the CPU lets you add an upgrade chip, such as the Intel Overdrive accelerator. However, since the 486DX2/66 is the fastest CPU currently available, there is no advantage or benefit to be derived by adding an Overdrive chip at this point in time.

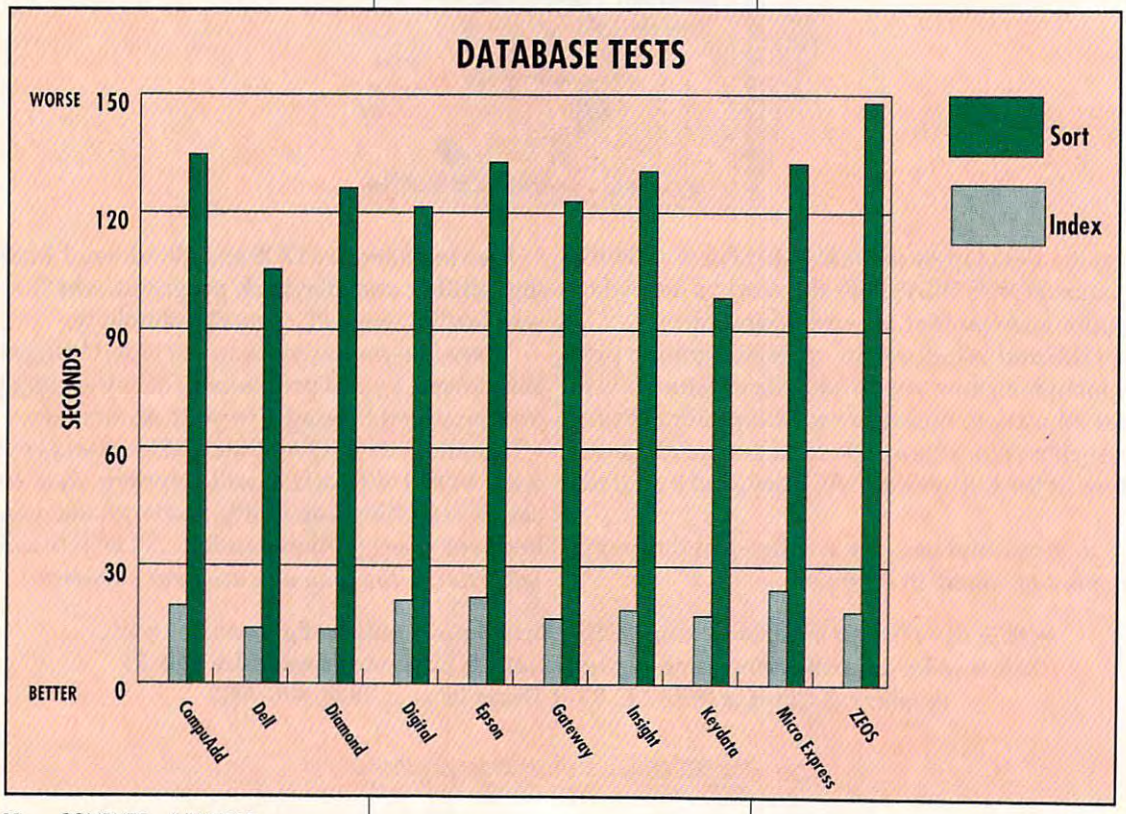
The system includes two local-bus expansion slots, one holding the ATI Graphics Ultra Pro video card. Of the five 16-bit expansion slots available, four can accommodate full-length cards; the other 16-bit slot can only accept a half-length card. Of course, you can use the remaining local-bus slot as a 16-bit slot for non-local-bus expansion cards if you need to.

The reset and turbo selector switches, flush mounted on the front of the case, reside next to the key lock, just above the illuminated power, hard drive activity, and turbo LEDs. The power switch is located at the right rear corner of the machine.

The machine comes with a special 124-key keyboard, but you can order a traditional AT-standard 101-key keyboard if you prefer. The 124-key keyboard has an enhanced cursor-control station with extra keys, which I found confusing. I found that both keyboards, made for Gateway by MaxiSwitch, feel great.

Gateway's 1572 FS 15-inch CrystalScan SVGA monitor accompanied the system unit and provided an excellent display for the high-speed graphics processed through the ATI video card and the local bus.

Overall, the performance of this machine was excellent, especially



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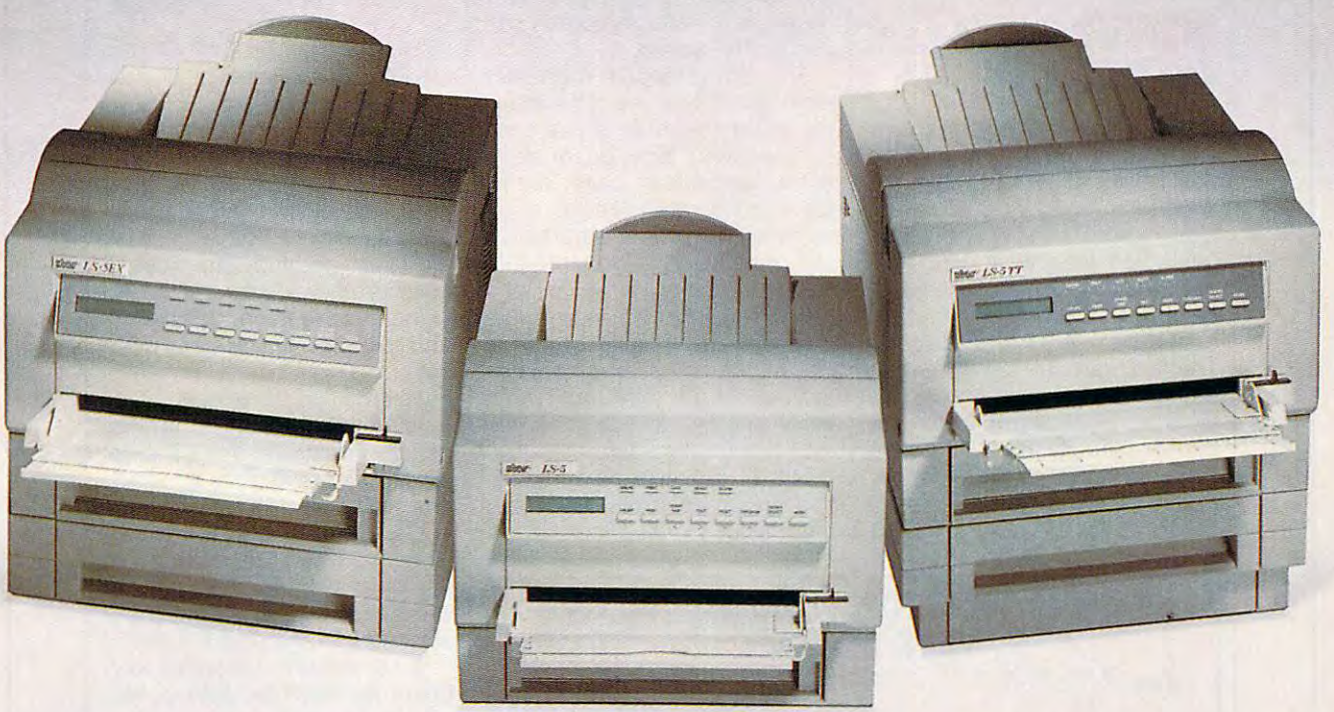

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when running Windows. Even with a screen resolution of 1024 × 768 with 256 colors, Windows was fast and snappy. And the Mach32 control panel, which is a dedicated front end that manages the ATI local-bus controller, makes it very easy to change resolutions, colors, and system fonts.

All in all, the Gateway 4DX2-66V is a first-rate local-bus system in a well-designed package. It's definitely worth considering.

Circle Reader Service Number 376

INSIGHT 486DX2-66 VL

Need a 486DX2/66 local-bus system with plenty of expansion possibilities as your needs grow? Well, then, you'll want to take a closer look at this tower configuration from Insight.

The full-size tower case has a base that pulls out laterally, from both sides, to provide stability. The full vertical configuration affords lots of room for adding drives or tape backup units, with three half-height front-accessible bays still available even with the system's dual floppies and 210MB Western Digital hard drive installed. If you need additional mounting room, there's also a concealed full-height bay.

A beefy 250-watt power supply should adequately power any drives or expansion boards you add to the system.

The motherboard, manufactured by ASUS, is one of the smallest 486 motherboards I've seen to date, and it looks out of place in the gargantuan cavity of this tower configuration. Small size notwithstanding, the motherboard still provides five available full-length 16-bit expansion slots, which should prove to be more than adequate for most users. The motherboard also contains two full-length local-bus slots, which are already occupied; the video controller occupies one local-bus slot, and the combination multi I/O-drive controller card resides in the other.

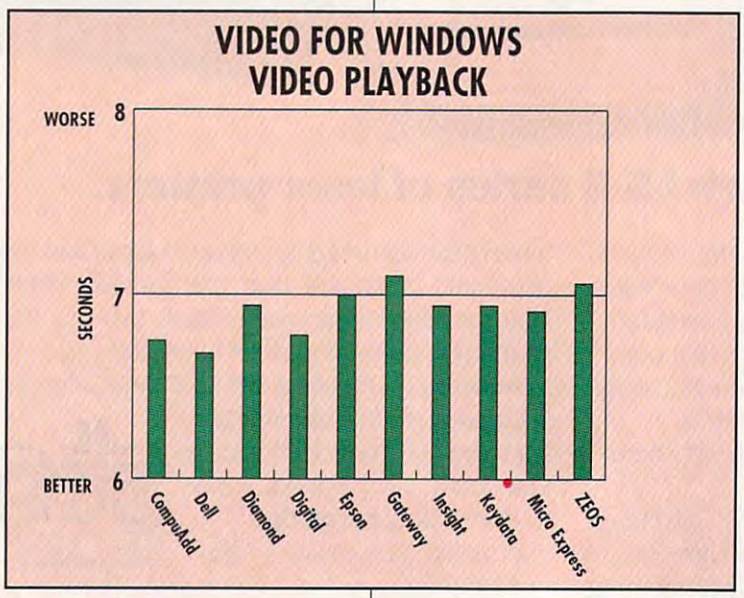
INSIGHT DISTRIBUTION NETWORK
1912 W. Fourth St.
Tempe, AZ 85281
(800) 927-7848
(602) 902-1176
Direct price: $2,779 for review configuration; $2,199 for standard configuration

The Intel 80486DX2 CPU is mounted in a ZIF socket for easy removal or upgrading. I found no heat sink on the chip (to help dissipate heat); however, owing to the spacious area of the tower case, heat buildup doesn't seem to be a problem. The large front-mounted cooling fan does a good job of circulating the air within the case to keep things cool, and I didn't experience any problems usually associated with overheating during my review.

The manufacturer integrates the drive controller and I/O ports all on a single board, which occupies one of the VESA local-bus slots. In addition to the parallel, game, and dual serial ports, this card also provides an IDE interface for the hard drive as well as control for the dual floppies.

A comfortable enhanced keyboard (no audible click) comes with the system, along with a Microsoft-compatible Insight three-button serial mouse. Software supplied with and installed on the system consists of MS-DOS 5.0, Windows 3.1, Dr. Solomon's Anti-Virus, and Stacker 2.0.

The Insight machine had a quality assurance sticker plainly affixed to the rear of the case, yet I was greeted with a *HDD controller failure* message when I first turned the machine on. I decided to remove the system cover to look for any obvious problems before calling Insight's tech support number, and as soon as the cov-



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er was removed I found the culprit: The ribbon cable coming from the hard drive had become disconnected from the pin connector on the I/O card. I reattached it and reinstalled the cover, and the system booted and performed perfectly, without incident, from that point on.

The machine proved to be quite a snappy performer for all types of applications—from word processing to spreadsheets and charting to 3-D modeling and other graphics-intensive tasks. The system came supplied with a 15-inch Viewsonic 6FS monitor, which provided excellent viewing and enabled the STB Powergraph video card (S3-based) with 1MB of RAM to show its stuff (aided in the express department by the system's 32-bit local bus).

Performance for today with room for expansion is what the Insight 486DX2-66 VL delivers.

Circle Reader Service Number 377

KEYDATA INTERNATIONAL
111 Corporate Blvd.
S. Plainfield, NJ 07080
(800) 486-7010
(908) 755-0350
Direct price: $2,675 (standard configuration)
Warranty: one year, parts and labor; on-site service; 30-day money-back guarantee

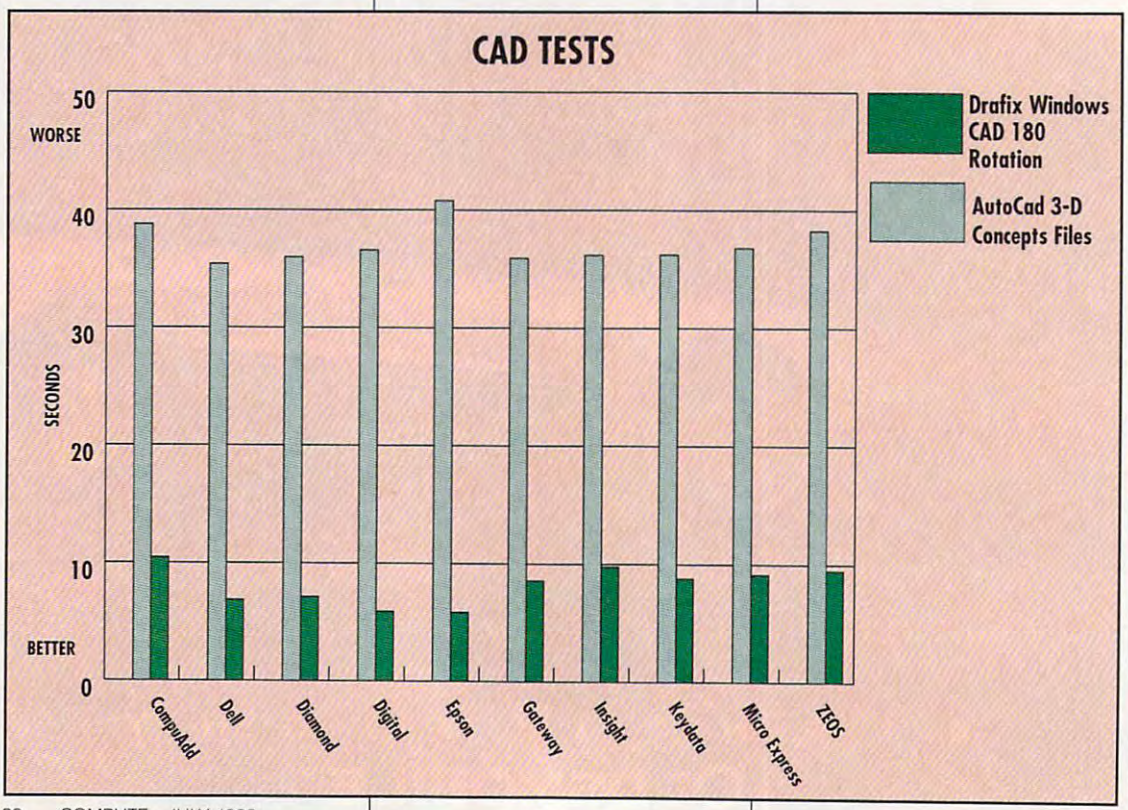
KEYDATA 486DX2-66 VL

If you're looking for 66 MHz of local-bus speed and power but prefer full-size tower computers, you'll be interested in Keydata's 486DX2-66 VL Bus WindowStation.

Like the Insight tower also covered here, the Keydata uses the Taiwan-manufactured ASUS local-bus motherboard. This compact motherboard provides two VESA-compliant local-bus slots.

In the first of the local-bus slots I found a Genoa Systems Windows VGA 24 video card (model 8500VL) with 1MB of RAM and a Cirrus Logic chip set. Keep in mind, however, that Keydata may furnish a different video adapter.

The second local-bus slot provides a home for the IDE disk controller card, which also includes the parallel port, two serial ports, and a game port. By



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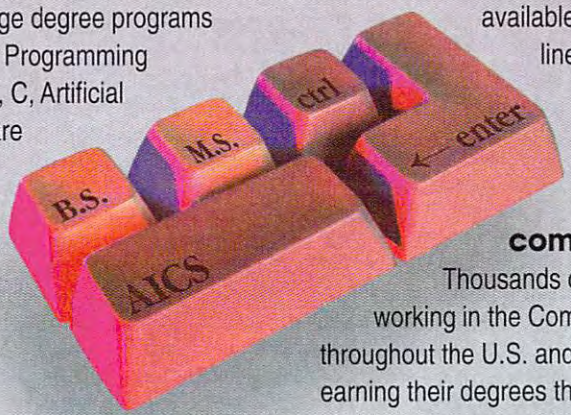

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using these two local-bus slots for the video, disk functions, and I/O, the manufacturer leaves five full-length 16-bit expansion slots free for adding expansion cards of your choice.

Four front-accessible half-height drive bays are available, as well as an additional hidden half-height bay. All of these available bays are located above the 3½-inch and 5¼-inch floppy drives and the 250MB Conner 30254 IDE hard drive. A particularly nice feature of the Keydata case is its use of a hinged door that conceals all of the drives and drive bays, giving the case an extra-clean, streamlined look.

The flush-mounted power, turbo, and reset switches, as well as their related LEDs and the three-place speed LED, are all mounted at the top of the case at an angle, which makes them easily accessible. I consider the Keydata case one of the best-looking tower units I've seen, with lots of eye appeal in addition to its functionality.

The i486DX2/66 CPU mounted in a ZIF socket is directly in the line of air flow coming from the front-mounted cooling fan. The manufacturer doesn't use a heat sink on the massive chip, and the chip apparently doesn't need one, thanks to the excellent circulation provided by the fan and the large open area of the case. I didn't experience any heat-related problems while using the machine for extended periods.

The CTX Model 1560 Proscan SVGA monitor I used with this system provided excellent color and definition. Other standard equipment includes an enhanced Chicony 5181KT keyboard with audible click and a three-button serial mouse. Keydata preinstalls MS-DOS 5.0 and Windows 3.1 on the system and supplies floppy backup copies.

If you expect to expand your system's capabilities as your requirements grow—perhaps adding a CD-ROM drive, a tape backup unit, a sound card, a digitizer, and so forth—it's comforting to know that the Keydata's 250-watt power supply has plenty of muscle and three available power connectors to service these additional devices. Clearly, this system delivers plenty of performance for today while affording great potential for tomorrow's expansion.

Circle Reader Service Number 378

MICRO EXPRESS
1801 Carnegie Ave.
Santa Ana, CA 92705
(800) 989-9900
(714) 852-1400
Suggested retail price: $2,375 (standard configuration)
Warranty: two years, parts and labor; 30-day money-back guarantee; optional on-site service

MICRO EXPRESS 486-VL/DX2/66

Building upon the success of its 486-Local Bus, which used a proprietary local-bus implementation for high-speed graphics processing, Micro Express now offers the 486-VL/DX2/66 for your purchasing consideration. This model features two VESA-compliant local-bus slots for accommodating a graphics processor and another local-bus expansion card, such as a disk controller.

The minitower configuration of the Micro Express case provides a nice compromise between standard desktop cases, which eat up lots of desktop space, and a full tower case, which sits on the floor. The minitower should work equally well either on a desktop or next to it.

You'll find flush-mounted power, turbo, and reset switches aligned vertically on the front of the case, just above the key lock. LEDs indicate power on, hard drive activity, and turbo status, and another LED display indicates the current CPU speed.

An ATI Graphics Ultra local-bus SVGA video card equipped with 2MB of video RAM ensures speedy graphics processing. The card resides in one of the 486-VL's two local-bus slots, leaving one vacant and available for a user-installable local-bus expansion card. This slot can also be pressed into service as a standard 16-bit slot if needed.

Of the six 16-bit expansion slots built into the motherboard, only four are available for accepting expansion cards. Of the available slots, two are full-length and the other two are three-quarter-length. One 16-bit slot has the IDE caching hard and floppy controller board inserted in it, and another 16-bit slot holds the I/O board with parallel, game, and serial ports.

The system includes dual floppy drives (a 3½-inch and a 5¼-inch), leaving two 5¼-inch bays and one 3½-inch bay available for adding drives. For mass storage, the system uses a Western Digital Caviar 2200 (210MB) hard drive. Micro Express installs Windows 3.1 and MS-DOS 5.0 on the drive for you, and you get floppy copies along with manuals.

The system comes with 8MB of RAM as the standard complement, but you can expand the memory up to a maximum of 32MB by replacing the 1MB

Benchmark/performance testing was conducted by Computer Product Testing Services Inc. CPTS is an independent testing and evaluation laboratory based in Manasquan, NJ. Every effort has been made to ensure the accuracy and completeness of this data as of the date of testing. Performance may vary among samples.

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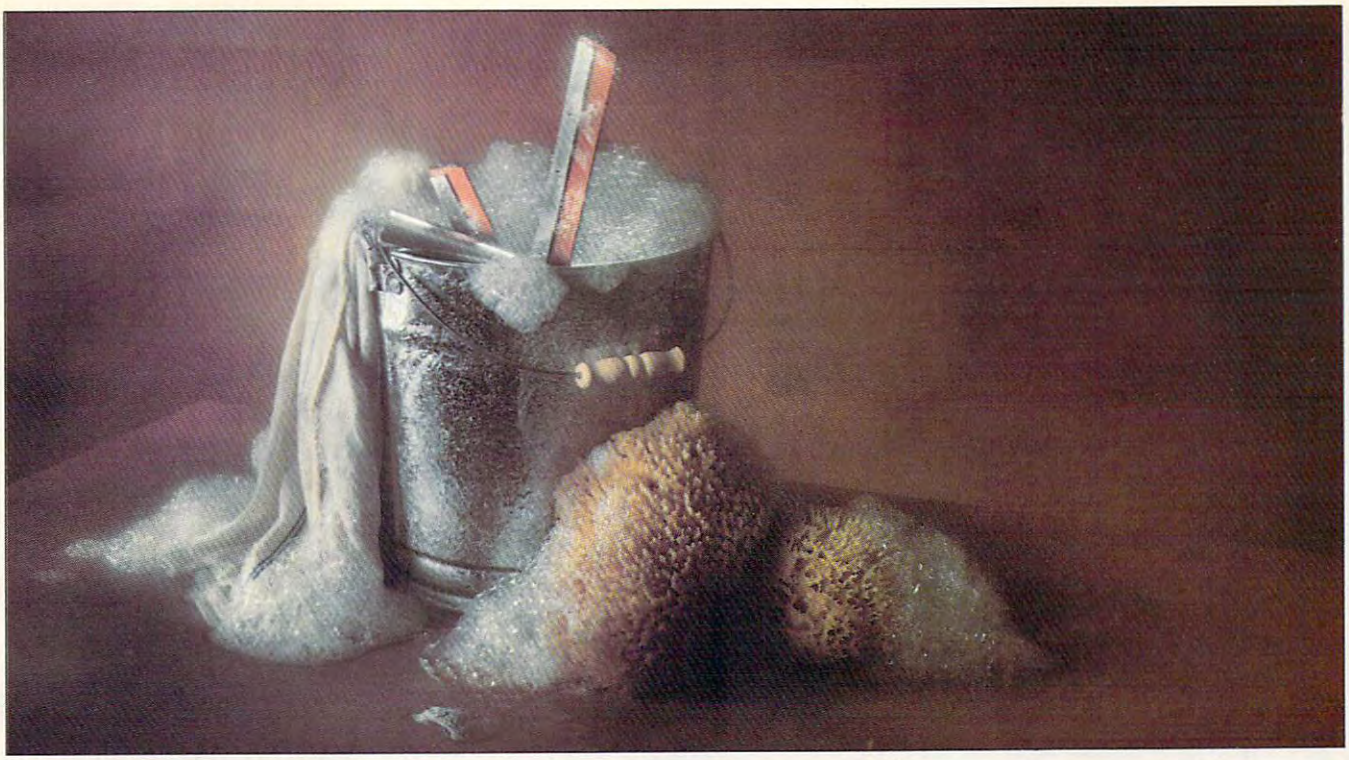

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SIMMs with 4MB units in the eight SIMM slots. The review unit came with 512K of cache memory, and this, too, can be upgraded to a full megabyte.

The manufacturer uses two methods of dissipating heat from the i486DX2/66 CPU: a deeply finned heat sink mounted atop the CPU chip and a miniature fan attached to the top of the heat sink. The fan serves two functions: It dissipates the heat which is transmitted through the heat sink's fins, and it also pulls cooler air through the fins to keep the chip's operating temperature within reasonable limits. Since heat buildup is the major cause of CPU and component failure, it's reassuring to see that the Micro Express folks have taken the bull by the horns, so to speak, with these preemptive measures.

I liked everything about this system except for the mouse. A three-button serial mouse from XOA, I found it to be a bit too bulky and stiff for my liking, but this is a minor point and purely one of taste. The enhanced keyboard supplied with the system is available in either audible-click or silent versions (a silent model came with the review machine), and it has a nice slope and comfortable action.

The minitower configuration provides lots of installation flexibility, and the 486-VL should prove to be adequate for the needs of most users. It certainly merits a closer look if you're interested in moving your data on the local bus.

Circle Reader Service Number 379

ZEOS 486DX2-66

When you unpack and set up as many computer systems as I do, you really appreciate it when the manufacturer has done a good job of preparing and testing the machine before it leaves the factory. The folks at ZEOS deserve some kind words in recognition of the exemplary job they do in making sure everything's right with a system before they ship it.

ZEOS INTERNATIONAL
1301 Industrial Blvd.
Minneapolis, MN 55413
(800) 423-5891
Direct price: $2,893 (review configuration)
Warranty: one year, parts and labor; 30-day money-back guarantee

In addition to a detailed packing slip with a complete inventory of the system components (both internal and external) and their associated part numbers, ZEOS also included a quality assurance checklist with the system. This checklist confirms that all aspects of system preparation and component quality assurance checking have been performed—not just once but twice—and that everything passed.

There's even a parts check section that ensures all required cables, manuals, power cords, and other required elements are also present and accounted for prior to sealing the box and shipping the system. Kudos to ZEOS for going the extra mile here.

Every computer system is the sum total of all its component parts, and ZEOS has supplied a shining example of what a good system is made of. The 200-watt power supply with built-in surge protection provides the operating voltage to power the system's dual floppy drives, its 245MB Seagate ST-3283AT hard drive, and the system board.

The spacious case provides lots of expansion room. Flush-mounted push-button reset, power, and turbo switches have LED status indicators, and a system key lock is also mounted at the front of the case. A snap-off plastic cover conceals the screws securing the case cover to the chassis and gives the rear of the machine a smooth and uncluttered appearance. As far as vacant bays go, you'll find a 5¼-inch bay and a vertical 3½-inch bay, both accessible from the front of the machine; inside the case there's room to add two additional 5¼-inch half-height drives.

ZEOS uses its own motherboard, which provides a total of seven full-length 16-bit expansion slots and a single three-quarter-length 8-bit slot. Two of the 16-bit slots have local-bus extensions on them as well. In the review unit, one of the local-bus slots was occupied by the Diamond Viper SVGA card, while all of the other slots were vacant and available. To dissipate the excess heat generated by the CPU, ZEOS installed a large heat sink about an inch longer than the 80486 chip itself. A ZIF socket makes removing the CPU for future upgrades an effortless procedure that consists of lifting the socket's locking lever, replacing the chip, and pushing the locking lever back down again.

I found the system's performance beyond reproach, handling both text- and graphics-based applications quickly and without a whimper. A comfortable enhanced keyboard with audible click and a Microsoft serial mouse make using the system a pleasure, and Lotus Organizer software, DOS 5.0, and Windows 3.1 all come standard. And if that's not enough, you can choose either Lotus 1-2-3 for Windows, Ami Pro, or Lotus Freelance as an additional included software package.

ZEOS builds a solid machine that should deliver excellent, trouble-free performance for many years to come. If you're thinking of purchasing a 486DX2/66 local-bus system, this one should be high on your list of potential candidates.

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SYSTEM FEATURES

	CompuAdd Express	Dell	Diamond Technologies	Digital	Epson
DIMENSIONS (in inches)					
Length	16.75	16.75	17.00	15.50	15.00
Width	17.00	24.40	16.25	16.00	17.00
Height	6.50	7.50	6.00	3.75	6.00
VIDEO					
Monitor	CompuAdd 51118	Dell UltraScan 14C	CTX 156NI	Digital PC7XV-de	Epson 17-inch Professional Series
Video adapter	Tseng W32	integrated S3 chip set	Diamond Viper	integrated S3 chip set	Wingine
Adapter max NI[1] res/colors	1024 × 768/256	1024 × 768/32,000	1280 × 1024/16.7 million	1024 × 768/256	1024 × 768/256
DRIVES					
Hard drive Make	Western Digital	Maxtor	Maxtor	Digital	Quantum
Model	Caviar 2340	LXT 340A	LXT 213A	Digital	ProDrive LPS
Formatted capacity	333MB	320MB	213MB	239MB	240MB
Controller	IDE	integrated IDE	IDE	integrated IDE	IDE
Controller cache	32K	32K	4K	NA	NA
Other drives 1.2MB	1	1	1	0	1
1.44MB	1	1	1	1	0
MOTHERBOARD					
Manufacturer	BCM Advanced Research	Dell	S&A Labs	Digital	Epson Portland
Standard RAM	4MB	8MB	8MB	4MB	4MB
Max RAM	32MB	64MB	32MB	64MB	128MB
No. of 8-bit slots	0	0	0	0	0
No. of 16-bit slots	6	6	6	3	6
No. of VESA local-bus slots	0	0	2	0	0
BIOS	AMI	Phoenix/Dell	AMI	Phoenix	Epson
External cache	128K	128K (optional)	256K	128K	yes[2]
Max cache	256K	128K	256K	256K	variable[2]
CPU socket	press-pin	press-pin	press-pin	press-pin	press-pin
Upgrade socket	yes	yes	no	yes	yes
Power supply	200 W	240 W	200 W	NA	200 W
INPUT/OUTPUT					
Parallel ports	1	1	1	1	1
Serial ports	2	2	2	2	1
PS/2 mouse port	0	1	0	1	1
Game port	0	0	0	0	0
Mouse supplied	yes	yes	yes	yes	yes
SUPPLIED SOFTWARE					
DOS	yes	yes	yes	yes	yes
Windows 3.1	yes	yes	yes	yes	yes
Floppy backups	yes	yes	no	yes	no
Other software	Close-up 4.0 and choice of one: Lotus Organizer, Lotus 1-2-3 for Home, Lotus Write, Lotus Works	NA	NA	QAPlus	NA

NA=not applicable or information about this feature not available
[1]noninterlaced
[2]Epson uses what it calls VirtualCache, a proprietary cache that can let you use all of your system memory as a virtual cache pool.

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TEST LAB

SYSTEM FEATURES

	Gateway	Insight	Keydata	Micro Express	ZEOS
DIMENSIONS (in inches)					
Length	16.00	17.50	17.00	16.50	18.25
Width	16.25	7.75	7.20	8.00	18.75
Height	4.25	25.25	24.80	24.80	6.25
VIDEO					
Monitor	CrystalScan 1572 FS	ViewSonic 6FS	CTX 1560	ME FM 360	ZEOS 14-inch SVGA
Video adapter	ATI Graphics Ultra Pro Local Bus	STB Power Graph	Genoa Windows VGA 24	ATI Graphics Ultra Local Bus	Diamond Viper VLB
Adapter max NI[1] res/colors	1024 x 768/256	1024 x 768/16.7 million	1024 x 768/16.7 million	800 x 600/32,768	1024 x 768/16.7 million
DRIVES					
Hard drive Make	Western Digital	Western Digital	Conner	Western Digital	Seagate
Model	Caviar	Caviar 2200	30254	Caviar 2200	ST 3283AT
Formatted capacity	333MB	210MB	250MB	210MB	245MB
Controller	integrated IDE	VL-bus IDE	VL-bus IDE	IDE	VL-bus IDE
Controller cache	128K	no	no	256K	no
Other drives 1.2MB	1	1	1	1	1
1.44MB	1	1	1	1	1
MOTHERBOARD					
Manufacturer	Gateway	ASUS	ASUS	Micro Express	ZEOS International
Standard RAM	8MB	8MB	8MB	8MB	4MB
Max RAM	64MB	32MB	32MB	32MB	64MB
No. of 8-bit slots	0	0	0	0	1
No. of 16-bit slots	6	5	5	6	5
No. of VESA local-bus slots	2	2	2	2	2
BIOS	Phoenix	AMI	AMI	AMI	Phoenix
External cache	256K	256K	256K	512K	128K
Max cache	256K	256K	256K	1MB	256K
CPU socket	press-pin	ZIF	ZIF	press-pin	ZIF
Upgrade socket	yes	yes	yes	no	yes
Power supply	200 W	250 W	250 W	200 W	200 W
INPUT/OUTPUT					
Parallel ports	1	1	1	1	2
Serial ports	2	2	2	2	1
PS/2 mouse port	0	0	0	0	0
Game port	0	1	1	1	0
Mouse supplied	yes	yes	yes	yes	yes
SUPPLIED SOFTWARE					
DOS	yes	yes	yes	yes	yes
Windows 3.1	yes	yes	yes	yes	yes
Floppy backups	yes	yes	yes	yes	yes
Other software	Cool Tools, PC Tools, QAPlus	Dr. Solomon's Anti-Virus, Stacker	Choice of one: Norton Desktop for Windows, Object Vision, Sidekick, Turbo C++, Paradox, dBASE IV	NA	Lotus Organizer and one: Ami Pro or Freelance

NA=not applicable or information about this feature not available
[1]noninterlaced

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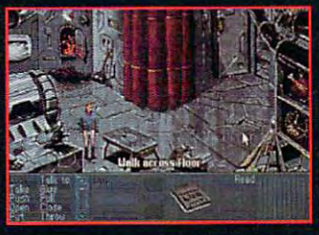

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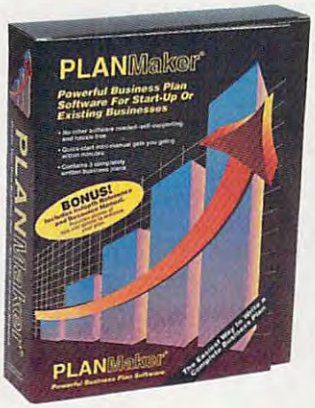
NEWS & NOTES

Jill Champion

For Capital Seekers

There's nothing like gridlock. While small businesses hold the greatest potential for creating new jobs, they also have the hardest time obtaining venture capital. Add to that bleak picture, according to one study (by Coopers and Lybrand), the fact that only 1 in 100 business plans ever shows promise of being seriously considered because it is concise and well written, and you can see that hopefuls with poorly constructed plans are working against a huge disadvantage.



PLANMaker helps you put together a winning business plan.

A new software package called PLANMaker, not your ordinary fill-in-the-blanks business program, is designed to help overcome such odds. It combines all the ingredients necessary to formulate and publish a sophisticated business plan—one that conforms to the standards now demanded by bankers and investors. Its suggested retail price is $129. For more information, contact PowerSolutions for Business, 1920 South Broadway, St. Louis, Missouri 63104; (314) 421-0670, (314) 421-0668 (fax).

Future Teleconferencing

We all remember the classic line from "Star Trek": "Lieutenant, can you put that on-screen for me?" Even three decades ago, remote communications in sci-fi programs and flicks involved visual as well as audio contact.

Now, NCR is bringing to market NCR TeleMedia Connection. It's a combination of hardware and software that lets PC users communicate with each other through teleconferencing while they collaborate on files and documents in realtime.

"NCR TeleMedia Connection will change the way we work," says Neil Whittington, assistant vice president of NCR's Multimedia Products business unit.

The product consists of two 16-bit ISA bus plug-in cards to support video and graphics on 386- and 486-based PCs, as well as software that allows users to collaborate on Windows-based files. It also supports an optional video camera and audio unit. As a result of all this technology, a widely dispersed group of people can work together as if they were in the same room.

NCR plans to introduce products utilizing TeleMedia Connection technology later this year. For more information, contact NCR, 1700 South Patterson Boulevard, Dayton, Ohio 45479; (800) 225-5627 or (513) 445-5000.

Beatles Tour—30 Years Later

The Beatles have begun an ambitious worldwide tour on CD-ROM. Voyager is launching a new CD-ROM edition of *A Hard Day's Night*, an interactive program that includes the complete uncut movie, the entire script, a book's worth of text about the Beatles and the rise of rock 'n' roll, a Beatles photo gallery, and profiles of the songs and the film cast.

The suggested retail price is $39.95 for the Mac version. A PC version of the program is scheduled for release later this year. For more information, contact Voyager, 1351 Pacific Coast Highway, Santa Monica, California 94041; (310) 451-1383, (310) 394-2156 (fax).

Decrypting the Code

The Computer Museum in Boston opened From Words to Code: How People Make Computers Work this April, the first exhibit to reveal in a lighthearted, interactive way the mysterious world of programming and how it affects daily lives.

Using video, computer stations, and 3-D objects, the exhibit takes visitors on a journey into a "land of languages" to discover how programs, or sets of instructions, are all around—from recipes to lock combinations—and how these sets of instructions are turned into code using programming languages. Visitors are even able to build their own programs. The grand finale, a nine-foot-high 3-D tower, graphically illustrates the variety of programming languages that have evolved since the early 1950s. The exhibit is on display through September 6, 1993. For more information, contact The Computer Museum, 300 Congress Street, Boston, Massachusetts 02210; (617) 426-2800, (617) 426-2943 (fax).

Don't Dump That Old Laptop!

Why spend more money on a new laptop when you can have your current one upgraded? Laptop Solutions of Houston replaces the current hard drive with a brand-new, higher-speed, higher-capacity drive. "We have a rigorous quality-control program," says Ken Duckman, president of Laptop Solutions. "We pride ourselves on our 0-percent defect policy—every ma-

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Whether you take your work across the hall or across the country, with PORT·ABLE Sound Plus, you have all the cards you need to play right in your hip pocket. The hinged design lets you flip up the unit if you are short on desk space or lap space. And, the power will always be with your whether you use rechargeable or non-rechargeable AA batteries. PORT·ABLE Sound Plus also comes equipped with an AC/DC power converter.

As a bonus, you will get all the software you need to communicate. Like Lotus Sound™ an OLE server for Windows 3.1. WinReader for Windows 3.1, a handy text-to-speech utility. Digispeech's DOSTalk and DOSReader text-to-speech applications. Show & Tell For Kids™ for Windows – an easy to use MultiMedia Authoring program. It is also Sound Blaster and AdLib compatible.

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To order or obtain more information about PORT·ABLE Sound Plus, write or call Digispeech, or, contact your local dealer.

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The entire process takes 48 hours. During the second 24 hours, after components have been upgraded, the machine is put through an intense "burn-in and test" period in which the hard disk is exercised through a variety of software applications and environments. The new drive must perform perfectly before the company will release the machine. Such meticulousness has helped Laptop Solutions win licensing agreements with Toshiba and Compaq, but the company is also skilled in upgrades of many other manufacturers' designs, including Sanyo, ZEOS, TI, Tandy, CompuAdd, and AT&T.

For more information, contact Laptop Solutions, 10700 Richmond Avenue, Suite 114, Houston, Texas 77042; (800) 683-6839.

Finding Silicon

Do-it-yourselfers take note: JDR Microdevices has a new catalog designed specifically for engineers, technicians, hobbyists, and hackers that offers the company's largest selection ever of electronic components, prototyping products, and developer's tools. Featured are components for today's advanced designs. Readers will also find Hitachi oscilloscopes, solder accessories, and even hard-to-find reference books from National Semiconductor, Intel, Motorola, and other chip makers.

The catalog also features insightful information to make the buyer more productive. Derrick Moore, director of engineering at JDR, shares his development strategies in "Derrick's High-Tech Corner" columns, and numerous "Tech Tip" columns offer insightful tips. To order a free catalog, contact JDR Microdevices, 2233 Samaritan Drive, San Jose, California 95124; (408) 559-1200, (408) 559-0250 (fax).

Floppy Jukebox

Once you've tried the Disk Dispatcher, a "point-and-click floppy jukebox," you might never go back to conventional disk storage methods again. The Disk Dispatcher, from Select Products, organizes, indexes, and dispenses 3½-inch floppy disks or Flopticals.

Simply list up to 20 of your most-used disks or Flopticals on the reversible index and punch in your selection, and the patented selector-action mechanism on the box instantly hands you your disk.

The Disk Dispatcher also has the smallest operating footprint of any 20-disk holder currently on the market, so it will save desk space. Its suggested retail price is $21.95. For more information, contact Select Products, 520 First Street, Fillmore, California 93015; (805) 524-1747, (805) 524-1767 (fax).

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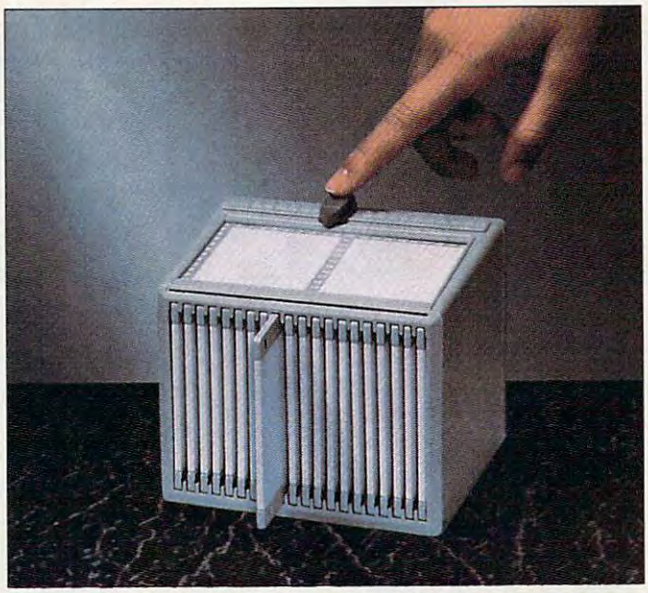
Businesses strapped for capital needed to purchase office computer equipment might want to try shopping with the LeaseCard—a credit card from Trans Leasing International that lets you finance purchases in the $1,000–$50,000 range. Rates are lower than with conventional credit cards, and applications are processed in one day. Trans Leasing's close relationship with major equipment manufacturers offers cardholders value pricing, eliminating the need for hours of comparison shopping. Says company founder Richard Grossman, "This is a service-driven business. The idea is to have credit available to customers immediately." And commenting on the success of his credit-card business, he says, "It pays off when satisfied customers purchase second and third pieces of equipment." For more information, contact Trans Leasing International, 3000 Dundee Road, Northbrook, Illinois 60062; (708) 272-1000, (708) 272-2174 (fax).

Companies or public relations firms with items suitable for "News & Notes" should send information along with a color slide or transparency to News & Notes, Attn: Jill Champion, COMPUTE, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. ❐



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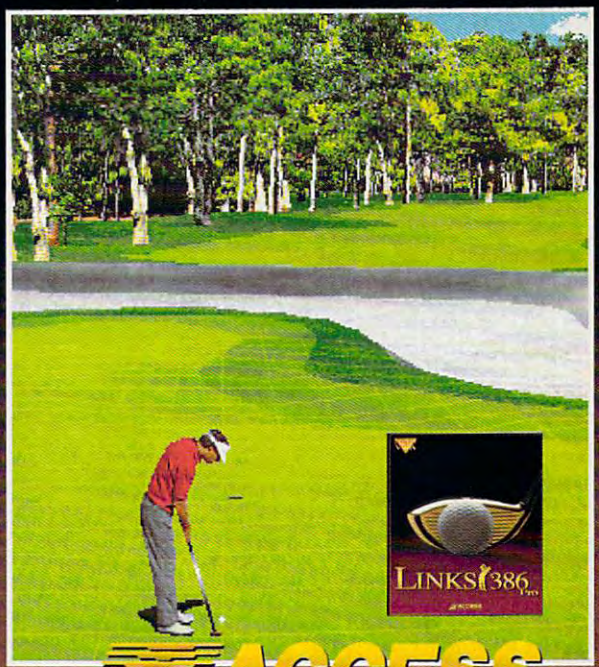

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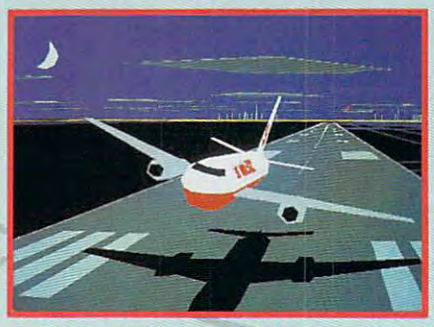

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FEEDBACK

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Keyed Up

Some time ago, you showed how to set or reset the Caps Lock key and other control keys. But what about ordinary keys? Is there a way to tell which key has been pressed?

JOHN JACKSON
DETROIT, MI

This program might work for you. It's written in QBASIC.

```
CLS
DEF SEG = 0
top:
LOCATE 1, 1
FOR i = 1049 TO 1088
PRINT (PEEK(i));
a$ = INKEY$
NEXT
GOTO top
```

This program displays the keyboard buffer (bytes 1053 through 1085), a pointer that keeps track of the current character in the buffer (byte 1052), and a pointer that keeps track of the most recent character read (1050). When increasing the value of 1050 will make it equal to the value in 1052, your computer beeps to alert you that your keyboard buffer is full. To print onscreen the ASCII value of the most recent keypress, use this program. (The line that reads a$=INKEY$ *keeps the beginning and end pointers in the same position.)*

```
CLS
DEF SEG = 0
top:
q = (PEEK(1052) - 32)
IF q = -2 THEN q = 30
LOCATE 1, 1: PRINT PEEK(1054 +
 q)
a$ = INKEY$
NEXT
GOTO top
```

Viral Spiral

The article on viruses in your February 1993 issue answered quite a few questions for me, but can you answer these?

Is it theoretically possible for a compiler, if infected with any of the viruses the article described, to generate an infected EXE file?

Is it theoretically possible to write a virus that would infect a compiler and cause it to generate an infected EXE file?

If the answer is *no* to both questions, can a newly compiled and not yet executed EXE file be considered virus free, assuming the source code contains no viruses?

RICHARD M. SANDERS
BURNSVILLE, MN

Anything is possible. Some of the viruses described in the article install themselves as TSR files which constantly scan the hard disk for uninfected files. A new EXE file (one that was just created) would be vulnerable to the Dark Avenger, for example. As far as we have been able to determine, no virus currently in circulation specializes in infecting compilers in such a way that they would generate diseased EXE files (although now that you've raised the question, someone somewhere will probably try circulating one). Such a virus would be too specialized to spread and would quickly be isolated and destroyed. The answer to your final question is that no file can be assumed to be virus free.

Rights and Wrongs

In response to the "News Bits" item called Controlling the Infectious (December 1992), I believe that there should be controls both on weapons and virus construction kits. Nobody sets a loaded and cocked gun in a room and then says, "Be careful." Virus construction kits are loaded guns. They're all too easily put to use. Viruses, like guns, will not disappear under stricter controls, but by restricting their availability, fewer people will suffer.

JOSEPH LEWIS LOUTZENHISER
ASHLAND, OR

Taking Control

I wish to point out a misconception regarding virtual reality and aviation. In "Virtual Reality" (February 1993), Jeffrey Hsu suggests that "air-traffic controllers may one day take direct control of the planes on their radar scope through VR." In fact, it's more likely that pilots will one day replace the ground controllers. Technology currently exists (GPS navigation and data link transponders) which would allow pilots to provide their own separation and sequencing. It should be noted that these are the services currently offered by ground controllers.

C. SEBERG
MOUNTAIN VIEW, CA

Infection Control

I would like to take issue with one of Philip Chien's comments in "The Great Virus Scare" (February 1993). He states, "In all cases, viruses are programs that were written by an outlaw—a hacker who specifically sets out to damage other people's computers." In all deference to Mr. Chien, this is simply not true. Paul Mungo and Brian Clough, discussing Teodor Prevalsky, a Bulgarian engineer who was an early virus writer, state, ". . . for Teodor, destruction of data or programs was never the point. He wrote viruses as an intellectual challenge. None of his viruses had ever been intentionally damaging . . ." (from *Approaching Zero,* 1992).

SCOTT MOSER
DANVILLE, IN

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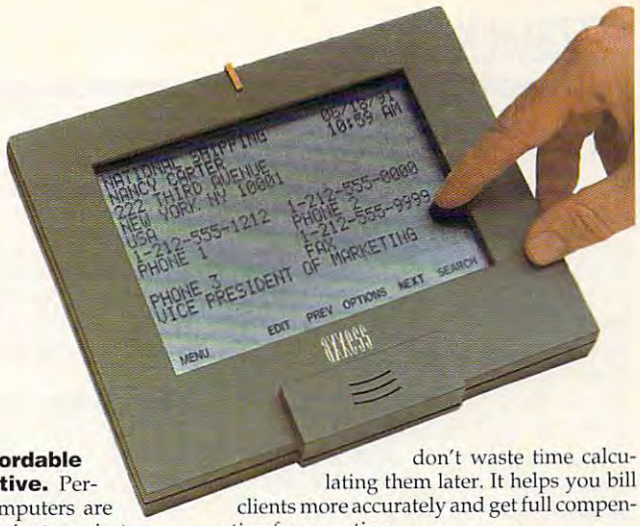

by Charles Anton

Do you ever get frustrated trying to locate the phone number or name of a client? Forget which piece of paper you wrote it down on? Well if you are like most people, your business depends on quick access to important phone numbers, appointment schedules or other messages that could make a difference in getting that "big job." With Axxess, the contact management solution from Oregon Scientific, you can immediately put an end to all these problems.

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Unmatched capabilities. No other legal pad or black book can match Axxess' capabilities. With just one touch, you can search through hundreds of notes and reminders. Brief yourself on clients, their companies and what you thought about them. Axxess will even speed dial up to four different phone numbers from every record.

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The affordable alternative. Personal computers are too expensive to use just for storing business records. But that's what most companies are using them for. The Axxess system from Oregon Scientific can store over 1,000 business records, including names, companies, phone and fax numbers, addresses and two-line memos. Just touch a number and it's dialed for you. It's great for small business owners who can't afford a secretary but still need an extra hand. Plus, with an optional cable, two or more Axxess units can share information!

Just a touch away. Simply touch the screen to access information... Keep accurate records of time spent on specific tasks... Speed search through the listings you want... Print this information directly to your printer... Schedule appointments--days, weeks or months in advance and let your alarm remind you... Never forget a phone number or be late for an appointment again.

Speed dialing. Axxess can be used with most phones for speed dialing. Just select your contact and touch the number on screen-- it's automatically dialed for you ... in seconds. Axxess can also be used as a tone dialer for phones that you cannot directly link to, like pay phones. Simply touch the number on the screen and then hold the phone's handset over Axxess' speaker. Axxess emits a series of electronic tones which dial the number for you.

Appointment scheduling. The Axxess personal organizer also has a 100-year calendar. Its built-in alarm reminds you of every appointment. There is a continuous time/date display to help you keep on schedule as you work, increasing your productivity.

Time log. The time log feature helps keep an accurate record of time spent on each project. Axxess tracks your hours as you go, so you don't waste time calculating them later. It helps you bill clients more accurately and get full compensation for your time.

Electronic protection. Another great feature-- Axxess allows you to set a security code. This keeps everything confidential, limiting Axxess to only the people you choose.

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Good point. There's a bit of intellectual challenge in writing a virus virulent enough to plant itself unknown in heavily defended computers. If that were all that viruses did, no one would care about them. Unfortunately, most virus writers go that extra mile to make their creations destructive, or at least troublesome. Recall that some say Nero's purpose in torching Rome was to receive the inspiration for a poem. Should we forget the damage that resulted from his flight of fancy simply because he was seeking an intellectual challenge?

In retrospect, we probably should have changed the word all *to* most *in Mr. Chien's article. Many people believe in the doctrine "All absolute statements are false."*

Flying High

I have DOS 5.0. How can I load my TSRs into high memory?

JOSHUA NEWMAN
COOPER, TX

We get a lot of letters about this. DOS programs (particularly games) have become so memory hungry that you need every byte of conventional memory you can get your hands on.

You can save significant amounts of conventional memory by loading your TSRs high. You do this with Loadhigh. If you have a TSR called Nicholas, instead of simply putting its name on a line by itself in your AUTOEXEC.BAT, put Loadhigh Nicholas.

A couple of other ways to save memory are to use DOS=HIGH and to use Devicehigh for the drivers in your CONFIG.SYS file (as in DEVICEHIGH=SETVER.EXE). Make sure DEVICE=HIMEM.SYS comes first in your CONFIG.SYS file. You can't load HIMEM.SYS high.

Color Forms

Are there any form programs that can use PCX graphics and make color forms?

STEVEN KILIAN
APO, AP

FormWorx (Power Up Software, 2929 Campus Drive, San Mateo, California 94403) can import uncompressed black-and-white PCX files up to 64K and print text and fills in color. PerFORM Pro Plus (Delrina Technology, 6830 Via Del Oro, Suite 240, San Jose, California 95119) will import and print gray-scale PCX files and print text and fills in color.

Drafted into Service

I'm a deputy sheriff and editor of a small journal for an organization of traffic crash reconstructionists. We've found that MacDraft is a great program. But because most sheriffs' departments have PCs rather than Macintoshes, I'm looking for a PC product that's as good as MacDraft on the Mac for drawing crash sites for courtroom presentations.

WILT NELSON
HOWELL, MI

MacDraft is now available in a Windows version called MacDraft for Windows. Contact Innovative Data Design, 2280-A Bates Avenue, Concord, California 94520; (510) 680-6818.

Looking for Trouble

I wanted to alert your readers to the fact that you can often detect viruses that infect EXE and COM files because they change the size of the infected files. Also, there's a simple test for certain viruses, particularly Stoned and Michelangelo. These viruses decrease the amount of base memory DOS thinks it has. If you run Chkdsk, you should see 655360 total bytes of memory. If you see a value less than that, your computer may have an infection. Also, if you think you have an infection, you should turn your computer off immediately and seek professional help. There's a chance that the virus can be stopped before it does serious harm to your computer.

MARK ANDERSON
DEL NORTE, CA

Readers whose letters appear in "Feedback" will receive a free COMPUTE's PC clock radio while supplies last. Do you have a question about hardware or software? Or have you discovered something that could help other PC users? If so, we want to hear from you. Write to COMPUTE's Feedback, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We regret that we cannot provide personal replies to technical questions. ❐

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- ☐ 640K or less
- ☐ 1MB
- ☐ 2MB
- ☐ 4MB
- ☐ 8MB
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- ☐ DELPHI
- ☐ GEnie
- ☐ Internet
- ☐ Prodigy
- ☐ Other _____

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WINDOWS WORKSHOP

Clifton Karnes

COMPILER WARS

Visual C++ is a superb development environment that has just about everything.

Back in January, I talked about Borland's C++ 3.1 and what a great Windows development environment it was. The quality of Borland's new entry in the compiler market wasn't lost on anyone, especially Microsoft. Now Microsoft has countered Borland's C++ 3.1 with Visual C++, a superb development environment that has just about everything.

There are lots of modules to Visual C++, and they all work together. The heart of the system is Visual Workbench, which is the Windows-based integrated environment. It boasts an interface much like QuickC for Windows but with many added features. There's a toolbar for quick access to common commands; a syntax highlighting editor; and a Tool menu, to which you can add your own commands.

The editor is not configurable (you can't remap the keyboard), but it's fairly powerful and has lots of useful commands such as one that lets you change the case of text and another that indents and unindents blocks.

Next on the list is App Studio, which you can use to edit all your resources, including dialog boxes, icons, cursors, menus, and bitmaps. You can also edit resources in EXEs, DRVs, and DLLs. App Studio is like Borland's pioneering Resource Workshop, but it's easier to use and more powerful. App Studio is written entirely in Visual C++, too, which brings us to this product's central theme: C++.

One of the reasons that Microsoft created Visual C++ was to make it easier for C programmers to move to C++, and two of Visual C++'s modules— AppWizard and ClassWizard—focus on that task.

If you've misspent your youth starting each new Windows' project by copying the canonical Generic, you'll really appreciate AppWizard. It's an application generator that lets you create a program's source files based on a series of options. You can create programs with an MDI interface, a toolbar, printing and print preview functions, custom VBX controls, context-sensitive help, and OLE client support. AppWizard can also create external makefiles, and it will generate source comments.

What language does AppWizard use? C++ and Visual C++'s new Microsoft Foundation Class 2.0 library. It's worth noting that you use AppWizard only once—when you create your program. It's not a CASE tool, like WindowsMAKER or Caseworks, that you can return to in the development process.

After creating your program skeleton, ClassWizard lets you make connections between user-interface elements, messages, and code by pointing and clicking.

When it comes to debugging, Visual C++ really packs the Raid. It boasts a Windows-hosted debugger that's integrated with the Visual Workbench editor. Just press F8 or click on the step button on the toolbar, and you're debugging. Find an error? Just start typing to correct it. This is the way Windows debugging ought to work!

The integrated debugger features normal and conditional breakpoints, watches, and register display. If you need more powerful debugging, there's CodeView for Windows, which, using technology from Nu-Mega, runs as a nonmovable Windows app in one corner of your screen. It's not as convenient as the integrated debugger, but it's a heck of a lot easier to use than Borland's full-screen debugger that makes you flip back and forth between the debugger and Windows.

Other debugging aids include HeapWalker, DDESpy, Spy, Stress, ZoomIn, and Hotspot Editor.

In addition to all this, Microsoft's online help, which has always been good, is even better now. The entire API reference is online, and you'll find tons of TechNotes—articles on programming problems.

The documentation is excellent, but all the 3.1 SDK docs aren't included. You can get the missing ones for an extra $99. I consider them a necessity, and they're a steal at $99.

Other useful features include a first-rate Browser and precompiled headers that are finally easy to use.

Visual C++ comes in two versions: a Standard Edition for $199 and a Professional Edition for $495. The Standard Edition has everything in the Professional Edition except for the Windows debugging applications, DOS program generation, and the optimizing compiler.

The Standard Edition replaces QuickC for Windows, and the Professional Edition replaces C 7.0 and the SDK.

The bottom line with a development environment is how fast it compiles and how small the executables are. With a few informal tests on medium-sized programs with 1000–4000 lines, I found Visual C++ to be slower at compiling than Borland C++, but the EXEs were considerably smaller (the in-memory images were the same as those generated by Borland's compiler).

One thing that has won me over to Visual C++ is the smaller executables. Another thing is the integrated debugger. This feature alone saves hours and hours with every project. Visual C++ is hard to beat, but I'm sure Borland's going to try. ❐

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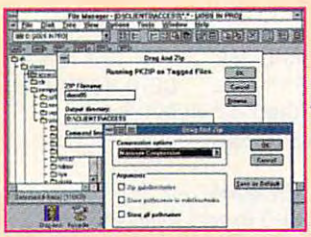

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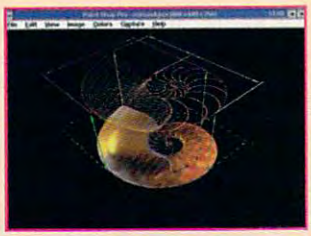

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TIPS & TOOLS

Edited by Richard C. Leinecker

Checking COM files with a new Checksum, finding files from any directory, and using the extended power of Xcopy and M.BAT

Checksum Redux

Here is a new Checksum Debug script. The original Checksum was published in the July 1992 "Tips & Tools" column in COMPUTE. In this column and in future columns, this is the Checksum program that will be used to verify the accuracy of COM files.

Make sure the DOS program called Debug is in your path or the current directory. In these examples, the italic text represents what the computer prints; the roman text represents what you should type. One way to be sure you get these programs exactly right is to have someone read the numbers to you as you type them in. Another way suggested by one of our readers is to read the numbers into a tape recorder and then play them back as you enter the program code.

```
debug checksum.com
File not found
-e 100 bd 70 01 be 80 00 ac 0a
-e 108 c0 74 61 ac 3c 0d 74 5c
-e 110 3c 20 74 f7 8b d6 4a ac
-e 118 3c 0d 74 04 3c 20 75 f7
-e 120 c6 44 ff 00 2b ff 8b f5
-e 128 b8 00 3d cd 21 72 3d 8b
-e 130 d8 b4 3f b1 01 8b d5 cd
-e 138 21 0a c0 74 06 8a 04 03
-e 140 f8 eb ee b4 3e cd 21 8b
-e 148 c7 bb 10 27 8b fd 2b d2
-e 150 f7 f3 04 30 aa 52 2b d2
-e 158 8b c3 bb 0a 00 f7 f3 8b
-e 160 d8 58 0b db 75 e8 8b d5
-e 168 b4 09 cd 21 b4 4c cd 21
-e 170 00 00 00 00 00 0d 0a 24
-RCX
CX 0000
:78
-W
Writing 0078 bytes
-Q
```

To use Checksum, type *checksum filename.com*. If you run Checksum on Checksum, you will see the number 13907 on your screen.

RICHARD C. LEINECKER
MIAMI, FL

No Scroll

In your December 1992 issue, you had a batch file called M.BAT that lists several different file specs in a directory. It also lists the volume name and free disk space after each file spec, and this can make the listings scroll off the top of the screen. I added the /b switch to Dir to eliminate these superfluous items. Here's my version, called DIRR.BAT.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM

:LOOP
DIR %1 /b
SHIFT
IF "%1"=="" GOTO END
GOTO LOOP

:NOPARAM
ECHO Parameter missing
ECHO Usage: DIRR file_spec_1
 file_spec_2. . . file_spec_9
:END
```

I also wrote a batch file that will find a file anywhere on a disk from any directory. You can add the /b switch to the directory to get rid of everything except the found files and their paths. I call it FF.BAT.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
DIR \%1 /s
GOTO END

:NOPARAM
ECHO Parameter missing
ECHO Usage: FF filename

:END
```

JIM KROON
WALLINGFORD, CT

Even Easier Backups

In your December issue, you showed how to do easy backups. There's an easier way with Xcopy and the right switches. The following batch file backs up the current directory, but only files from the given date forward. The batch file is called X.BAT. For it to work, you must give it the date from which to start backups in the form mm/dd/yy.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
XCOPY *.* A:/M/V/D:%1
GOTO END

:NOPARAM
ECHO Usage: X mm/dd/yy
ECHO Files from the given date
ECHO forward will be backed up to
ECHO the destination drive.
:END
```

You can modify this batch file to include subdirectories by adding a /s switch to the Xcopy line. Here's X.BAT reworked slightly to include subdirectories.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
XCOPY *.* A:/M/V/S/D:%1
GOTO END

:NOPARAM
ECHO Usage: X mm/dd/yy
ECHO Files from the given date
ECHO forward will be backed up to
ECHO the destination drive.
:END
```

You can also do a selective backup and get prompted for each file by adding the /p switch. Here's X.BAT with the /p switch so that you're prompted for each file.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
XCOPY *.* A:/M/V/P/D:%1
GOTO END

:NOPARAM
ECHO Usage: X mm/dd/yy
ECHO Files from the given date
ECHO forward will be backed up to
ECHO the destination drive.
:END
```

BARRY L. REHEARD SR.
LANCASTER, PA

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Clearing Keys

I've used GETKEY.COM from the October 1991 issue many times in my batch files. Once in a while, users press keys before my screens are displayed. This can lead to the wrong input. The way I solved this problem was to write a short file called CLKEY.COM that clears the keyboard. Then, GETKEY.COM can wait for a key when the display appears.

You can type in Clkey using the DOS Debug command. You will type in the text in roman. The italic text is provided by Debug.

```
debug clkey.com
File not found
-e 100 b4 01 cd 16 74 06 2a e4
-e 108 cd 16 eb f4 b4 4c cd 21
-RCX
CX 0000
:10
-W
Writing 0010 bytes
-Q
```

If you run the new Checksum on this file, you will see the number 02000 appear on your screen.

In case you missed the October 1991 issue, here's GETKEY.COM. It returns the keypress as an errorlevel code; this code is the ASCII value of the key. If A was pressed, it would return 65. If you want it to capitalize all return values, pass it any command line parameter.

```
debug getkey.com
File not found
-e 100 be 80 00 2a e4 cd 16 80
-e 108 3c 00 74 0a 3c 61 7c 06
-e 110 3c 7a 7f 02 24 df b4 4c
-e 118 cd 21
-RCX
CX 0000
:1a
-W
Writing 001a bytes
-Q
```

If you run Checksum on this file, you will see the number 02480 on your screen.

You might want to clear the keyboard buffer and then wait for a key, all in one step. Here's a program that does just that. It returns the same values as GETKEY.COM.

```
debug clgetkey.com
File not found
-e 100 b4 01 cd 16 74 06 2a e4
-e 108 cd 16 eb f4 be 80 00 2a
-e 110 e4 cd 16 80 3c 00 74 0a
-e 118 3c 61 7c 06 3c 7a 7f 02
-e 120 24 df b4 4c cd 21
-RCX
CX 0000
:26
-W
Writing 0026 bytes
-Q
```

If you run Checksum on this file, you will see the number 03986 on your screen.

VINCENT D. O'CONNOR
BABBITT, MN

Safer File Moves

I've read a number of batch files that move files from one directory to another. Ultimately, the file is copied to the destination and then removed from the source.

Unfortunately, a few mistakes can cause a user to lose the file. That's why I wrote a batch file called COPYMOVE.BAT that makes several checks and tries to prevent accidents.

```
ECHO OFF
IF "%1"=="" GOTO NOPARAM
IF "%2"=="" GOTO NOPARAM
IF EXIST CHECK.DIR DEL
  CHECK.DIR
IF NOT EXIST %1 GOTO NOFILES
IF NOT EXIST %2\NUL GOTO
  NODIR

IF EXIST %2\CHECK.DIR DEL
  %2\CHECK.DIR
ECHO TESTING > CHECK.DIR
IF EXIST %2\CHECK.DIR GOTO
  SAMEDIR
GOTO COPYMOVE

:NOFILES
ECHO %1 file(s) not found
IF EXIST CHECK.DIR DEL
  CHECK.DIR
GOTO END

:NODIR
ECHO Directory of %2 not found
IF EXIST CHECK.DIR DEL
  CHECK.DIR
GOTO END

:SAMEDIR
ECHO Files cannot be
ECHO COPYMOVED into the
ECHO current directory.
ECHO Change to
ECHO any other directory
ECHO and try again.
IF EXIST CHECK.DIR DEL
  CHECK.DIR
GOTO END

:NOPARAM
ECHO Missing parameter
ECHO Usage:
ECHO COPYMOVE
ECHO filespec
ECHO destination_path
GOTO END

:COPYMOVE
IF EXIST CHECK.DIR DEL
  CHECK.DIR
COPY %1 %2
FOR %%F IN (%1) DO DEL %%F
ECHO %1 file(s) COPYMOVED
ECHO to the %2
ECHO directory

:END
```

DENNIS T. MILLER
DALLAS, TX

Three batch-file-enhancing COM files and a safer file moving program

---

If you have an interesting tip that you think would help other PC users, send it along with your name, address, and Social Security number to COMPUTE's Tips & Tools, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. For each tip we publish, we'll pay you $25–$50. All tips submitted become the property of General Media International. ❐

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INTRODOS

Tony Roberts

GRASPING POWER

Overcoming fear of the DOS prompt just takes a little understanding.

Windows may get all the attention these days, but DOS-based computing is still alive and well. Just because a computer doesn't have the horsepower to run Windows applications doesn't mean it's a candidate for the landfill. Jay Atlas, a reader who is a professor of philosophy at Pomona College in Claremont, California, made this point to me recently during an exchange we had over Internet.

Atlas contends that most homeowners, small businesses, and students in particular can get by just fine without getting all wrapped up in Windows. I have to agree. Although the point-and-click environment makes a computer a little easier to use, there's a great deal of overhead (fast processor, fast hard disk, lots of RAM) involved in attaining that ease of use.

If you're into desktop publishing, multimedia, CAD, or graphics design, then you probably need Windows and Windows software. But if your computing needs are less lofty and you're willing to eschew the glitz and glamour that the latest machines offer, you'll discover that even an 80286 with 1MB of memory can be a powerful workhorse.

Let's look at what a DOS machine can do.

Word processing. Most people I know use their computers for writing, and as far as I'm concerned, no graphical application compares with DOS when it comes to word processing. I'm not talking about type styles and headlines; I'm talking about content. A student writing a term paper should be more concerned with what words say than how they look. The same can be said for a businessperson preparing a business plan. Parents will appreciate a plain and simple letter just as much as one gussied up with fancy fonts and dingbats.

Telecommunications. Even if you have the fastest computer on earth, your telecommunications progress is measured by the speed of your modem—1200, 2400, or 9600 bps. A modem and telecommunications software provide a gateway to vast quantities of information. Sign up for GEnie or CompuServe and tap into whatever field of data interests you there. For example, owners of small businesses can learn to avoid numerous stumbling blocks and pitfalls with information found on GEnie's Home Office/Small Business RoundTable. DOS computers telecommunicate so well that several Windows users I know have set up their older, slower computers as telecommunications stations.

Database applications. Today's newest database software has gone graphical, allowing you to include a digitized photo with each employee record, but most of us have database needs that are far less demanding. Mainly, we want to manage an address and phone list for a few friends, associates, and customers. There are numerous DOS applications that do this well—and fast.

So there's still plenty that can be done at the DOS prompt, but therein lies the problem: the *DOS prompt,* the C:\ with the bad reputation.

I won't deny that DOS can be cumbersome and difficult to use, but the same can be said for a sewing machine or a power saw. Using any tool properly requires an understanding of the process and the expected outcome. For example, a seamstress understands how to use a sewing machine to assemble a garment. The sewing machine is a great tool, but it can't be put on autopilot. The operator is required to use judgment, make decisions, and decide what steps will be completed in what order.

Computer users get in trouble with the DOS prompt when they try to engage the autopilot—they try to memorize commands rather than to understand processes. For example, I'm continually amazed at how troublesome the DOS subdirectory structure is for most computer users. Let's look at a simple example. On our disk, we have the root directory, C:\, and two subdirectories, DIR-1 and DIR-2.

Assume you're working in DIR-1 and you want to get to DIR-2. If you enter *cd dir-2,* all you'll get is the message *Invalid Directory* because there's no subdirectory named DIR-2 that branches off the current subdirectory (DIR-1). To avoid this frustration, you've learned that when changing directories, you must first go back to the root directory and then change to the target directory. So you type *cd* \ to get to the root directory and then *cd dir-2* to change to DIR-2.

Mission accomplished, but without full understanding of what's happening. What you really need to know is that the full name for DIR-2 is C:\DIR-2. The backslash is important; it represents your disk's root directory. When you know that DIR-2 is a branch of the root directory, you can easily switch to it from any subdirectory by typing *cd \dir-2.* In this case, the CD command uses the root directory (\) instead of the current directory as the starting point in looking for the DIR-2 subdirectory.

If you're computing at the DOS prompt and feeling blue, it's time to snap out of it. Commit yourself to understanding the processes, and you'll discover you have a most helpful tool at hand. ❐

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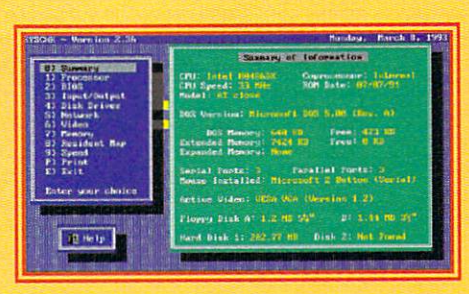

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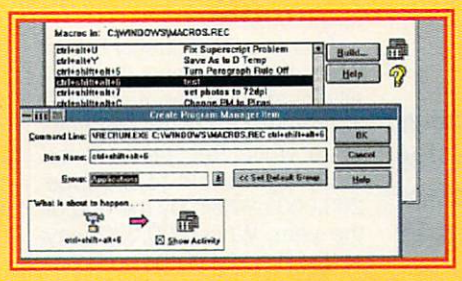

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HARDWARE CLINIC

Mark Minasi

PENTIUM POWER

Why is a Pentium faster than a 486, and how fast is it?

By now, you've heard a lot about Intel's new microprocessor, the Pentium. Wondering how much of the stuff that you're hearing is actually true? Well, the Pentium is a good chip in many ways, although not the amazing world-beater that some of the (ahem) competing computer magazines claim it to be. This month, let's take a very quick look at what's fact and what's not concerning Intel's newest engine.

I said you'd probably heard a lot about the Pentium; actually, hearing is about all you'll be doing about the Pentium for a while, as Intel will be lucky to be able to produce 200,000 of them by the end of the year. While 200,000 may sound like a lot of chips, it's only about 1 percent of Intel's production run for this year's 386 and 486 chips, and an even smaller percentage when you add in the folks like Cyrix, AMD, and IBM who make clones of those CPUs.

There are lots of things to like about the Pentium, and not a lot of space to describe them. Here's a whirlwind tour.

Greater raw speed. The Pentium comes in 60-MHz and 66-MHz flavors. If offering two speeds that are so close together seems odd, it is—usually. The Pentium is such a difficult chip to make, however, that the percentage of manufactured chips that can operate at the goal rate of 66 percent—the yield, in chip talk—is much lower than it is for, say, 386 or 486 chips. Lowering the bar of acceptability to 60 MHz allows Intel to sell the chips that almost made it. That means that the 60-MHz Pentiums failed the 66-MHz test but passed the 60-MHz test, whereas the 66-MHz Pentiums passed both tests. Personally, I'd look closely at a return and service policy before buying a PC based on a 60-MHz Pentium.

Why is the Pentium so difficult to make? For one thing, it's much bigger than the 486. The 486 contains 1.2 million transistors; the Pentium contains 3.1 million—over two-and-a-half times as many. (That's not the biggest jump we've seen, however. The 386 is only a quarter million transistors.) The Pentium is also a hot chip in the literal sense. The Pentium overview document from Intel says that the chip should be expected to run at up to 85 degrees Centigrade—that's 185 degrees Fahrenheit—prompting the inevitable observation that it'll not only crunch your numbers, but it'll also cook your dinner. Look for makers of Pentium-based computers to tout their unique cooling facilities.

The greater raw speed refers to the fact that the 66-MHz clock rate is a pure clock rate, unlike the 486DX2/66 chip, which runs at 66 MHz internally but interacts with the outside world at only 33 MHz. A 486DX2/66 is a relatively simple chip to design a PC around; that it communicates at 33 MHz externally means that all a designer needs to do is to mate a DX2/66 CPU chip with a run-of-the-mill 33-MHz motherboard, and it's an instant 66-MHz computer.

With a Pentium-66, on the other hand, both internal and external communication is at 66 MHz, requiring a motherboard that runs at 66 MHz. While it may seem that building a 66-MHz motherboard would be a small incremental change from the currently available 33-MHz and 50-MHz motherboards, it's not—the task gets harder as the speed gets greater. It turns out that 66 MHz is around the frequency of TV channel 4, so a Pentium-equipped PC has a serious potential noise problem. Run one without the proper shielding (with the cover off or with an inadequate cover), and you're, well, on the air. Currently, anyone can design a motherboard with a few chips and a processor. That won't be true with Pentium-based systems. Don't be surprised if the early 66-MHz Pentium-based PCs vary in usable speed by as much as 50 percent.

Smarter cache. Since the 20-MHz 80386DX's introduction, PC designers have been faced with a difficult choice—what kind of memory to use in their machines. The majority of PC RAM is called dynamic RAM (DRAM): It's relatively cheap, but it's not available in the kind of speeds needed to keep up with systems of 20+ MHz. You can't get DRAMs in 40, 25, 20, or 15 nanosecond access times, the times required by those systems. There's a different kind of RAM called static RAM (SRAM) that's available in those higher speeds, but SRAM is much more expensive than DRAM.

How do manufacturers build high-speed machines and still find RAM that won't drive the price of the PCs out of sight? By using a lot of DRAM and a little SRAM. The DRAM serves as main memory, and most systems have megabytes of it. But many motherboards have between 64K and 512K of SRAM called cache RAM. When the CPU needs the next item of data from the system RAM, it looks first in the fast SRAM cache to see if it's there. If the data is in the SRAM cache, then the CPU gets it from the SRAM without delay.

If, on the other hand, the required data isn't in the SRAM, the CPU must go to DRAM for the data, which slows the system down considerably. The whole idea of a cache is that some smart hardware called a cache controller (it's built into the 486, and it's an optional chip with the 386) must essentially look into the future, guess which data the CPU will

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soon need, and go get that data before the CPU asks for it.

While many 386 motherboards incorporate some kind of cache memory and cache controller, the 486 actually builds a cache and cache controlling into the CPU. The 486 chip contains 8K of cache, and most 486 systems have additional cache on the motherboard.

The Pentium's cache system is better than the 486's in four ways. First, the Pentium has twice as much cache, with two 8K caches—one for data, one for program code. Second, the cache's method of organizing its cached data is more efficient, employing a write-back algorithm. The opposite of a write-back algorithm, a write-through algorithm, forces data written to the SRAM cache memory to be immediately written to the slower DRAM memory. That means that memory reads can come out of the cache quickly, but memory writes must always occur at the slower DRAM time. Because not every piece of information written to memory stays in memory very long, the Pentium's cache algorithm puts off writing data from SRAM to DRAM for as long as possible, unlike the 486, which uses a write-through cache.

Third, there's the time wasted by the cache controller in searching to see if an item is in the cache. The Pentium reduces that time by dividing the cache into smaller caches, each of which can be searched more quickly; that technique is called a two-way set associative cache.

To explain the fourth way in which the Pentium's cache is better than the 486's, I have to first make an important point about what a cache must do. Recall that a cache has to guess which data and program code the CPU will need soon, and then go get that data before the CPU asks for it.

Guessing what the CPU will need isn't a straightforward task, particularly when there are decisions to be made. Suppose the cache sees that the CPU is currently executing some instructions that mean: "Compare value A with value B. If A is greater than B, then set the value MAXIMUM to A; otherwise, set the value MAXIMUM to B." That simple statement boils down to a bunch of instructions that had better be in the cache if the Pentium is going to continue to run without delays. But since the cache controller can't know whether the CPU will take the "A is greater than B" or "B is greater than A" fork in the road, it doesn't know which result's code to go grab and put in the cache. For years, mainframe cache controllers have used a technique called branch prediction to guess which way the CPU will go, and now a PC chip—the Pentium—has a cache controller built into it with branch prediction capabilities.

Two processors in one. There are essentially two CPUs in this chip. The first one is a simple 386-like CPU: It does integer operations, not floating-point operations. The second is like the 486—a 386 with floating-point capabilities built right into it. That means that the Pentium is essentially a parallel-processing CPU, with the ability to do two things at once. Those two CPUs-within-a-CPU are called the U and V pipelines, and the fact that the Pentium has more than one pipeline makes it a superscalar CPU. Without special programming, only the 486 pipe (the U pipe) is active. New programs and operating systems, such as Windows NT and OS/2 3.0, will be required to make use of these multiple processors.

Fault tolerance. The Pentium is designed to be linked with another Pentium on the motherboard that's dedicated to fault tolerance. The second Pentium constantly monitors the first. If the main Pentium malfunctions, the other one jumps right in and takes up without skipping a beat.

Benchmarking the Pentium

How much faster is a Pentium, really? As I said, the actual speed of a Pentium-based PC will depend heavily on motherboard design, as the Pentium relies upon the motherboard to access both its DRAM and its external SRAM cache. If those respond slowly, the Pentium can only run slowly.

Simple small benchmarks, on the other hand, will run like greased lightning because they'll fit entirely into the Pentium's 16K cache. They'll return some great numbers, but those numbers will be of very little real-world value in judging system effectiveness. After all, how many applications do you run that will fit in 16K?

I should also mention that modern benchmarks don't exploit multiprocessor capabilities, so any benchmark values on the Pentium are values determined while it works with one hand tied behind its back—that is, while the V pipeline isn't doing anything. Using a common set of benchmarks, the Pentium-based PC built by Intel (who should, after all, know how to make a Pentium-based PC) turns in a performance 76 percent faster than a DX2/66 on basic processor operations, with memory throughput almost exactly the same as the fastest current DX2/66s.

This underscores my previous point: The CPU performs amazingly well in a vacuum, but hook it up to peripherals on a motherboard—such as RAM chips—and you'll see that while the Pentium is a very special chip, it will need some very special hardware surrounding it before it can soar to computing heaven. ❐

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PROGRAMMING POWER

Tom Campbell

POWERBASIC 3.0

There's a sparkling "new" BASIC on the scene, one that might be familiar to old hands. PowerBASIC 3.0 from Spectra Publishing (1030-D East Duane Avenue, Sunnyvale, California 94086, 408-730-9616) has just been released, and it's very hot. If the name doesn't ring a bell, it used to be Borland's Turbo Basic two versions ago. PowerBASIC 2.0 was the first release from Spectra, and I loved it.

There's a sparkling "new" BASIC on the scene, one that might be familiar to old hands.

Uppermost in many people's minds is: How compatible is PowerBASIC with Microsoft's QuickBASIC? The answer is that they're fairly close. But any large program will probably require major rewriting.

PowerBASIC is a lightning-fast native code compiler, just like QuickBASIC's Make EXE file option. But this one always compiles, and it compiles insanely fast. For large projects, you can break programs up into precompiled versions called units, just like Turbo Pascal's. You can also use OBJ files, but they aren't as good as units.

PowerBASIC has a ton of new features. My favorite by a landslide is its ability to create any kind of TSR imaginable. TSRs can be triggered by hot keys, by interrupts, by timer ticks, and by a few less obvious methods. You can swap them out to EMS memory or a disk file, so that the executable can be 200K yet still consume only 4.5K of conventional memory. The TSRs are quite stable, working well under my rather strenuous test conditions. In all, this feature alone is worth buying the product if you need to develop TSRs. It's cheaper than many C libraries that offer the same feature, yet it offers the convenience of BASIC. Related to that is the new ASM statement (with the alias ! for brevity), which allows you to embed assembly language statements right into the BASIC code.

A less sexy feature (but perhaps a more important one) is the ability to create huge arrays, which may contain more than 64K of data. Unlike "the other BASIC," PowerBASIC lets you create these huge arrays in any size, not just a space-wasting power-of-two dimension. Hand in hand with huge arrays is the ability to create compound data types—not only the TYPE variety, but the UNION variety as well, which lets you overlap similar data structures, like the variant records of Pascal or the union of C. And anyone who writes directly to the screen or reads from the BIOS frequently will appreciate the ability to declare arrays at an absolute memory location. Ever since Turbo Pascal added this one, I've been champing at the bit for a better DEF SEG.

Last on the list of my favorite new features is the addition of a deceptively simple option that requires you to declare variables before using them. Although this seems like a cruel trick on BASIC programmers, I have found it absolutely essential on large projects. Until now I haven't been able to use BASIC for programs over a thousand lines or so because BASIC will simply initialize to zero any new variable it finds. Too many times, my development has ground to a halt at 2:00 in the morning while I read and reread my code, missing every time that an array called SymTable has quietly transmogrified into *SymbolTable*. That C and Pascal require variable declarations went from an onerous burden to a basic requirement. Now I can look forward to using PowerBASIC even in serious development.

Besides these major new additions that hit home with me, there are scores of other features you'll find it hard to resist, such as byte, word, and double-word types (all unsigned, at last!); ON ERROR LOCAL for intraroutine error trapping; an editor that can handle huge files and, finally, mice; reasonably good hypertext help; and a stand-alone debugger. But call for a brochure—there are even more.

This month's program is written in PowerBASIC and is available on CompuServe in the IBMPRO forum under the filename DBFDIR.BAS. If you have any trouble finding it, you can send me E-mail at 75530,3607. It both highlights and improves one of PowerBASIC's most useful features, the DIR$ function. DIR$ is meant to be called once with a file specification, such as "C:\DBF*.DBF", and after that in a loop without the file specification. The first time it's called, it returns the first file matching the specification; the second time, and on subsequent invocations without a parameter, it returns the remaining matches. The problem is that it only returns a filename and extension, not the drive and path. So, in the example of "C:\DBF*.DBF", it might return "TODO.DBF", "ACCTS.DBF", and so on, but not "C:\DBF\TODO.DBF", and so forth. DBFDIR.BAS, the PowerBASIC program I wrote, acts like dBASE's Dir command and lists database characteristics (last update and record size) of all the dBASE data files in the specified directory. I ported SplitFilename$ from an earlier column with no effort at all; it's used to reconstruct the matching filenames so they can be opened and the DBF header data read in. As usual, this is modular code, so you can easily hollow out the dBASE-specific portion and just use the framework for your own files. ❐

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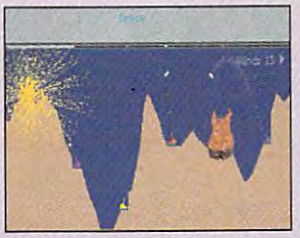

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HOW DOES YOUR HARDWARE COMMUNICATE WITH YOUR SOFTWARE? THE SOFTWARE HARD-WIRED INTO YOUR COMPUTER'S BIOS IS LIKE A BRAIN WITHIN A BRAIN.

WHERE HARDWARE

MEETS SOFTWARE

By Richard C. Leinecker

Illustration by Bill Bruning

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Today's computers think faster than mere mortals can comprehend. But without software—the instructions the processor performs—a computer is just a pile of scrap iron, wire, and silicon.

Application software has to run on virtually an infinite variety of hardware configurations. That's why each IBM-compatible computer has a liaison layer that acts as a compatibility-assurance arbitrator between the application software and the hardware. This layer is called the BIOS (Basic Input/Output System). It usually resides in two ROM chips on a computer's motherboard.

Imagine the difficulty software developers would face if they had to worry about whether their products were saving data to a 20MB or a 200MB hard drive. They'd need to treat each variation as a different case. Or worse yet, what if they had the additional difficulty of providing separate routines to deal with each drive type, whether it was an IDE, MFM, SCSI, or RLL drive? If not for the BIOS, applications would be many times larger than they are. The BIOS shields developers from these headaches by providing a standard way of talking to hard drives and other hardware.

There's a standard way of dealing with all peripherals, including floppy and hard drives, modems and serial ports, printers, video systems, and keyboards. DOS (the Disk Operating System) builds its own routines around the BIOS routines. That's why different versions of DOS run on all IBM-compatible systems.

Some peripherals, like video cards, have their own embedded BIOS. In most cases the specialty BIOSs add functions that extend the original BIOS. A good example is a VESA-compatible (Video Electronics Standards Association) Super VGA card. At runtime the video card patches the base BIOS so that new routines are available to application software. This is necessary because video standards change rapidly and many people upgrade their video systems many times before replacing their computers. The motherboard manufacturer couldn't possibly anticipate which of the hundreds of types of video boards users will install.

In addition to allowing the operating system to communicate with the hardware, the system BIOS also contains diagnostic programs that check out the computer each time it's turned on. This series of diagnostic tests is called the POST, or Power-On Self Test, and it involves checking the microprocessor, memory, video system, and other internals. Not all installed options are tested. For example, printers and modems are not tested.

The more comprehensive the POST, the better your computer can diagnose itself and alert you to problems. And the more memory you have installed, the longer the tests take to verify it all.

Power-On Self Test

Here's the sequence of tasks your computer performs when it starts up.

1. The microprocessor begins execution at address FFFF:0000, an area almost at the end of the ROM BIOS area.
2. The microprocessor is tested, usually with a self-test mode that's built into the microprocessor. The system board, the system buses, and the system memory containing the POST code are tested, too.
3. The system timers are tested.
4. The video display system is tested, usually the video memory and the signals that drive the display.
5. All memory is tested.
6. The keyboard is tested.
7. The disk drives are tested for their status.

BIOSs Aren't Created Equal

IBM was the creator of the first BIOS used in a PC, but it was the development of third-party BIOSs that made it possible for virtually anyone to build a PC. The three major companies that specialize in development and sales of compatible BIOS products are AMI (American Megatrends, Incorporated), Award Software, and Phoenix Technologies. Each one licenses its BIOS to hardware manufacturers. Selecting a BIOS for motherboards isn't easy. A list of questions has to be addressed in order to choose a BIOS that's already been designed or to custom-develop a BIOS.

The AMI BIOS has a built-in setup program activated by pressing the Delete key in the first few seconds after the boot procedure begins. In addition to the setup program, the AMI BIOS features a built-in, menu-driven diagnostics package.

The Award BIOS has a built-in setup program activated by pressing Ctrl-Alt-Esc. Award is unique among BIOS manufacturers in that it provides its code to hardware manufacturers and allows them to customize the BIOS themselves. Because of this customization, the hardware companies can fine-tune the BIOS to work best with their computers.

The Phoenix BIOS has been the standard by which others are judged. It was the first third-party BIOS on the market. One area of particular strength for the Phoenix is its POST. The BIOS outputs an extensive set of beep codes that help diagnose problems on the motherboard. It can even isolate a memory failure to an individual chip. This simplifies identifying system problems for the owner or the repairperson.

If you have a modem, you can get support from these BIOS manufacturers (or their distributors) or from their BBSs (see the "Support Reference" sidebar). All of these BIOSs have been on the market for years. Although they offer different kinds of diagnostics, all are extremely reliable and have proved themselves over time. But since they have to be updated every time a new piece of hardware is introduced, a few bugs have cropped up from time to time.

Support Reference

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BIOS Bugs

Like all software, the ROM BIOS is not immune to bugs. If your BIOS is from one of the major manufacturers, you're probably safe. But even then, don't forget that BIOS manufacturers have had some minor problems.

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Wolfenstein 3-D requires an IBM or 100% compatible computer with 640K RAM, a VGA graphics card, and a hard disk drive. Extended memory (XMS), expanded memory (EMS), joystick, and mouse are optional. IBM is a registered trademark of International Business Machines Inc. Sound Blaster is a registered trademark of Creative Labs, Inc. AdLib is a registered trademark of AdLib, Inc.

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tions you'll be using and make sure they perform the way you expect before laying your money down. For new equipment, you should install your applications and put them through their paces as soon as you can. If you find a problem, contact the source that sold you the computer.

BIOS Upgrading

You'll rarely be in the position of needing a BIOS upgrade. Here's a list of reasons why you might want to consider it.

- Adding support for 720K 3½-inch, 1.2MB 5¼-inch, and 1.44MB 3½-inch drives.
- Allowing a user-definable hard drive type that matches an MFM, RLL, IDE, or ESDI drive.
- Adding support for 101-key enhanced keyboards.
- Correcting known conflicts or bugs. It's best if you contact the hardware or software vendor's technical support to verify that there is a problem with your particular BIOS.
- Adding features and performance found in newer BIOS versions.

Before you go shopping, you'll need some information.

- Make and model of the system. For many popular systems this is all that's needed to find the right BIOS. For less common clones you'll need more information.
- The CPU type (286, 386SX, 386, 486SX, 486).
- The make and version of the existing BIOS. This is necessary because some revisions will require that the keyboard controller be replaced, too.
- The type and number of the existing BIOS ROMs. Locate the part number on one of the ROM chips. You may have to peel back a label. The part number will usually start with 27.
- Check for an integrated chip set. This will consist of square, flat, large-scale integration chips with pins around all four sides. They'll usually have a manufacturer's name or logo. Some examples are CHIPS, SUNTAC, VLSI, and OPTI. An integrated chip set performs the functions of hundreds of smaller chips. Even IBM uses third-party integrated chip sets on some models.

To get this information, open your computer's case and start taking notes. It only takes a few minutes. With this information you can accurately order BIOS upgrades.

There are some alternatives to upgrading your BIOS. Some companies (Washburn & Company, for example) supply accessory ROMs to augment the existing BIOS. They can fit in the two empty sockets that are found on most AT motherboards, or they can go on a card that fits in any 8- or 16-bit slot.

If you've identified a specific problem, some technicians are well versed at patching BIOSs. But it may be risky if the person doing it doesn't possess the skills. (I don't think I've ever heard a technician admit he or she couldn't do something until it was too late.) Unless you have complete confidence in a technician, leave this option out.

Don't Be Fooled by Imitations

Just because your computer boots and shows you the copyright of a major BIOS manufacturer doesn't mean you're home free. If you bought your system used, bought it from a cut-rate source, or have had it serviced by cut-rate technicians, there's a small chance you have an illegal BIOS copy. I've heard of more than one person who, having experienced system-level bugs and incompatibilities, inspected the motherboard and found a BIOS copy—not the real thing.

This is illegal and dilutes the BIOS manufacturer's ability to provide the best possible product for paying customers. Besides that, those BIOS copies may not be the best fit for the systems.

Flash BIOS

You've probably heard the term *Flash BIOS* at some point and wondered what it meant. It doesn't mean an ultrafast BIOS. It's just an alternate way of placing information in the BIOS. A BIOS is simply an EPROM (Erasable Programmable Read Only Memory). Flash BIOS is a special kind of EPROM that can be erased and rewritten while it's still on the motherboard. That allows manufacturers to make minor changes in the BIOS to conform to new computer designs. Don't think you can simply go into your Flash BIOS and start changing things, though. Altering the BIOS requires specialized equipment. The Award spokesperson told me that eventually the BIOS could be available in CMOS, which would allow you to upgrade your BIOS in place with a manufacturer-supplied utility.

—ROBERT BIXBY

Ending BIOS Fear

Compaq actually created the first BIOS clone, but it was only interested in providing BIOSs for its own machines. Only when Phoenix introduced its version of the PC BIOS did the clones and compatibles war really begin. Since then, many other makers have entered the market, notably the makers mentioned in the article. One additional BIOS maker, Quadtel, was recently purchased by Phoenix.

I called various BIOS makers and asked them about their products. I was surprised by their responses. The question Why is your product better than the competition? usually invites a fusillade of marketing squibs, but this time, most of the people I spoke with echoed the statement, "A BIOS is a BIOS." The principal differences among BIOS makers are their market niches and small utilities and improvements that are quickly incorporated by the competition.

For example, a spokesperson for Award stated that the Award BIOS is outfitted with a boot-sector virus detector which is expected to appear soon in new BIOSs from other manufacturers.

AMI sells primarily to motherboard makers while Phoenix sells primarily to OEMs (Original Equipment Manufacturers—companies that make the whole computer and some peripherals).

One irony of the modern BIOS has resulted from IBM's decision to market its BIOS to compatibles manufacturers (in the industry, this is called opening the kimono), which would allow non-IBM computer makers to advertise an even higher level of IBM compatibility. Since a system's design is such an integral factor in BIOS design (virtually all BIOSs are customized at least a little to match the system they serve) and since no OEM wants to provide detailed system design information to IBM, an avid competitor, IBM has decided to market its BIOS through Phoenix, the first company to release an IBM-compatible BIOS. This will allow Phoenix, a disinterested third party, to make the tweaks necessary to allow the IBM BIOS to work with an individual system.

—ROBERT BIXBY

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Beep Beep

1Here's the scenario. Your computer won't boot, but you hear beeps. Interpreting those beeps might mean the difference between rectifying the situation yourself and calling a technician. Here's a list of the error beep codes for AMI, Award, IBM, and Phoenix BIOSs.

AMI

1 short	DRAM refresh failure
2 short	Parity circuit failure
3 short	Base 64K RAM failure
4 short	System timer failure
5 short	Processor failure
6 short	Keyboard controller gate A20 error
7 short	Virtual mode exception error
8 short	Display memory read/write test failure
9 short	ROM BIOS checksum failure
1 long, 3 short	Conventional/extended memory failure
1 long, 8 short	Display/retrace test failed

Award

All Processors

1 long, 2 short	Video error
2 short	Any nonfatal error
1 short	No error during POST

80286/80386/80486 Processors

1 long, 3 short	Keyboard controller error

IBM

1 short	Normal POST system OK
2 short	POST error—error code displayed on CRT
No beep	Power supply, system board
Continuous	Power supply, system board
Repeating short	Power supply, system board
1 long, 1 short	System board
1 long, 2 short	Display adapter (mono/CGA)
1 long, 3 short	Enhanced graphics adapter (EGA)
3 long	3270 keyboard card

Phoenix

The Phoenix BIOS beep codes are three groups of beep counts.

1-1-3	CMOS write/read failure
1-1-4	ROM BIOS checksum failure
1-2-1	Programmable interval timer failure
1-2-2	DMA initialization failure
1-2-3	DMA page register write/read failure
1-3-1	RAM refresh verification failure
1-3-3	First 64K RAM chip or data line failure, multibit
1-4-2	Parity failure first 64K RAM
1-4-3	Fail-safe timer feature (only EISA BIOS)
1-4-4	Software NMI port failure (only EISA BIOS)
2-1-1, 2-1-2, 2-1-3, 2-1-4, 2-2-1, 2-2-2, 2-2-3, 2-2-4, 2-3-1, 2-3-2, 2-3-3, 2-3-4, 2-4-1, 2-4-2, 2-4-3, 2-4-4	First 64K RAM chip or data line failure on bit 0–F
3-1-1	Slave DMA register test failure
3-1-2	Master DMA register test failure
3-1-3	Master interrupt mask register failure
3-1-4	Slave interrupt mask register failure
3-2-4	Keyboard controller failure
3-3-4	Screen memory failure
3-4-2	Screen retrace failure
4-2-1	Timer tick failure
4-2-2	Shutdown failure
4-2-3	Gate A20 failure
4-2-4	Unexpected interrupt in protected mode
4-3-1	RAM test of memory above 64K failed
4-3-2	Programmable interval timer channel 2 test failed
4-3-4	Realtime clock test failed
4-4-1	Serial port test failed
4-4-2	Parallel port test failed
4-4-3	Math coprocessor test failed

It's pretty easy to distinguish the real McCoy from a fake. Take a look at the ROM BIOS chips on the motherboard. You should clearly see the name of the manufacturer, along with a serial number, usually on a label. If you buy a new system with a fake, report the supplier to the manufacturer of the BIOS cloned on the fake chips, and return the system for a full refund. If you're looking at a used system with a copied BIOS, tell the seller you're not interested. Even if you buy it at a bargain price, you're in for trouble in the future.

Into the Sunset

Most people never consider the BIOS version and manufacturer when purchasing a computer. We take it for granted that such an integral component is carefully checked by the system manufacturer for correct operation, and it almost always is. But as a system ages and newer peripherals become available, you need to be thinking about a BIOS upgrade to support newer hardware. Generally, a BIOS upgrade is a step involved in some other kind of major equipment upgrade. If you install the hardware correctly and it still won't work, your BIOS automatically becomes the prime suspect.

The guidelines I've presented should help you make your purchase and upgrade decisions now and in the future. If you have any questions, though, a reputable technician will help you out. And if you're adventurous and want to upgrade, order the chips yourself and have at it. ❑

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PRODUCTIVITY CHOICE

The improvements to this development system keep it the preferred choice for Windows programmers who value ease of use and extendible power.

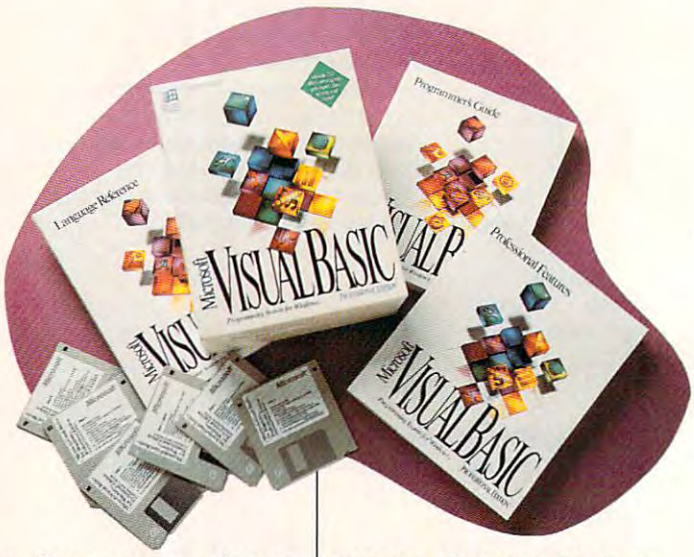
George Campbell

VISUAL BASIC 2.0

Microsoft brought about a revolution when it introduced Visual Basic 1.0, making Windows programming accessible to just about anyone with some BASIC programming experience. With the introduction of version 2.0, programmers get even more of a good thing.

Like version 1.0, VB 2.0 gives you a quick way to design the interface for your Windows programming project. Since interface design has always been the most difficult part of programming for Windows, using VB lets you get down to the business of the working part of your program with very little delay. You simply draw your interface on the screen, much like using an object-oriented paint program, and then write code to tell the program what to do when something happens. For example, if a user clicks on a command button in your program, you need only write the code for that button click. List boxes, text-editing windows, and all other interface objects work in the same way.

This event-oriented programming style is the key to VB's ease of use. Since you write less code to make your program work, you can concentrate on the important code, rather than on code that simply displays your program. Using language syntax familiar to all BASIC programmers, VB makes writing simple programs fast and easy. While Windows programming was once the province of dedicated C or C++ experts, anyone willing to learn some new rules can use VB 2.0 to create professional-quality Windows applications and utilities. Since you can also access most of the commands embedded in the Windows API, you can even extend VB far beyond its own internal statements.



There are two VB packages: Standard and Professional. The Standard Edition, designed for casual or personal use, lists for $199. The Professional Edition, listed at $495, includes enhancements more advanced programs need. You can begin with the Standard Edition and upgrade if you want. Both packages have good documentation and extensive online help. An online tutorial and plenty of sample code and applications also ease the transition from DOS programming.

Both editions offer improved performance over the original VB. Programs generally run about 20 percent faster. A program's EXE file is now smaller, although the VBRUN200.DLL runtime library needed for all programs has grown. The program design environment is also improved; you now get a separate window for setting the properties, like color, fonts, and size of objects (such as command buttons, list boxes). Since this window can always be onscreen, setting an object's properties is fast. An icon-based toolbar also makes programming easier—you click on an icon to carry out most functions in the development environment.

New graphics controls let you insert bitmapped images in your program or draw lines, boxes, and circles without using as much precious Windows memory as needed with version 1.0. The program also offers support for Windows OLE (Object Linking and Embedding) plus a spreadsheetlike grid control from the earlier Professional Toolkit. You also get support for the Multiple Document Interface (MDI), a huge array library for arrays larger than 64K, and tools to create automated installation systems for your applications.

Other programming tasks, too, get a boost, with improved debugging features like watch and break expressions. You can also select multiple controls and set common properties for all of them

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in a single step. A new variable type, called Variant, can substitute for any variable type, such as Integer or String; and you can shift between variable types automatically when needed. Using Variant, you don't have to convert a numerical variable to a string variable to display it in a text area onscreen.

With the Professional Edition, you get additional tools, such as a communications module, a help compiler for creating full-scale hypertext help systems, support for the MAPI E-mail system, ODBC database libraries, and more. Custom controls available only in the Professional Edition include a group of 3-D controls like command buttons and check boxes, an animated command button, access to the Windows Common Dialog windows, multimedia controls, controls specific to pen-based computers, plus a handful of other useful additions. For programming professionals, the additional features are well worth the cost.

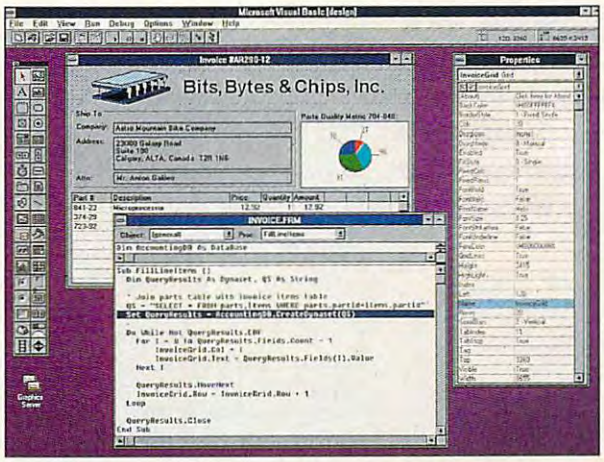
Overall, the additional features and improvements in both VB 2.0 editions are very welcome and help keep VB well ahead of competitors like GFA Basic and Turbo Pascal for Windows. It's still by far the easiest development system you can find for Windows, and it's a pleasure to work with.

That said, however, VB is not the be-all and end-all for Windows programming. A number of limitations keep it from becoming the only language Windows programmers need. First, its inability to use Windows API functions that require callbacks keeps VB programmers from accessing some important Windows tools, such as setting printer options without user input. Further technical limitations include an inability to use pointers to memory locations and a requirement that a runtime library be included with each program. While VB can use Dynamic Link Libraries (DLL) to extend the language, it cannot create them—a particularly annoying limitation for advanced programmers, who must turn to other languages to create modular extensions to VB.

Then, too, while Microsoft fixed some bugs that plagued VB 1.0, it introduced some new problems in 2.0. Especially irritating is a bug which sometimes causes programs that run perfectly in the development environment to crash after being compiled. There's an easy way to work around this bug, but it's a bother. A bug in the Professional Edition's Common Dialog tools makes the Printer dialog difficult to use, requiring additional code to change the default printer from within a VB program. Microsoft acknowledges these problems and offers work-around solutions, but the company apparently has no plans to issue an interim version of the language.

A final limitation can cause problems for some users. While you can effortlessly display bitmapped graphics onscreen, it's very difficult to send them to the printer. Indeed, there's no direct method in VB itself to print graphics and text on the same page. Printing bitmaps means using a complicated set of Windows API commands and, even then, it's almost impossible to print graphics on a PostScript printer without purchasing an add-on library from another source.

Fortunately, an entire industry has already grown up around VB. Vendors like Crescent Software and MicroHelp offer extensive add-on libraries. These libraries, which become part of the VB development environment, extend the language and fill in the gaps Microsoft left. VB's popularity also means that support on forums such as MSBASIC on CompuServe is excellent, with many advanced users offering solutions for VB problems and even free add-on libraries. Microsoft, too, is active on the CompuServe support forum, offering solutions for many problems and answers to tough technical questions.



IBM PC or compatible (80286 compatible); 1MB RAM; Hercules, EGA, VGA, or better graphics; one high-density floppy drive and one hard drive with 18MB free; Windows 3.0 or higher; mouse recommended—$199 (Standard Edition), $495 (Professional Edition)

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All in all, Visual Basic 2.0 is the ideal way to get started in Windows programming. Its ease of use and extendible power may make it the perfect platform for most programmers, especially for creating uncomplicated applications and utilities. If you have any desire to create personal or professional applications for Windows, definitely look into this development system. ❐

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PERSONAL PRODUCTIVITY

Rosalind Resnick

LEASING VERSUS BUYING

When it comes to financing your beast, take the time to crunch the numbers. You might be surprised at the hidden costs.

Flip through just about any newspaper or magazine these days, and you're sure to find ads for cut-rate computers. With computer prices in a virtual free fall, millions of computer users are finding it difficult to justify *not* upgrading to an 80386 or 80486 with the latest features. And no matter what computer you buy or where you make your purchase, it's hard to overpay.

Even so, there's more to shopping for computers than simply deciding how much RAM you want and how big a hard drive to get. To entice shoppers to part with their money, computer dealers nationwide are offering not only low prices but seductive lease deals, too. Let's face it: If you're just starting a business, you may not have enough money to buy a new computer with cash, but you might easily be able to afford a monthly payment that costs little more than a business lunch with a new client.

The trouble is that some computer leases are far more costly than they first appear. Recently, one national computer chain ran a newspaper ad offering a brand-new 25-MHz 386SX IBM-compatible computer for $1,150. It also offered buyers the option of financing their purchase with a three-year, $42.55-a-month lease—and buying the computer for $1.00 when the lease term was up.

The beauty of the lease, of course, is that you don't have to tie up that $1,150 right now (assuming that you have the money in the first place). And you don't have to tie up your credit cards, either, leaving you free to spend on other things.

So is leasing the better deal? Not really.

In preparing this story, I asked my accountant, Art Berkowitz of Mission Viejo, California, to crunch the numbers and compare the two options. What he found out amazed me. Leasing the computer for three years would cost $1,532.80 (including the $1.00 you'd pay at the end of the lease to buy it)—only $0.08 less than you'd pay to finance it with a credit card at the standard 21-percent interest rate! (In fact, Berkowitz says, what the chain bills as a lease is actually more like a financing arrangement than a true lease, in which you pay only for the use of the computer and not the retail cost.)

That's why, Berkowitz says, the most economical way to buy a new computer is with cash, unless your business is so hot that you can invest the money in your company and reap double-digit returns.

"For the person who has the funds available, cash is the best way to buy almost all of the time," Berkowitz says. "Only if you're making more from your business than you'd pay out in interest, [or] if you're squeezed for cash, does it make sense to finance your computer purchase."

Even if you don't have the money, Berkowitz says, there are some other options to consider. Your credit card, for one. Though many credit cards charge interest as high as 21 percent, some cards offer lower rates, occasionally as low as 10 to 15 percent, to customers who have good credit ratings. Many newspapers publish a list of low-rate credit cards in their business sections.

By charging the computer on your credit card, you can pay off your purchase as fast or as slowly as you like. If your business kicks into high gear sooner than you expected, for example, you can pay off the computer more quickly. If sales are sluggish for a while, you have the option of making only the minimum monthly payments until things get rolling. Under the terms of most leases, Berkowitz says, you're stuck making the same monthly payments until the lease term is up, forcing you to continue financing your purchase at high interest rates even when you can afford to pay it off completely.

Another option is a home equity line of credit. Because a home equity credit line is secured (that is, the equity in your house acts as collateral for the loan), banks are willing to lend you money at lower rates than you'd get with a credit card. In fact, many banks are so eager to lend you money that they'll waive all the fees and costs involved in doing the paperwork and assessing your home's value. While it doesn't make sense to mortgage your house just to buy a computer, a home equity credit line might make sense if you're starting a business and need, say, $10,000 in working capital.

"A home equity loan makes sense as long as you remember the biggest caveat of all, which is that you could lose your home," Berkowitz says. "And frankly, that scares me to death."

The bottom line: When shopping for a computer, it's just as important to check out the fine print on the financing contract as it is to read the reviews in the computer magazines. And if you're not so handy with a calculator, there are plenty of software programs (and accountants) that can crunch the numbers for you.

Remember: The old adage "Let the buyer beware" applies not just to shopping for computers but also to paying for them. ❐

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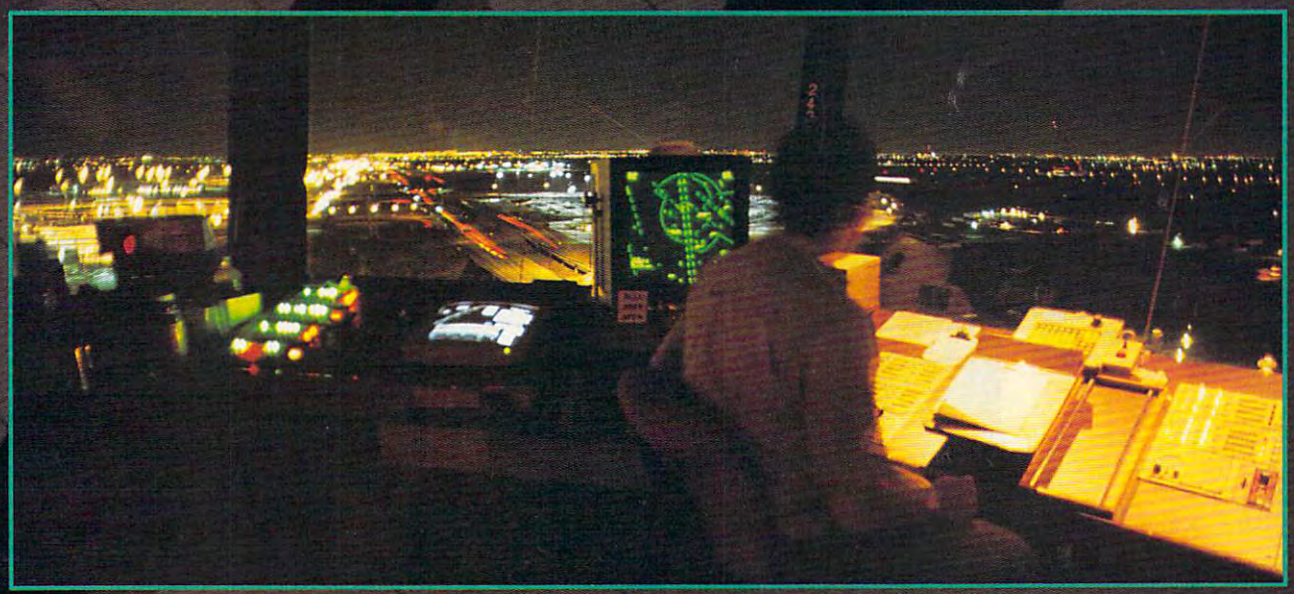

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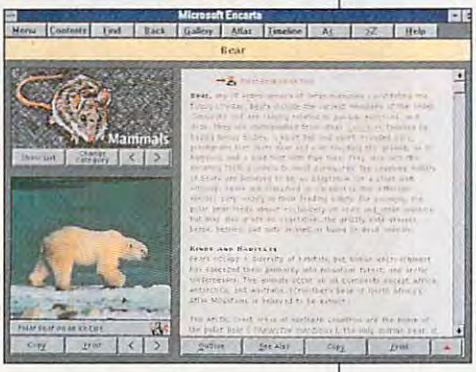
MULTIMEDIA PC

David English

THE WORLD ON A PLATTER

Until recently, you could sum up the major CD-ROM encyclopedias like this: One has better multimedia, while the other has better text. The better multimedia encyclopedia has been Compton's Interactive Encyclopedia (Compton's NewMedia, 2320 Camino Vida Roble, Carlsbad, California 92009; 619-929-2500; $395). Formerly called Compton's MultiMedia Encyclopedia, it has introduced several innovative techniques for gathering up electronic information.

Encarta is so good you no longer have an excuse for not owning a CD-ROM drive and sound card.



The better text encyclopedia has been The New Grolier Multimedia Encyclopedia (Grolier Electronic Publishing, Sherman Turnpike, Danbury, Connecticut 06816; 800-356-5590; $395). Its text is written on a higher grade level than Compton's, with many of its articles penned by experts in their respective fields.

During the last nine months, Grolier has worked hard to close the interface gap by finally introducing a Windows version of its encyclopedia. It's much easier to use than the earlier DOS version. Compton's has responded with its new Virtual Workspace technology that more closely approximates how we collect information in the real world (sort of a books-open-and-scattered-in-a-logical-order approach).

Just when things had settled into a predictable two-way competition, along comes Microsoft to shake everything up. Microsoft's entry in the world-on-a-platter sweepstakes is called Microsoft Encarta Multimedia Encyclopedia (Microsoft, One Microsoft Way, Redmond, Washington 98052; 800-426-9400; $395). Quite simply, it's one of the best multimedia applications I've seen. While the 25,000 articles that Microsoft has taken from the Funk & Wagnalls' Encyclopedia may not be as strong as the 33,000 articles contained in Grolier, Microsoft has added so much additional information and organized the material so well that Encarta is easily the most browsable and usable of the three products.

Like Compton's and Grolier, Encarta offers a time line for a chronological view of events, an atlas for a geographical view of events, and a knowledge tree for a conceptual view of events. All three CD-ROM encyclopedias let you get at their vast bodies of knowledge by letting you choose the most appropriate path. This multiple-path approach lets you follow from one fact to another until you've explored a series of connections guided by your own interests.

Encarta improves on the multiple-path approach by offering a more logical structure and building up the components that are best suited to multimedia. The overriding structure for Encarta is its 93 categories, which include 9 primary categories (Physical Science and Technology; Life Science; Geography; History; Social Science; Religion and Philosophy; Art, Language, and Literature; Performing Arts; and Sports, Games, Hobbies, and Pets) and 84 subcategories. For instance, the primary category of Performing Arts includes the subcategories of Music; Musical Instruments; Musicians and Composers; Dance; Theater; and Cinema, Television, and Broadcasting. Once in a subcategory, it's easy to view a list of each entry in that subcategory, browse each entry in alphabetical order, or switch to a new category or subcategory. By stressing a categorical organization, Microsoft has recognized how we learn best: by exploring a group of associated ideas and then jumping to a related group of associated ideas.

Wherever possible, Microsoft has added material to Funk & Wagnalls' Encyclopedia to exploit the new medium of multimedia. Fully half the CD-ROM is made up of images and audio, with another 10 percent devoted to animations and videos.

For example, the Gallery section, where you can quickly browse Encarta's 7000 photographs and seven hours of audio, includes a Special Lists button. Included among the special lists is a Foreign Language Samples list, which, when combined with the automatic slide show, lets you sample common words and phrases (spoken by native speakers) from 46 nations and cultures. A slide show of World and Folk Music offers a similar tour with a generous helping of musical examples and stunning pictures.

I could go on and on about the gems of wisdom you'll discover as you explore Encarta. Suffice it to say, if you're the type who can spend hours in a library moving from one reference book to another, this is the one product that will make it worth your while to buy a CD-ROM drive and sound card. It's that good. ❐

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ART WORKS

Robert Bixby

WHO ARE YOU?

As the hit song by The Who says, "I really want to know." I'd be interested to know what software you're using and what you're using it for. If you have a moment to spare, drop me a letter or postcard to tip me off. Desktop publishing has become so widespread, and desktop publishers are engaged in such a broad array of activities, I feel the need to focus on the things that are of most benefit to you. I want to provide information that will directly assist you in the kinds of projects you are pursuing. If you have tips or ideas that make publishing easier or more rewarding, I'm interested in hearing those, too. If I use your tip in the column, I'll give you full credit (and maybe something extra besides).

A specialty paper supplier will make any desktop publishing project easier and more attractive.

Here's what I've been up to. Recently I've been involved in making my books more visually interesting by using different kinds of paper. In the beginning, I simply used a cardstock cover, usually in buff or gray because those were the most attractive cardstocks available from my printer.

What finally drove me to search for alternative sources of paper was a book I was putting together for a poet who used very long lines. I decided the easiest way to present her material was by using saddle-stitched legal-size paper to yield a 7- × 8½-inch page (as opposed to my standard 5½- × 8½-inch page. I could find legal-size paper in many different colors and textures, but I also needed cardstock in a precut 8½- × 14-inch size to make the cover. I couldn't find anyone who stocked it, and no one would provide it in the quantity needed (75 sheets).

Finally, serendipity took a hand in my quest when I received, unsolicited, the Paper Direct catalog (Paper Direct, 205 Chubb Avenue, Lyndhurst, New Jersey 07071; 800-272-7377). If you haven't seen this little collection of specialty papers, you're in for a treat. All you need to do is call to get a free catalog.

About half of the catalog is filled with specially printed paper for letterhead, invitations, presentations, and pamphlets. If you think you can't afford to print up a four-color pamphlet, buy a box of beautifully colored pamphlets from Paper Direct and fill them in with your information.

The other half of the catalog is a desktop publisher's dream. I won't say that every weight and color of paper is available (only three colors of cardstock were available in the size I wanted, for example—white, pale gray, and pale blue), but a wide enough variety is available to meet virtually any need. Paper Direct has many different kinds of recycled paper, textured paper, and even translucent vellum in many different styles.

Because its primary customers are desktop publishers, Paper Direct also provides tips on using its papers, maintenance supplies for Hewlett-Packard laser printers, and interesting, hard-to-find items like foil, a pamphlet folder, and a paper recycler you can use to make your own paper out of scrap. A minimum order is $30 (plus $6 for UPS shipping; the charge is slightly more for overnight delivery). With your first order, you can request a sampler containing a sheet of each type of paper offered by the company and a fan of paper strips to simplify ordering.

A couple of months ago, I mentioned the nVIEW line of video projectors. Since then a couple of other very interesting product announcements have crossed my desk. The Eiki (pronounced "achy" as in "achy, breaky wallet") LC-300 provides up to a 300-inch projection picture (diagonal measure) of any composite video image for $4,395. To use this with a computer, you would also need a VGA-to-composite converter. The LC-200 provides a 200-inch picture for $3,995. Expensive, yes. But a video display 15 × 20 feet in size (10 × 13.3 feet for the LC-200) is bound to impress. To find out more, write or call Eiki International at 26794 Vista Terrace Drive, Lake Forest, California 92630; (714) 457-0200.

Another product that will interest people making traveling presentations is the Cruiser notebook computer. This computer features a detachable translucent LCD screen that can be used with an overhead projector. It has a 25-MHz 386SL chip, built-in trackball, fax/data modem, removable hard disk, and an optional external 16-bit expansion bus. To learn more, contact Rever Computer at 8F, Number 2, Alley 6, Lane 235, Pao Chiao Road, Hsin Tien, Taipei, Taiwan, Republic of China. ❐

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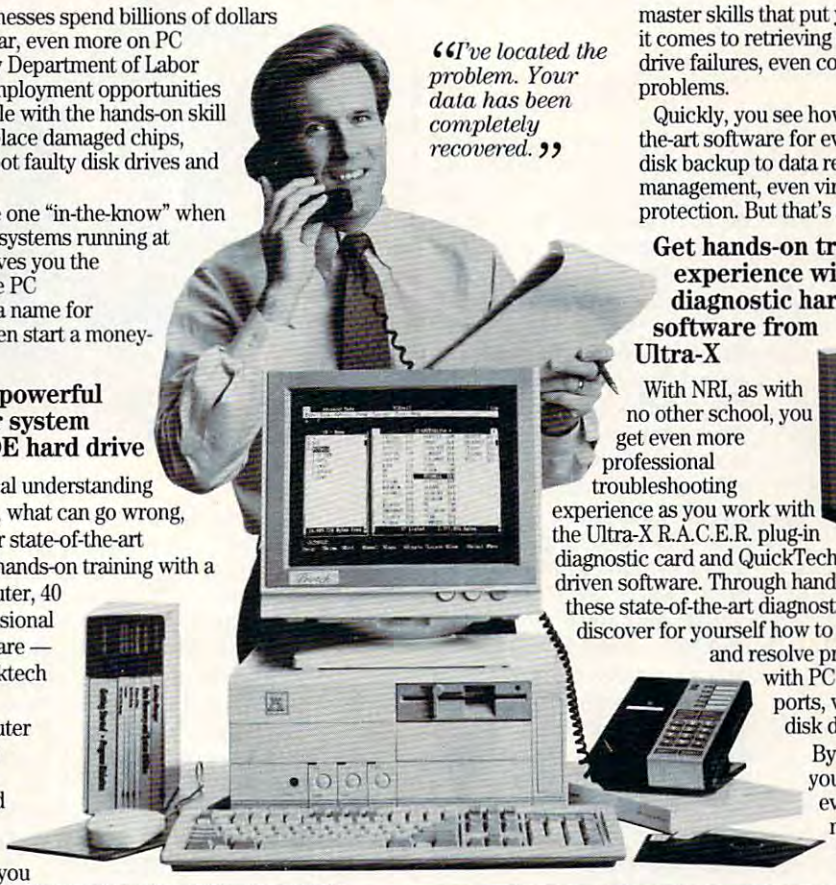

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David Sears

THE ANIMALS!

See lions and tigers and bears and more when you visit the world-famous San Diego Zoo. Don't think you can afford the plane fare and hotel accomodations (not to mention the time off from work)? If you own a CD-ROM drive, you can send your favorite youngsters all the way to San Diego without their having to leave your home—for a very reasonable fee. The Animals!, a true multimedia tour de force featuring the San Diego Zoo, makes this trip possible, and it's more than worth its price of admission.

The Software Toolworks took advantage of the vast world available on a CD-ROM drive and made The Animals! almost as much fun and as easy to explore as the real zoo. After loading the program but before you even reach the Main menu, you have the option to browse through exhibits by looking up animals by name. You simply click on the appropriate icon on the title screen, and a windowful of animal names, all alphabetically listed, appears. Click on the name of any animal, and you'll see the animal beautifully and very sharply digitized before you. The Animals! creators did a fantastic job both collecting and transferring the visual data to disk. From the title screen, you can also click on the Sky Tram icon for an overview of the zoo's exhibits, or you can click on the Main Menu icon, which opens the Main Menu map. On to the zoo!

The Main Menu is essentially a large map divided into sections. These sections include Tropical Rain Forest, Montane, Tundra, Desert, Island, Grassland, Savanna, Temperate Forest, Taiga—all the earth's biomes. The Animals!, like the San Diego Zoo, displays its animals in surroundings that approximate their natural habitats. The map also includes the Center for the Reproduction of Endangered Species (CRES), a Kids section, a Storybook Theater, a Nursery, and a Tours booth, among other things. At the CRES, you can learn what the zoo does to repopulate dwindling species. At the Storybook Theater, you can watch films about the zoo and its inhabitants. The Kids section even contains a few quizzes. There are hours of fun and learning to be spent here.

Navigating The Animals! does not consume much of your time—it's faster than walking to exhibits at the actual San Diego Zoo. At the top of the Main Menu, you'll find the Navigation Palette, which holds a band of command buttons that allow you to travel quickly to any point in the zoo. These are simple enough to operate, and you can move forward or backward one exhibit, jump to any exhibit within the biome that you selected, and summon extensive online help related to your situation. A Copy to Disk option allows you to fill the Windows Clipboard with text or graphics data from The Animals!. If you ever seem lost, it's very easy to retrace your footsteps: You simply click on the Go Back icon (which displays a list of all the places you've visited so far).

You may also locate animals by searching for keywords such as *bird* or *tiger*. Clicking on the Media Library icon presents you with a list of all the pictures, video clips, and sounds found on the disc.

When you discover an interesting animal, you may read about it in the text window or view the snapshots and videos of it in the picture window. Just click on the necessary icons, and in a second or two, the show begins. Other icons include the Information Profile, which offers a summary of the exhibit; a Kid's Planet, which features a simplified overview for younger zoogoers; an Endangered Species section; and more.

Before any of this matters, though, you have to choose a section of the zoo to visit. To

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do this, examine the Main Menu map, choose a biome, and click on it. The Animals! transports you to the first exhibit in that particular section. Now, the fun really begins. The San Diego Zoo is home to more than just lions and elephants, and finding these more unusual creatures can prove enlightening as well as entertaining as you use the Text and Audio/Visual options to explore links between one animal and another.

For instance, while I was visiting the grasslands, I came across the greater prairie chicken exhibit. This less popular animal had only a single color snapshot and a single sound on disc. The text window did little to liven up the display with its brief summary, but it did mention that the prairie chicken and the blue peacock are related. So, I explored the text-media link by first clicking on the A/V Links icon; this led me to the California quail. I went to the top of the screen to click on the Next Exhibit icon, passed by a number of exhibits that weren't particularly interesting to me—all still in the grasslands, of course—and stopped to stare at a peculiar bunch of animals, the meerkats.

Cute and ferretlike, they warranted a few minutes study and observation time. I clicked on the Facts and Figures icon to quickly read up on the little creatures. It turns out that they're related to the slender-tailed mongoose; are native to Angola, Namibia, Botswana, and South Africa; and love to eat eggs.

The Animals! let me down a bit at this point, however. The meerkats' "chitchat," which is mentioned in the text, wasn't used as a sampled sound in the A/V Links menu. The meerkats did get to star in their own short video, however, and their exhibit sported four additional snapshots besides.

The playback panel for the video clips appears after you click on a video clip's icon. It offers Play, Pause, Frame Advance, Frame Rewind, Rewind, and Fast Forward buttons—and all work exactly as you'd expect, though the Frame Forward and Frame Rewind do cause the otherwise smooth playback to jar and display some disorganized pixels for a moment.

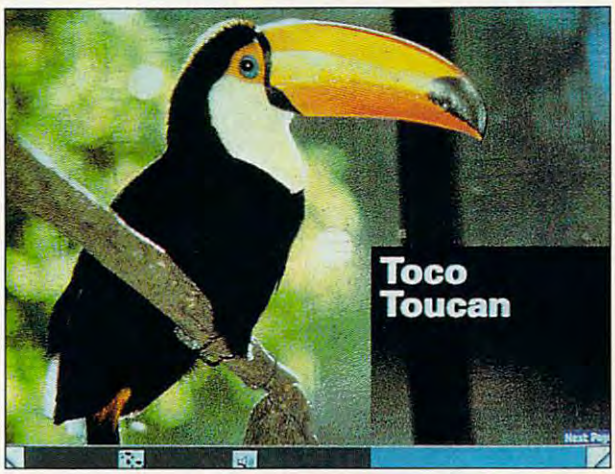
Also, the playback can be viewed in any of three modes: 160 × 120, 320 × 240, or full screen. The larger the display area, the blockier the images become. If you want the finest resolution, you should select the smallest display area option on the Customization menu. But if you want to view a reasonably sized movie, you should go with the 320 × 240 display mode. The fantastic, high-quality sounds remain synchronized with the images, no matter what image size you've selected.

The meerkat exhibit also contains a Kid's World icon labeled Crazy Ways. I clicked on this and read some of the more amusing and peculiar details of meerkat life. The text seems considerate of young readers and contains as much information as kids probably could retain from a visit to the zoo. This is, alas, also the major weakness of The Animals!: It provides as much information as a trip to the zoo and can show you pictures of the animals there, but it often doesn't include an overwhelming amount of factual detail.

Certainly the extensive online bibliography will aid anyone who is interested in researching meerkats or other of the less-famous zoo animals, but much more information could've gone onto this CD-ROM program than the amount that goes onto the exhibit placards at the actual zoo in San Diego.

Don't think The Animals! is run-of-the-mill, would-be multimedia PC (MPC) fare, though: The Software Toolworks did an outstanding job of packaging more than 82 short films on a single CD-ROM, along with 1300 256-color pictures, 2500 pages of text, and 2½ hours of sound data. The DOS (non-CD) version offers fewer options but retains all the educational value. But the real deal is the CD-ROM version. Its incredible images, animation, and sound will motivate you to learn about all the animals in the San Diego Zoo.

If The Animals! is any indication of the next wave of MPC products, an upgrade to CD-ROM would make a most worthy investment. ❐



Windows version: IBM PC or compatible (80386 compatible), 2MB RAM, SVGA, Windows 3.1, CD-ROM drive, MPC-compatible sound card, mouse—$119.95
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GAME INSIDER

Shay Addams

EVERYTHING'S COMING UP ACES

Following up on last year's hit, Aces of the Pacific, ace designer Damon Slye has turned in his latest tour de force with Aces over Europe. The P-51 Mustang, the Me 109 and Me 262 fighters, and many other war birds seen in World War II games are included. One novel addition is the German Arado, a light jet bomber. Surprisingly missing, though, is the Ju-87 Stuka, Nazi Germany's main dive bomber.

Aces incorporates more ground action as it moves from the Pacific to the European theater, but you'll still see plenty of stomach-churning dogfights.

The action, spanning events from D-day to the end of the war in Europe, unfolds across your screen in much the same manner as in Aces of the Pacific. You choose a side and the branch of service and then begin a series of missions based on the historical research of Dynamix's in-house war historian, John Bruning. Another part of the program allows you to practice specific mission types or dogfights on either side.

Aces over Europe employs new flight models and an enhanced version of Slye's 3-Space graphics system. Major differences in the new game are that it incorporates a greater and more detailed emphasis on ground attacks, reflecting the nature of the war in Europe, and that the dogfights are even more stomach churning than in the original Aces. Improved polygon graphics now show legible insignia on the planes, so you'll know which enemy squadron you're fighting. And each enemy plane in an engagement is now numbered, enabling you to know which pilot you're chasing—or which is about to shoot you out of the sky.

While most games released for CD-ROM have been minimally enhanced versions of the programs available first on floppy disks, Spectrum HoloByte's new Iron Helix was designed specifically for CD-ROM by Drew Pictures. It's an action adventure with a science-fiction scenario reminiscent of Suspended, Infocom's classic all-text adventure.

The goal in Iron Helix is to track down certain DNA samples on an abandoned spaceship. To explore the six-level ship, you must direct the actions of a remote-control probe as it travels throughout the corridors and rooms. The obstacle is the ship's security probe. The security probe detects your probe's every move and tries to blow it away. Graphics and animation look sharp on a screen divided into four quadrants. One quadrant depicts a television view of the probe's vicinity, the other quadrants show icon-based commands and other elements of the interface. Iron Helix is available for Macintosh as well as the PC.

With the recent release of a MiG-29 mission disk, Spectrum HoloByte has added yet more life to what remains the world's top jet flight sim. The new missions are set in the same theaters that appear in the original game. This time, however, you can fly one of the other side's craft—the MiG-29 Fulcrum, one of the few light fighters to employ Beyond Visual Range capability, a capability which the F-16 doesn't possess. What may prove even more fun than the new missions is the opportunity to choose either the F-16 or MiG-29 in a head-to-head game played via modem.

A pair of new mission disks for X-Wing offers more challenges for veterans who have already completed the first two Tours of Duty. LucasArts is calling the new mission disks Space Combat Tours. The first of these, which provides another series of missions set in the Star Wars universe, should be out by the time you read this. By early fall, look for another mission disk that will include a new craft—the B-Wing—in addition to a new Tour of Duty. And if they prove popular with the public, LucasArts will turn out at least one more X-Wing mission disk. (There is, however, no truth to the rumor that X-Wing designer Lawrence Holland and Wing Commander designer Chris Roberts are teaming up for a joint production called X-Wing Commander.)

For X-Wing and the super-realistic air combat sims of the 1990s, a new breed of joystick has emerged with lots more buttons for all the sophisticated flight commands. The latest entry is the Gravis Pro, distinguished by adjustable tension and a pair of extra buttons. The buttons correspond to the buttons on a second joystick (which many major flight sims support for various features). The tightest of the adjustable-tension settings makes it far easier to fly jets that require a light touch (like the Harrier in Domark's AV-8B Harrier Assault), especially if you tend to overcontrol and wind up like me: out of control. When set at one of the four looser positions, the Gravis Pro is at home in action games. ❐

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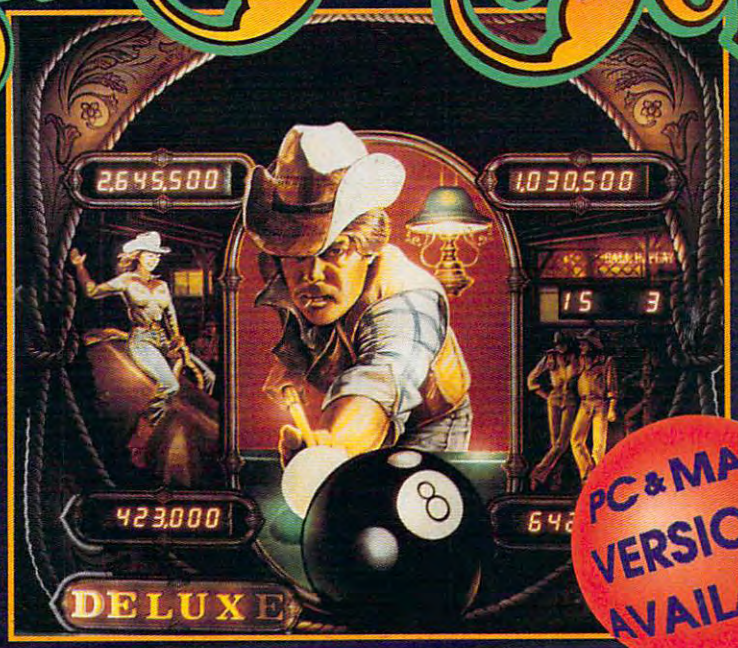

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ENTERTAINMENT CHOICE

You'll want to sleep with a night-light on after playing this scary action-adventure game.

Peter Olafson

ALONE IN THE DARK

I sense that some line has been crossed; I can't leave now—even if I wish to. Even the most innocent volume on the bookshelf fills me with disquiet. A rocking horse seems to move on its own, and I don't like the look of that trapdoor.

I finally spot the piano in a distant, shadowed corner of the attic and am on my way toward it when I notice a suggestion of movement outside the window: something tattered and ungainly fluttering in the air. A wrecked flag, perhaps, I imagine, though I recall no flagpole. I look more closely. It's not a flag. The fluttering form looks back at me. It has teeth—many teeth. It's almost at the window. Help! The stairs! The stairs!

I wish a thousand blessings upon anyone trapped in the wonderful, terrifying place that is Alone in the Dark. This three-dimensional adventure game from the French company I * Motion is the first computer game I've seen that has fear running through it like an electric current. Raw emotion is a rare enough quality in real life, and its appearance in this virtual world definitely defines Alone as a breakthrough product.

A line has indeed been crossed: Alone is the first of a raft of fright bytes that were to hit the market in the first half of 1993. But it isn't the first of the breed, of course. We have Accolade's now-niter-encrusted role-playing game Don't Go Alone, and Horrorsoft's two Elviras and the quasi Elvira, Waxworks. But there's a delicate line between horror and terror: One is as easy as turning your eyelids inside out; the other is the art of setting you on pins and needles. The Elvira games may make you recoil at their carnage, but they aren't genuinely scary.

Alone is genuinely frightening without ever being grisly. When you run from its horrible creatures, you'll do so in shuddering terror. The first time you open a door and find something unspeakable waiting for you on the other side, something which proceeds to advance on you with arms outstretched, you'll feel a genuine shock.

The game blurs the line between actually being there and being at home, safely in front of a computer. Play it in the dark for maximum effect. Even writing about it two weeks after playing gives me the creeps. It's that good.

The adventure is based on the works of the author H. P. Lovecraft, who penned wonderful horror and fantasy stories back in the early part of the century. They aren't the best stories ever written, but they are responsible for creating the foundation for a wonderful cosmology called Cthulhu Mythos, which postulates an ancient monstrous race of creatures lying in wait, creatures who can be gated into this world, invariably with disastrous consequences for the gate opener.

As Alone opens, the gate is wide open and swinging. You're cast as either Edward Carnby, who is a private detective, or Emily Hartwood, who is the niece of the last tenant—who killed himself. You'll quickly find that the vague agendas found in the documentation have little bearing on the task at hand. In no time you'll be exploring, fighting for your life, solving puzzles, reading books, and enjoying a good deal of stimulating action-adventuring.

You get to explore the three-story house and its underpinnings, and they are a delightful hybrid of filled polygons and bitmaps. They're as solid and real a place as we've visited this side of Ultima Underworld. Actually, it is not all that dark in this world, and you're hardly alone. The house comes fully equipped with a staff of splendid terrors ranging from the mundane (like spiders and rats) to the completely outrageous (such

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as a rabbit with a ferocious *Tyrannosaurus rex* head).

When you begin your adventure, you're armed with nothing more than your wits and a passing knowledge of karate. But if you're nosy enough, you'll eventually come across more conventional weapons. Combat is fun even when your weapon of choice doesn't quite do what you had hoped. The aiming is fun, and the enemy's recoil and the fine mist of blood are nice rewards when you do make contact. And your opponent's collapse and disintegration into a hail of polygon circles—to the distant crackle of thunder—are truly satisfying. (I prefer to play the game with the theme music turned off, but the sound effects and spot musical effects are quite superb.)

Quite different from that of any other game, the perspective in Alone is as if you're watching your character from a trapdoor just above and to the side. What's especially nice is that the view shifts, sometimes a number of times, depending on where you're standing. Finding the different views is fun and lends a sense of the house as an environment rather than as a series of snapshots. This haunted house really seems to occupy space, inside and out: Fights started in one room can spill through a doorway into another, and the program takes up over 5.5MB of hard disk space.

Alone is very easy to control. The keyboard interface is almost as transparent as the game's ethereal critters. Characters move around smoothly and realistically on a 33-MHz 80486. You simply hold the space bar to invoke your current mode (Fight, Open/Search, Close, or Push), and hit Enter to change it or inspect your inventory. The commands available are keyed to the designated object, and it's easy to change gears on the fly.

You'll quickly acquire a thorough sense of being a real character inhabiting a real place. It's a quality that seeps into the opening copy protection (picking the game's 3-D objects from a book) and is sustained into the save-game mechanism (each save is accompanied by miniature screen captures).

Alone is very much of a piece; it even possesses a properly apocalyptic, roof-coming-down Lovecraftian ending. And when the game's over, delightfully, it's not *quite* over. You'll still need to make your way back up to more civilized surroundings and out the front door. Since all the unearthly critters have been pacified, this is a perfect opportunity for unbridled exploration. As you play, you'll discover lots of books and documents that are useful but not exactly essential in the solution. It's easy to overlook them when you're running for your life. (Save your game anyway; a couple of books have decidedly nasty properties.) Now's your time to enjoy them.

At the same time, Alone's very consistency of tone makes doubly disconcerting the occasional hiccup in the program engine. For instance, while your character may be standing immediately in front of a cabinet, both of his arms extend to the left of it when you move to open it. Likewise, toward the end of the adventure, when you have to explore a decent-sized maze, the game suddenly abandons its multiple camera angles and adopts an overhead perspective similar to that used in games like LucasArts' Indiana Jones and the Last Crusade. It's a bit jarring, and it's unnecessary; the designers at I * Motion might have had a bit more respect for the purity of their otherwise impeccable creation. But these complaints are a small exception rather than the rule.

I truly had a fantastic time playing this game—so fantastic, in fact, that I not only finished the adventure but also went back a second time to see if I had missed anything. And the morning after I finished playing it, after a restless night of dark and unremembered dreams, I thought twice every time I had to open a door.

Alone in the Dark has been described as "a poor man's 7th Guest." We should all be so poor! This game is a triumph of the spirit—in more ways than one. ❐

Circle Reader Service Number 393

IBM PC or compatible (80286 compatible, 80386 recommended), 640K RAM, MCGA or 256-color VGA, hard disk with 5MB free; supports Sound Blaster, Covox Sound Master 2+, Ad Lib, and Disney Sound Source—$59.95

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Paul C. Schuytema

PANT YOUR WAY TO VICTORY

When I think of the Olympics, the sports that excite me are the individual ones like pole vaulting and the javelin throw.

On my PC, I have the opportunity to play superathlete, trained in a variety of Olympic sports and honed to take on the best. Summer Challenge (Accolade; 800-245-7744; $54.95) gives me the chance to be the track-and-field athlete I've always wanted to be. It encompasses a wide array of sports, including pole vaulting, throwing the javelin, kayaking, cycling, and hurdling. You can even try your abilities in archery, the high jump, and an equestrian jumping event. Control is simple—you use the joystick, mouse, or keyboard or a combination of the three. In cycling, for example, you can use your fingers to tap the Enter key for pedaling while steering with the joystick. For a high-speed sprint, you'll want to switch hands midpedal, since bashing the Enter key is remarkably exhausting.

Experience the rush of victory as you streak past the finish line or outshoot, outski, and outjump the best Olympic athletes.

In the kayaking event, you paddle by pushing the joystick forward and turn by moving the stick left and right. The graphics are smoothly scrolling 3-D polygons.

The Carl Lewis Challenge (Psygnosis; 617-731-3553; $49.99) is another take on the Summer Olympic events. In it, you control not only the actions of the athlete but also the rigorous prematch training. You play coach to a team of athletes, and training can vary from isometrics and circuit training to several methods of stretching. The individual training activities aren't controlled; instead, you assign workouts with varying levels of intensity and time spent on each method of training. The goal is to produce a team of perfectly trained athletes, either all generalists or specialists trained in specific events.

Once trained, the athletes compete in sprints, hurdles, javelin, high jump, and long jump. Performance depends not only on how well you control the athletes but also on how well you've trained them.

The graphics consist of a scrolling side view and feature fluidly animated competitors. As a departure from the typical stab-the-keys-as-fast-as-you-can approach, Psygnosis offers three control options. One is the typical key-bashing (which is nice since it simulates exhaustion so well); the others are rhythm control and gearing control. Rhythm control challenges you to tap the Ctrl key as a pendulum passes the center of its path. The more accurate your control, the faster the athlete. In gearing control, you tap the Ctrl key as the athlete reaches certain strides; hitting the strides right increases the speed.

When I long for the snows of winter, I dive into Winter Challenge (Accolade; $54.95), which is easily the most addictive of all the Olympic games I've played. Players compete in the luge, the downhill, cross-country, giant slalom, two-man bobsled, and the biathlon. You can also compete at speed skating and ski jumping. The wide array of wildly different sports makes play exciting, and there are so many different types of controls that my hands don't cramp up on me.

The downhill, with its breathtaking background and fast polygon graphics, conveys the illusion of superspeed. As I whip down the course, I have visions of Franz Klammer's brilliant, out-of-control gold-medal run in the 1976 Innsbruck games. Fortunately, Accolade's games feature a VCR which allows you to relive your brilliant runs.

Probably my favorite Winter Challenge event is the expertly modeled biathlon, that curious marriage of cross-country skiing and marksmanship. Smooth graphics give the illusion of skiing through the European countryside, and as you control every stroke, you must watch the stamina meter, which shows a combination of breath and heart rate. When your skier reaches the shooting range, the steadiness of the aim is determined by how exhausted your skier is; if your skier is frazzled, the aiming reticle bounces up and down with every labored breath.

These games are great for parties. Four players can compete in The Carl Lewis Challenge, while ten can go head-to-head in Accolade's games.

Sports games aren't limited to baseball, football, and golf. Go beyond the standard fare and see if you have what it takes to be an Olympian. ❐

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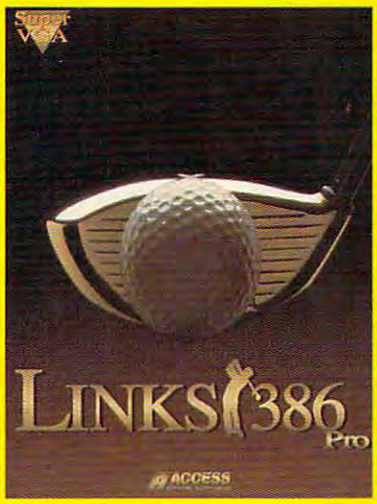

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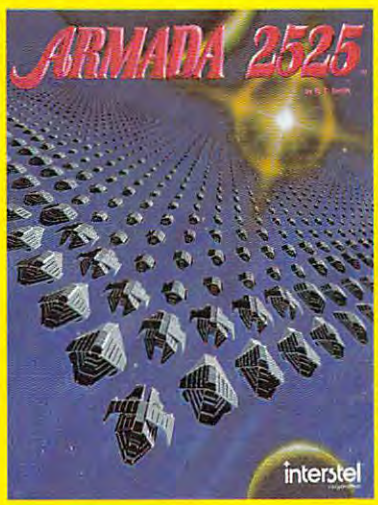

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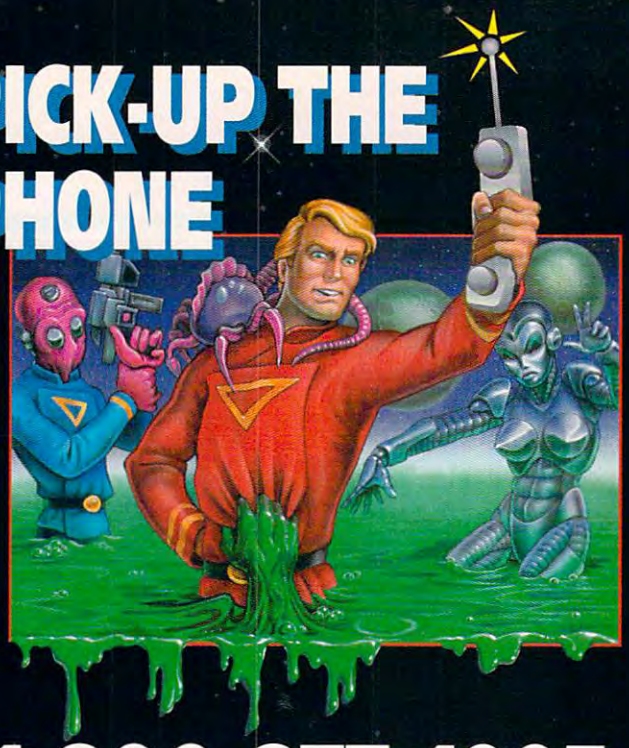

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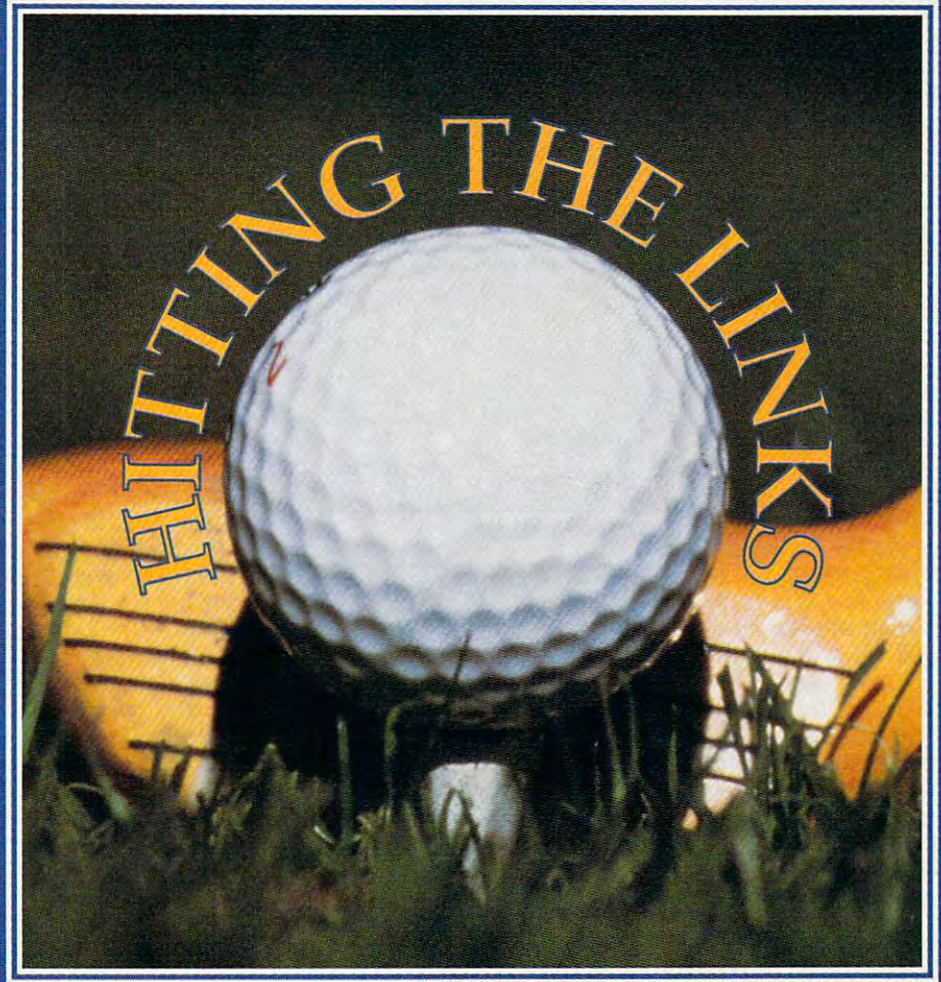

If golfers and caddies be not better neighbours
Than abbots and soldiers, with crosses and sabres,
Let such fancies remain with the fool who so thinks,
While we toast old St. Andrews, its Golfers, and Links.

—Andrew Carnegie, from a toast delivered in Chicago in 1874

BY PAUL C. SCHUYTEMA

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Golf is a game with a long, rich heritage. Golf enjoys such popularity as to have become a staple of our popular culture and iconography. It's no wonder, then, that golf simulators have been chipping around computer screens as long as there have been CRTs.

In the early days, aspiring computer golfers had to work with blocky, unrealistic graphics and limited play options. As computer technology evolved, so did golf simulations. Now, players enjoy stunningly realistic scenes, compensate for wind and the slope of the green, and choose from a variety of options. They can play against PGA pros in a tournament, play against other computer golfers over the phone, play a skins game for a million-dollar purse, shoot for par in Hawaii, or even design a golf course. Indeed, the modern computer golfer can play under the blustery, overcast skies of Scotland without even leaving home.

In addition, golf simulators have reached the level where they can actually assist players in their real-world golf games. Players who had never before picked up a real club are now hitting the links after discovering the fun of golf via a computer simulator, and computer users who don't play ordinary computer games discover that computer golf offers something different from the run of the mill and become hooked on the virtual country club on their hard disk.

Different Strokes

There are a wide variety of golf simulations, each with a different spin on the game. Links 386 Pro strives for the ultimate in visual realism, while PGA Tour Golf lets players play in a PGA tournament and go head to head against the tour's best players. The Jack Nicklaus Signature Edition allows players to design a fantasy course and share it with people around the world. David Leadbetter's Greens is an expert-level tutorial that features dynamic camera tracking, which makes the experience seem more like televised coverage than a computer game.

Most of the games employ some type of power meter to judge the shot and generally require three actions from the player. In a drive, you might tap the space bar once to begin the swing. The power meter then moves to reflect your backswing. Then, you tap again at the power point—the top of the stroke—and the power meter begins to recede. You must time your third tap to fall at a precise moment to strike the ball straight on; any variance can lead to a hook or a slice.

PGA Tour Golf: fast and fun

Links 386 Pro: many views

David Leadbetter's Greens: dynamic

You may enjoy having such control over your strokes. Or you may prefer spending your time designing the perfect course or playing against the masters. Whatever simulation you choose, the addiction level is bound to be high. Each of the games discussed here will lead you to many late-night playing sessions and to true bragging rights for that one-in-a-million shot.

PGA Tour Golf

Electronic Arts' entry in the golfing competition, PGA Tour Golf for Windows, satisfies that deep need to go up against really expert competitors—the best the sport has to offer—and to beat them at their own game. In this simulation, the only PGA-licensed product, the pros are the real McCoy: Their abilities are modeled on PGA players' actual performances.

PGA Tour Golf uses stylized renderings of the players, courses, and objects, but the level of realism is quite acceptable. The natural scenery surrounding the course is a little on the sparse side, but there are enough trees to get in the way of nearly every golfer. The game features four courses: PGA West, Sterling Shores, the Tournament Player's Club at Avenel, and the Tournament Player's Club at Sawgrass.

This game's hallmarks are its speed, its challenge, and its playability. The courses may look easier than those in games with more visually complicated graphics, but the play is extremely demanding. One thing lacking, though, is the sense of rolling terrain: The fairways are flat and expansive, without either visual or play-affecting slope.

This changes when you reach the green, however. A window appears that models the green in 3-D with an imposed grid. You can rotate the picture to judge the break and adjust your aim accordingly. The view then shifts back to the playing screen to allow you to attempt the putt.

Far and away the most notable feature of PGA Tour Golf is the PGA tournament. The game proceeds in televised fashion, with an announcer commenting on each shot and giving reports from other holes. It's very tough to beat the pros, but it's extremely satisfying when you start to win.

Electronic Arts also sells a DOS version of PGA Tour Golf, which differs from the Windows version only in that it doesn't require Windows. PGA Tour Golf Limited Edition is a special packaging of the DOS version of PGA Tour Golf that includes the tournament course disk (normally sold separately), plus a VHS tape containing a documentary history of PGA tour golf, including interviews with players.

Links 386 Pro

The Links simulation has been with us for a while, but only recently has 386 Pro, the flagship of the Access Software line, made an appearance. A visually stunning achievement, 386 Pro requires Super VGA, at least an 80386 processor, and a whole lot of RAM (Access suggests 8MB, but 4MB seems to work just fine). With all of that computing power behind the game, the results are incredible.

The play window, a view from behind the golfer, approaches photo-realism, with varying textures in the grass, subtly rolling hills, and gently shaded sand bunkers. Access allows you to set up many viewing options, from a full-screen window of the course to a split screen featuring a

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front view and a view from the pin. Other windows include a top view, a slope window, a stance window, and a scorecard.

To aim your shot, you use a unique "barber pole" that you move around the course with the mouse. When the shot is set, you use the mouse to control your swing. As in the other two Links products, the power bar is curved to simulate the arc of the golf swing, and there's a realistic time-lag from the moment you attempt to stop the swing until the club reacts. This takes getting used to, but it accurately reflects an actual swing.

There are no tournaments in 386 Pro, but you can play against several friends or a recorded player shot for shot for some heated competition.

If there are any weaknesses in 386 Pro, the foremost would be its speed. The game really needs an 80486 to play as fast as the other games. With an 80386SX, the redraw time can take quite a while. The other weaknesses are poor-quality sounds and no golfer animation when the shot is viewed from the green in reverse angle. It's a little odd to just see the ball leap from the fairway with no golfer in sight.

There's no course-design feature in 386 Pro, but Access is providing an ever-increasing array of courses, and original Links courses can be converted for play with 386 Pro (the resolution isn't as good as that of the 386 Pro courses, but the quality is still high). I had the opportunity to play golf in Hawaii (via the computer, of course) using the Mauna Kea course disk. The Championship disk contains files to play this course with Links 386 Pro, Links, or Microsoft Golf for Windows 1.0—and it's a gorgeous course. Playing the third hole in 386 Pro, a par-three iron shot over a volcanic Pacific inlet, is arguably reason enough to go out and buy a PC.

David Leadbetter's Greens

Greens takes two different approaches to simulating golf: It strives for real-world instruction, and it uses dynamic views of play.

The game is endorsed and heavily influenced by David Leadbetter, arguably the preeminent professional golfing instructor. The manual included with Greens consists of a richly detailed instructional course, featuring everything from club selection to stance and play strategies. MicroProse sets up the game as a vehicle for players to learn more and improve their regular game of golf, as well as for entertainment.

The second unique aspect of Greens is the view. There are a number of different camera angles, and if you select the intelligent camera, a shot is visualized more like television footage than a static view: The camera cuts, pans, and follows the ball in 12-frame-per-second animation. As a result, the quality of the graphics is a far cry from that of those in Links 386 Pro, but the way MicroProse executes the cuts makes up for the lack of resolution.

Greens also features an amazing amount of player control over the shots. Golfers can experiment with

Microsoft Golf: Links for Windows

Jack Nicklaus Signature Edition: solid

stance and tee placement beyond the usual club selection. The power meter in Greens is also different: As you twist into a backswing, the "sweet spot" where you must hit the ball shrinks, which corresponds with the increasing difficulty of hitting a power shot accurately.

On the green, Greens allows a golfer-to-hole view, a hole-to-ball view, and a perpendicular view. Using these different angles gives you a wealth of information about the lay of the green.

Greens features tournament and skins game options as well as modem or direct-connect play, allowing two players to battle against each other in realtime via phone.

Microsoft Golf for Windows 1.0

Microsoft, in an arrangement with Access, ported the original Links game to the Windows environment. More than just a quick fit, Microsoft Golf for Windows 1.0 is a true Windows program and takes full advantage of the operating system. Windows can be dragged and resized, and the game can wait in the background while you switch to a spreadsheet when your supervisor walks in.

Microsoft Golf also borrowed the golfer animation from Links 386 Pro, giving the swing animation greater depth than that of Links. All original Links courses are fully compatible with Microsoft Golf. The game can handle eight players simultaneously, but there are no options for tournament play or any of the other variations (such as a skins game, a recorded player, or an AI opponent).

As in the original Links and Links 386 Pro, you have complete control over your golfer's stance, swing plane, and ball position. As in Links 386 Pro, you have the option to step back from the ball and swing the club a few times before addressing the ball for a solid hit.

The game plays very smoothly, but aiming the ball is a little awkward, since your golfer disappears when the barber pole appears. Occasionally, the windows seem to get in the way of each other, and you have to make sure that the swing window is active before attempting a swing; otherwise, the delay as the window pops to the forefront will play havoc with any attempts at timing.

Microsoft Golf, like Links and Links 386 Pro, enables you to print out a scorecard (which must be signed and attested to be valid, of course).

Links

The most venerable of all the versions mentioned, the original Links is still a solid game that can be played adequately on an 80286, and up until the recent explosion of quality golf games, it was the king of the heap.

Links and Microsoft Golf have a library of over eight courses to choose from, including Troon North, set in the deserts of Arizona, and the Dorado Beach East Course in the heart of the Caribbean.

Jack Nicklaus Signature Edition

The Signature Edition is a significant rewrite of Accolade's Jack Nicklaus Ultimate Golf and is a youthful descendent of the old Mean 18 golf simulation.

Signature Edition is an extremely solid program and features 256-color graphics; while the resolution doesn't approach that of 386 Pro, the sense of

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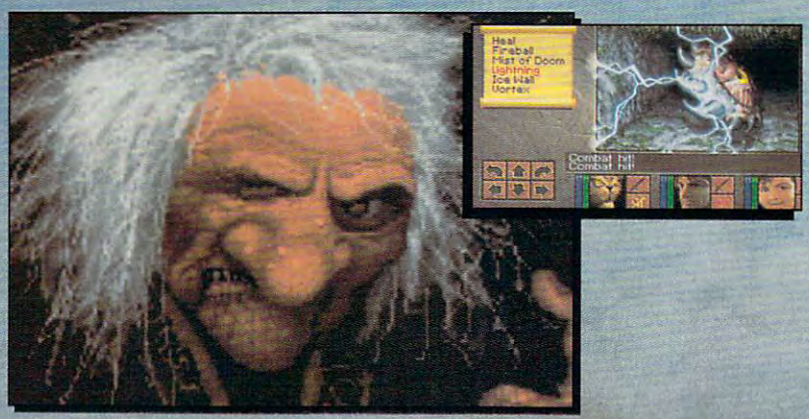

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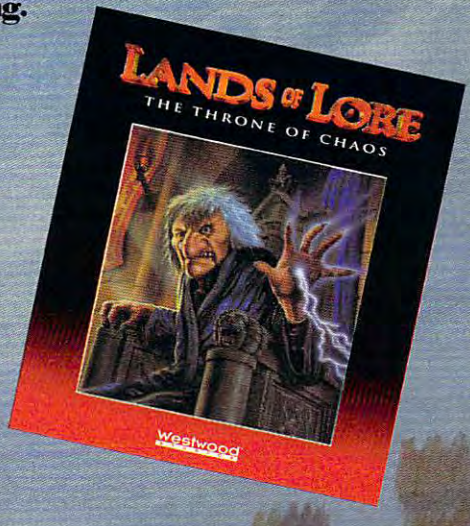

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rolling terrain is amazing. Also, Accolade chose to use a deep, rich palette of colors that seem to drip right off the screen.

The gameplay is solid, with most of the features you'd expect from a top-of-the-line golf simulator. One item it lacks, however, is player control of the golfer's stance or ball position.

You can choose stroke play, tournament mode, or a skins game, with a number of players competing at once. Signature Edition possesses a solid arsenal of AI golfers to battle against, and you can create computer players of matching ability (or inferior ability when you need a victory for psychological reasons). You can even compete against the Golden Bear himself. But if you do, it's a serious challenge: Nicklaus just doesn't seem to miss any shots.

The most striking feature of the Signature Edition simulation is its course-design program. With it, you can get your hands dirty and tackle the tedious, frustrating, and amazing task of terraforming a course. After you've designed a hole, you can play it through to examine its subtleties. The design program and the golf simulation do a credible job simulating the rolls and dips of terrain.

Course designers have control of the scrolling background, the pixel-by-pixel construction of the various objects that populate the course (such as trees, flowers, and the occasional caddie shack), and the type of terrain, from green to cart path. Utilizing a paint program type of interface, you draw terrain, select areas, and impose hills, dips, cliffs, and even railroad-tie shoring for a raised green.

Hundreds of user-designed courses, from Mark Willett's beautiful and fictional Alhambra course to Links set entirely on the surface of the moon, can be found on CompuServe and many other online services and BBSs. You can also join a tournament on Prodigy, download a course, and battle for position on the leader board, posting scores each week.

Wilson ProStaff Golf

Konami enters the world of computer golf with Wilson ProStaff Golf, a game that prides itself on the speed of its play. In a field of games battling for visual supremacy, Konami's entry takes a different approach. Instead of offering photorealistic graphics, Konami chose instead to make the screen redraws lightning fast.

In that area ProStaff Golf succeeds completely. The panoramic screens pop up almost instantly, and each shot is followed by a televisionlike gallery replay, focusing on where the ball lands. The graphics are well rendered and have something of the same flavor as the graphics in PGA Tour Golf and Greens.

ProStaff Golf features a very nice overhead view of each hole, showing where the ball will probably land if hit correctly. The overhead view breaks the shot distances into 25-percent intervals, making it easy to gauge how much force to put on a pitch or a choke shot. Konami has also rethought the basic power-bar approach to hitting the ball. The game features a circular bar for the power stroke, similar to the power bar in the Links games. But when a player selects the power for the stroke, the action then moves to the face of a stylized golf ball, where a red dot circles around the dimpled surface. To actually make the shot, the player must tap the selector key when the dot is exactly in the center of the ball. This approach accomplishes the same thing as the traditional power bar, with the added ability to purposely hit the ball either low or high, thereby controlling the spin.

ProStaff Golf features an impressive array of games, from stroke play to several skins games to a game called bingo-bango-bongo, in which points are awarded for being first on the green, closest to the hole, and first in the hole. The game also features an entire array of team games.

ProStaff Golf, for all of its features and fast gameplay, is somewhat limited. It only provides one course, which can get old fairly quickly. There are no facilities for playing against recorded players or computer players, so the game can get lonely during the early hours of the morning. Finally, putting is more difficult here than in any of the other games I've played. Some greens are so sloped that they appear to be located on the side of a mountain, and the aiming reticle is located at the top of the screen, a long way from the hole and the player's best line of sight.

Still, the play is fast and engaging, and the ease of the game, the short learning curve, and the ability to play teams makes it a great choice for a computer golf party after the links have been rained out.

Pro Shop

Links
$59.95
Links 386 Pro
$69.95
ACCESS SOFTWARE
4910 W. Amelia Earhart Dr.
Salt Lake City, UT 84116
(800) 800-4880
(801) 359-2900

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$69.95
ACCOLADE
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San Jose, CA 95129
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(303) 352-3183

PGA Tour Golf
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PGA Tour Golf for Windows
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PGA Tour Golf Limited Edition
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1450 Fashion Island Blvd.
San Mateo, CA 94404
(800) 245-4525
(415) 513-7555

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Buffalo Grove, IL 60089-4510
(708) 215-5111

David Leadbetter's Greens
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Hunt Valley, MD 21030-2245
(800) 879-7529
(410) 771-1151

Microsoft Golf for Windows 1.0
$64.95
MICROSOFT
One Microsoft Way
Redmond, WA 98052
(800) 426-9400

Grab Your Clubs

Golf is a rich and compelling game, and computer golf simulation has finally become nearly as challenging and enjoyable as the real thing. Whether you prefer head-to-head competition with a friend on a BBS, tournament play with the pros, creating a challenging course, or working on your golf game on a rainy day, you're sure to find a golf simulation that matches your style. And when you do, prepare to lose track of time. You won't want to quit until you've mastered your game—and then you'll want to challenge the world. ❑

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64/128 VIEW

Gazette celebrates its tenth birthday with this issue—and launches a new column to help celebrate.

Tom Netsel

What were you doing ten years ago this month? If you happened to visit a newsstand, you may have picked up a new magazine called COMPUTE!'s Gazette.

I was working at the University of Central Florida in Orlando, and I had just bought a 64. I was wondering what to do with it when I spotted a Gazette at my local grocery store. I'll have to confess that I missed the first issue. I didn't see Gazette until the second issue hit the newsstand, but I've been hooked ever since.

Gazette was billed originally as being "for owners and users of Commodore VIC-20 and 64 personal computers." As time passed and Commodore introduced the Plus/4, the 16, and the 128, Gazette's coverage expanded to those machines. But when the smoke finally settled over the personal computer battlefield, the 64 and 128 emerged as the survivors, and Gazette narrowed its editorial focus to those Commodore veterans.

Speaking of veterans, as I browse through the masthead of that first issue, I see the names of four people who are still associated with the magazine. Regular readers will recognize columnists Jim Butterfield and Fred D'Ignazio, but two other veterans may not be as familiar. Terry Cash is now copy production manager, and De Potter is production manager. Without their valued assistance, there wouldn't be any magazine.

Editorial's staff has changed frequently, but Gazette's goal of providing its readers with the best of Commodore-related information and entertainment has not changed. In large measure, each Gazette editor has relied on 64 and 128 owners who are willing to share their knowledge with our readers. From that first issue through the one you read today, we've encouraged you to submit articles and programs for publication. That need is just as strong today as it was a decade ago. Some things don't change.

Change is inevitable, however, and you'll see it in this issue with the addition of a new column. Over the years we've published original programs and reviewed commercial software, but we've seldom covered public domain programs and shareware—until now. GEOS columnist Steve Vander Ark examines this vast source of programs in his new column, "PD Picks."

The programs Steve will review and recommend can be found on bulletin boards, commercial online services, user group libraries, and elsewhere. If you can't locate a convenient source for these programs, look for them on our monthly Gazette Disks. These programs—unlike the Gazette type-ins—are not copyrighted, and you may distribute them freely. All we ask is that you honor the fee requests of shareware authors if you use their programs.

In closing, I'd like to thank all of you devoted Commodore users for your support over the past ten years. Without your help, Gazette would have folded years ago. But with it, look for Gazette each month for years to come. ❐

GAZETTE

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Gazette marks a milestone with this issue—ten years of serving the 8-bit Commodore market.
By Tom Netsel.

11 YEARS IN 8-BIT HEAVEN G-3
In 1982, dozens of home computers were struggling to pull ahead of the pack—then, along came the Commodore 64.
By Larry Cotton.

REVIEWS G-8
Jara-Tava, Mathbooster, and Flyer.

FEEDBACK G-14
Questions, answers, and comments.

PD PICKS G-16
This new column focuses on the best of public domain and shareware programs.
By Steve Vander Ark.

MACHINE LANGUAGE G-18
To read a file successfully, you must know how it ends.
By Jim Butterfield.

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By Randy Thompson.

BEGINNER BASIC G-22
Here's how to activate your user port.
By Larry Cotton.

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11

YEARS IN 8-BIT HEAVEN

BY LARRY COTTON

THE YEAR WAS 1982.

The Vietnam War Memorial was dedicated in Washington, D.C.

England and Argentina fought over the Falkland Islands.

The Equal Rights Amendment lapsed without ratification.

The St. Louis Cardinals won the World Series.

Barney Clark became the first person to receive an artificial heart, the Jarvik-7.

And in the autumn of that year, the Commodore 64 personal computer was born.

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Commodore International, a darling of Wall Street investors at that time, was known primarily for its calculators; the PET series of computers; and a successful, albeit memory-deficient older sibling of the 64, the VIC-20. The company was run by the inimitable Jack Tramiel and sons, a team famous for squeezing the most bang from a buck.

The personal computer market was in a frenzy at the time, and Tramiel brazenly introduced a new computer called the Commodore 64. This new machine was priced at $595, a ridiculously low price for that time. A disk drive or a monitor were extra.

The Field

The 64's major competitors were the Apple II+ ($1,530), Atari 800 ($899), IBM PC ($1,565), and TRS-80 Model III ($999). The 64 was exactly the machine the world had been holding its breath for, with a third more built-in memory than the Apple II+—four times more than the Atari 800—yet priced at two to three times less than the Apple and a third less than the Atari.

The 64 featured (as it does today) a breathtaking 16 colors; 40 characters per screen row; eight Movable Object Blocks (sprites); and, best of all, an unbelievable 64K of random access memory, 39K of which was available for BASIC programs. Even without a drive and color monitor, the 64 was still far and away the feature leader with outstanding color, graphics, and an integral three-voice music synthesizer. Its musical talents alone rivaled those of many dedicated keyboard synthesizers at the time.

I must confess that I was not one of the original personal computer enthusiasts. I hadn't assembled an Altair in my basement back in the 1970s. My computer-related background consisted of occasionally perusing Byte magazine and assembling a few Circuit Cellar projects. Later, my interest expanded into creating some original, but primitive, rats-nest circuits around various Radio Shack chips. One such device featured four toggle switches to input data to a tone-generating chip. It could play tunes stored in its minuscule 1K of memory! I began to see the need for a real computer.

Full List Price

After extensive comparative research, I decided to invest in a 64. I bought the shiny little machine (serial number 10917, with no colored bars in the logo) from a nearby dealer for full list price. I sold my prized 1959 Mercedes to raise the cash to finance it. In addition to the computer, I proudly took home a disk drive (instead of the more common Datassette tape drive), a printer, and a 13-inch color television to use as a monitor.My sons, David and Michael (then 13 and 10), and I cleared some working space and unpacked each component with loving care. With great anticipation and excitement, we connected the parts with cables, plugged them into the wall, and gingerly threw the power switches. Everything worked beautifully! We were thrilled!

As we tentatively put our new toy through its paces, we marveled at its wondrous capabilities. The only demonstration program our Commodore dealer supplied with the 64 (in anticipation of a wildly successful Christmas selling season) showed Santa Claus sailing around a chimney and surrounded by flurrying snow, all the while accompanied by background music playing "Jingle Bells."

Software Shortage

Our giddiness soon diminished with the slow dawning that, however wonderful the computer itself was, Commodore had introduced the 64 with virtually no available software. The company's first ads had vaguely promised a word processor; a database; a spreadsheet; and several games, including Gorf, Visible Solar System, Radar Rat Race, Mole Attack, Avenger, Ace of Aces, and Jupiter Lander.

With a dearth of software, we dutifully turned to the user's guide and began teaching ourselves to program in BASIC. My first program (beyond the sophisticated 10 PRINT "HELLO") was one I called Tunnels. This gem printed multicolored rectangles to the screen that overlapped in increasing and decreasing sizes. It was eventually published in a series of demos called "Baker's Dozen" that were published in the January and February 1985 issues of COMPUTE!'s Gazette. (That was back when COMPUTE had an exclamation point.)

Magazine Scene

After tiring of driving 45 miles every month to my dealer, I started a subscription to COMPUTE! in February 1983 and voraciously read every word written about the 64. That was when COMPUTE carried articles and type-in programs for all of the popular PCs of the day. Charles Brannon, Jim Butterfield, and Richard Mansfield became my gurus of the 64, educating me on every aspect and minutiae of video, inputs, outputs, machine language, and math. I snipped hundreds of articles from that magazine and from Gazette after it premiered in July 1983.

Articles in that first Gazette included a review of the strange Exatron Stringy Floppy, a mass storage device that's sort of halfway between a cassette recorder and a disk drive. There was a column by Fred D'Ignazio called "Computing for Kids," and tutorials on sound, reading paddles in BASIC, accelerated IF statements, and joysticks. I still have my volume 1, number 1 safely stashed away with other prized memorabilia.

Many other Commodore-specific magazines have appeared—and disappeared—during the past 11 years, among them Ahoy!, Commander, Transactor, Midnight Gazette, Commodore Magazine, Power Play, and RUN. Today, only the Gazette section of COMPUTE remains.

Software at Last

Commercial software soon started to catch up with 64 sales, and I could finally put my 64 to work. Among the first programs I bought for the 64 were

TUNNELS

Larry Cotton is the author of Gazette's popular and long-running "Beginner BASIC" column. The following program is the first one that he wrote for the 64 and was among the first that he sold to Gazette.

```
10 PRINT POKE 53280,0: POKE
   53281,0: PRINTCHR$(147)
20 A=1: B=-1: C=40: D=-40: N=1:
   P=54272: V=1984
30 FORZ=1TO12: GOSUB 110
40 V=V-39: N=N+1
50 NEXT
60 V=V+42: N=N-1
70 FORZ=1TO12: GOSUB 110
80 V=V+42: N=N-1
90 NEXT
100 END
110 Q=INT(15*RND(1))+1
120 FORX=1TON:POKEV+A,67:
    POKE V+A+P,Q: V=V+A: NEXT
130 POKEV,75: POKEV+P,Q
140 FORX=1TON: POKEV+D,66:
    POKEV+D+P,Q: V=V+D: NEXT
150 POKEV,73: POKEV+P,Q
160 FORX=1TON: POKEV+B,67:
    POKEV+B+P,Q: V=V+B: NEXT
170 POKEV,85: POKEV+P,Q
180 FORX=1TON: POKEV+C,66:
    POKEV+C+P,Q: V=V+C: NEXT
190 POKEV,74: POKEV+P,Q
200 RETURN
```


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Since the Commodore 64's debut in 1982, worldwide sales of it and the 64C, shown here, have topped 10 million.

the Commodore Macro Assembler Development System, Editor Pak, Word Machine, Name Machine and, Totl Time Manager 2.6. Although it has long been excelled by other assemblers, I still use MADS for my feeble attempts at machine language programming. The first BASIC program I ever typed in was a sprite editor by Donald A. Pitts. It appeared in an article called "A Shape Generator for the Commodore 64" that was published in COMPUTE (November 1982).

SpeedScript

Perhaps the most famous type-in program ever published in any computer magazine is SpeedScript, the program that I'm using to write this article. It was written by Charles Brannon and first appeared for the VIC-20 and 64 in the January 1984 Gazette. Updated several times over the years, its latest version, SpeedScript 3.2, was published in May 1987. The program has been enhanced many times, allowing users to customize the program to their liking. Among these programs are SpeedScript-80, an 80-column version; SpeedCheck, a spelling checker; SpeedSearch, a fast utility for finding any phrase within a SpeedScript file on disk; SpeedCount, a word-counting enhancement; ScriptRead, a fast SpeedScript file reader; and Instant 80, a true WYSIWYG preview for SpeedScript. Some of these enhancements were published in Gazette and others appeared in COMPUTE when it still published type-in programs. (All of these programs are still available on the SpeedScript disk.)When I considered myself proficient in BASIC (I wasn't), I wrote a 92-block program called Muzic! which I attempted to package and sell. I think I sold a grand total of four disks—and these probably went to my 64-owning friends.

Meanwhile, back on the hardware front, finding the television hookup inadequate, I bought my one and only upgrade for the 64—a 1702 monitor. I'm staring at it still. What a wonderful improvement! No more zigzag lines and blurry characters.

Rabbits and Snails

Although it represented a quantum leap in data transfer speeds over the interminably slow tape cassette, the 1541 disk drive soon earned a reputation of its own for snail-like loading and saving (90 blocks—23K—in about a minute) and an easy-to-misalign read-write head.

To alleviate the first problem, I bought an Epyx Fastload cartridge. If there ever was a 64 accessory that's deserved to become a classic, it's this cartridge. Soon thereafter, I read an article on how to add an on-off switch to avoid plugging and unplugging the cartridge to accommodate programs which did or didn't use it. My Fastload's been sticking out of its port ever since.

The head alignment problem was much more frustrating. I read many articles, sent the 1541 to several repair shops, and drilled holes in the bottom housing to access the stepper motor's adjustment screws. Finally, someone managed to fix it, and it's been fine ever since.

Price Wars

As the years flew by, the 64's price plummeted. By June 1983, the 64's mail-order price was $395; a year later, it had slipped to $199; in May 1987, $169.95. Today you can buy one for about $150.

Part of the reason for its decreasing price was the onslaught of other low-priced competitive machines which vied for the computerphile's attention: APF Imagination Machine, the Apple-compatible Franklin Ace 1000 and 1200, Timex/Sinclair 1000 and 2000, Apple IIc, more Tandy machines, Texas Instruments 99/4A, Coleco Adam, Atari 520ST, and IBM PCjr (born November 1983 and died March 1985). When used 64s began to hit the want ads at rock-bottom prices, I bought a spare.

Meanwhile, Commodore wasn't resting on its laurels. While simultaneously boosting production and cutting the price of the 64, Commodore was trotting out the portable SX-64; the anomalous Plus/4 and 16; the 128 and 128D; the breakthrough Amiga family; and the IBM compatibles, variants of which became especially popular in Europe. None of those computers approached the sales of the 64, which is still being built and sold internationally today as the cosmetically enhanced 64C.

Software Bonanza

Within 18 months after its splashy introduction, more and more software companies had climbed aboard the lucrative 64 bandwagon. Ads for programs like EasyCalc, Sprite-Magic, Mail Mate, Choplifter, Sargon II, General Ledger, Busiwriter 64, Monopoly, Centropod, Software Automatic Mouth (an amazing voice-synthesis program known as SAM), Script 64, Typing Tutor, SuperTerm, and WordPro Plus/64 proliferated in Commodore-specific magazines.

Programmers who knew the 64 were in demand. Even Brøderbund Software was advertising for software authors in December 1983.

A New Operating System

In March 1986, Berkeley Softworks—now GeoWorks—introduced GEOS, the Graphic Environment Operating System. Although I'm not a GEOS fan (without an REU and extra drives, molasses is fast in comparison), I seem to be in the minority. Commodore quickly adopted GEOS as its "official operating system" for the 64, and many apparently excellent software products have greatly helped the 64 stay alive and kicking. Gazette's GEOS column first appeared in September 1987.

Applications

By November 1988, 64's were being pressed into service for almost everything but cleaning the kitchen sink. A radio station in Phoenix used one to

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report activities on a call-in talk show. Many people, such as one avid user in Niceville, Florida, used their 64's to track stock market investments. One commercial application used 128s to monitor and control furnace settings in a large apartment complex.

Teachers calculated students' grades with them in Richmond, Virginia. A fireman in Tulare Country, California, used his for eliminating some of the paperwork involved in running a fire department. A preacher in Asheville, North Carolina, tracked the recreational activities of his church with his 64. A Union, Iowa, farmer used a spreadsheet running on a 64 to keep an eye on his farm's financial condition. At Bosch Power Tools, where I work, we used a 64 for years to calculate and generate graphs of motor-performance curves.

Hardware

While millions of owners were putting their 64s to creative uses, hardware manufacturers were busy as well. Here's a short list of peripherals that have made life easier and more interesting.

- Card? printer interface (Cardco)
- VIC-1520 plotter/printer (Commodore)
- Fastload cartridge (Epyx)
- Command Control Trackball (Wico)
- The Voice Box voice synthesizer (The Alien Group)
- Hearsay 1000 voice synthesizer/recognizer (Hearsay)
- Minimodem-C (Aprotek)
- Super Graphix printer interface (Xetec)
- SWL shortwave listener cartridge (Microlog)
- Flexidraw 170-C light pen (Inkwell Systems)
- Stringy Floppy storage device (Exatron)
- Ultimate Interface (Schnedler System)
- Lt. Kernal hard drive (Xetec)
- ComputerEyes video digitizer (Digital Vision)
- MW-302 printer interface (Micro World Electronix)
- Home Control Interface (X-10)
- Interpod interface between computer and various peripherals (Limbic Systems)
- VIC 1650 modem (300 bps, original ly $150) (Commodore)
- 1750 RAM expander (Commodore)
- Sonus MIDI interface (SOFTpacific)
- Video Byte II video digitizer (The Soft Group)
- 1351 mouse (Commodore)
- Ten Key Pad (Quality Computer)
- Super Expander 64 cartridge (Commodore)
- 1581 3½-inch drive (Commodore)
- Bodylink fitness system (Bodylog)

Perhaps the most bizarre peripheral of all was the heavily advertised Spartan adapter for interfacing the 64 to Apple II/II+ peripherals (Mimic Systems). I'm not sure it ever attained volume production.

Software

Here are some of my favorite programs and applications for the 64. Chances are you probably have some of these, too.

- SpeedScript 3.2 word processor (COMPUTE Publications)
- Instant 80 80-column preview (COMPUTE Publications)
- Print Shop card/sign maker (Brøderbund)
- Doodle drawing program (City Software)
- Flexidraw (Inkwell Systems)
- Generic Librarian MIDI software (The Music Software Exchange)
- Simon's BASIC cartridge (Commodore)
- PractiCalc spreadsheet (Computer Software Associates)
- CADPAK-64 drawing program (Abacus)
- Screen Graphics-64 graphics enhancement to BASIC (Abacus)
- Tax Master (Master Software)
- Datafile (RUN magazine)

How about a few games?

- Space Taxi (Muse)
- Summer Games II (Epyx)
- Impossible Mission ("Stay awhile; stay forever!") (Epyx)
- Raid on BungelingBay (Brøderbund)
- Tetris (Spectrum HoloByte)
- Advanced Dungeons & Dragons (Strategic Simulations)
- Bard's Tale (Electronic Arts)
- Pinball Construction Set (Electronic Arts)
- Zork series (Infocom)
- Dragonworld (Trillium)
- Flight Simulator II (subLOGIC)
- Choplifter (Brøderbund)[a] Where in the World Is Carmen Sandiego? (Brøderbund)

In a Babbage's one day, I ran across Light and Temperature Labs, scientific experiments from Hayden Software. They were on sale for $10 each. In case you missed these sadly underpromoted products, each one is a series of scientific experiments on disk, supported by great documentation, along with an interface box which connects to a joystick port. The box accepts either a photocell or an accurate temperature probe—also furnished! What a find!

Gadgets

Over the last decade-plus, I've whiled away quite a few hours building and writing supporting software for my own collection of miscellaneous gadgets that connect to the user, cartridge, or joystick ports. Some of these include the following.

- A numeric keypad
- A plotter (although plodder would be a better name), which could draw with four felt pens whatever appeared on the monitor screen
- A MIDI interface (I still use it almost daily with my spare 64)
- A relay interface which controls small electrical devices
- A room measurer which uses an old Wico trackball mechanism to roll around the periphery of a room, taking the room's measurements
- A model "drummer boy" which uses relay-switched solenoids to control drumsticks
- A device to synchronize taped music and kaleidoscopic images (works with a four-track tape deck)
- A talker, based on a Radio Shack voice synthesis chip

In Retrospect

I've spent literally thousands of pleasant hours with my 64 over the past 11 years. The computer is still perfect for the vast majority of my purposes. Back in May 1988, Rich McIntyre, then Commodore's senior vice president of sales and marketing said, "Eight-bit? Who cares? You're buying a machine for a specific reason. If it satisfies that need, it's never obsolete. Only your requirements become obsolete. . . . If the need continues to exist until the year 2000, that machine is still satisfactory."

Maybe Jim Hilty said it best in last December's issue of Gazette. "The 64 has always been kind of a barnstorming computer . . . just plug it in and fly by the seat of your pants. It's a fun computer, a truly personal computer, a computer that an individual can enjoy programming, a welcome friend."

Thank you, Commodore. Thanks also to everyone who builds the hardware, writes the software, and publishes information about this marvelous machine that is the Commodore 64. Here's to 11 more happy, productive, profitable, educational, and entertaining years in 8-bit heaven. ❑

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MATHBOOSTER

I don't think there's a kid left in the universe who doesn't respond to falling images on a computer screen with a desire to stop them, to be the good guy, the hero. Witness the fact that even kids who own videogames and whose parents won't give them quarters can't resist checking out the games in malls and stores.

What does this have to do with an arithmetic drill-and-practice program for the 64? Boosting falling satellites back into space is the premise behind Mathbooster, a program imported from Australia.

To prevent these satellites from tumbling down and crashing into the earth, students must quickly and correctly solve math equations. This program provides a drill with positive reinforcement that's fun.

Mathbooster is not a teaching program. It's designed to reinforce through practice the math skills that the students have learned in class.

When the game starts, satellites are strung across the sky, and a booster rocket waits atop its launch pad. Below each satellite is an equation. This first wave of satellites begins to fall. Using the appropriate keys, you place the launch pad beneath a satellite and type in an answer to the equation. Pressing Return or the space bar launches the booster rocket—only if the answer is correct. If so, the booster rocket then pushes the satellite back into space. If the answer is incorrect, the satellite continues its fall toward earth. Once you've successfully propelled the first wave back into orbit, a second wave begins to fall—at a faster rate than the first!

The third wave consists not of satellites but the space shuttle! It's a very large space shuttle that needs a very large booster rocket to restore it to orbit. Points are accumulated for boosting satellites and the shuttle back into space. If a satellite or the shuttle reaches the ground, the game ends. As in arcade games, the program keeps track of current high scores.

Boost falling satellites back into space with Mathbooster, a program that combines arcade action with math drill.

Mathbooster comes with ten sample games already prepared. However, its power comes in the variations you can create by altering the type of problems. The main menu lists three options: Start the game, Load different problems, and Change problems. The first one is self-explanatory. The second option lets you load other files of problems already created and saved on disk. The third option lets your create these other math files.

The first menu under option 3 allows you to view the current problem type, change it, change the speed settings, load and save the problem type and settings, or return to the game. When you view a problem, the screen lists the type of operation that's being displayed: addition, subtraction, addition and subtraction, multiplication, division, or multiplication and division.

Next, it tells you what form the equation will take, such as A + B = C. Then, for each A, B, C, or other variable, the program sets the parameters. For example, if you're practicing addition where the sum, C, never exceeds 12, then A's parameters would be 1–6, and B's would be 1–6 also.

The next option is to change the problem type. The Operations List lets you do this. For each operation there's a screen that guides you through the steps of choosing the parameters for the variables. This requires care and thought, but it isn't difficult. The screen instructions and the manual enable you to create the exact drill you want for your student.

Speed Settings govern the actual game, controlling how fast the satellites and shuttle fall, how quickly that speed increases, when the first shuttle appears, how many times per wave it appears, and whether or not the sound effects are turned on. With these you can customize a game to best challenge students without overwhelming them.

The manual is thorough. Aside from a couple of typos, it provides helpful insight and guidance in devising games that will provide the kind of drill that will most benefit your children or students. Included are some appendices describing the ten sample games already on the disk and providing some examples of how to set up game formats. Mathbooster also carries its own copying program to allow you to make backups.

Mathbooster is the second Free Spirit import from Australia that we've reviewed. These two programs by Satchel Software are copyrighted by the Minister of Education and are used by the school systems in South Australia. (Mathbooster's manual even makes reference to the South Australian curriculum modules.) As with the first program, Dr. Spellingstein, we are impressed by the solid programming that provides the actual computer game yet allows you to create and modify within the program to make it fit your needs. It's powerful, flexible, and easy to operate.

Kids love computers and computer games. Most kids also love learning, although they'd deny it if you'd ask

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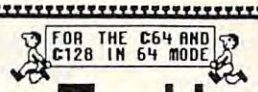

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REVIEWS

them. Computers and learning games can be an irresistible combination when blended properly. Mathbooster provides the perfect recipe for turning math practice into a real treat.

DAVID and ROBIN MINNICK

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JARA-TAVA

Want to take a trip to an exotic location; hunt for buried treasure; and fight crocodiles, sharks, and hungry snakes? Then Satchel Software's latest text adventure, Jara-Tava, is your ticket to adventure.

Jara-Tava begins, like many good adventures, with the inheritance of an ancient treasure map. A letter from your dear, departed Uncle Bartholomew suggests that Captain Kidd's treasure might be found on the island of Jara-Mau. It also warns of danger should you go to neighboring Jara-Tava, the Isle of Fire.

With no further urging, you're on your way. Of course, you learn early in the game that the treasure isn't on peaceful Jara-Mau but across the shark-invested strait on Jara-Tava.

Satchel Software designed this interactive text adventure with junior high students in mind. It has colorful graphics, easy-to-use text commands, and a challenging plot. Familiar elements from classic literature, skillfully woven into the game, are sure to please teacher, student, and parents alike. In addition to Kidd's treasure, you'll find Robinson Crusoe's tree house and Captain Nemo's submarine, *Nautilus*. Also, straight from an Indiana Jones adventure, there's a golden idol that's protected by a large boulder.

Teachers in Southern Australia have been using this text game in their classrooms since 1988. However, the game has only recently been licensed for distribution in the U.S. by Free Spirit Software. The package comes complete with three disks and a 134-page combination instruction and resource manual.

Teachers who decide to use this game as part of their classroom curriculum will be delighted with the hidden teacher's controls built into the program. Accessed by pressing Shift-T at the beginning of the game, teachers or parents can set options like help com-

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