SPECIAL ISSUE

BYTE

THE WORLDWIDE COMPUTING AUTHORITY

Includes Buyer's Guide Section
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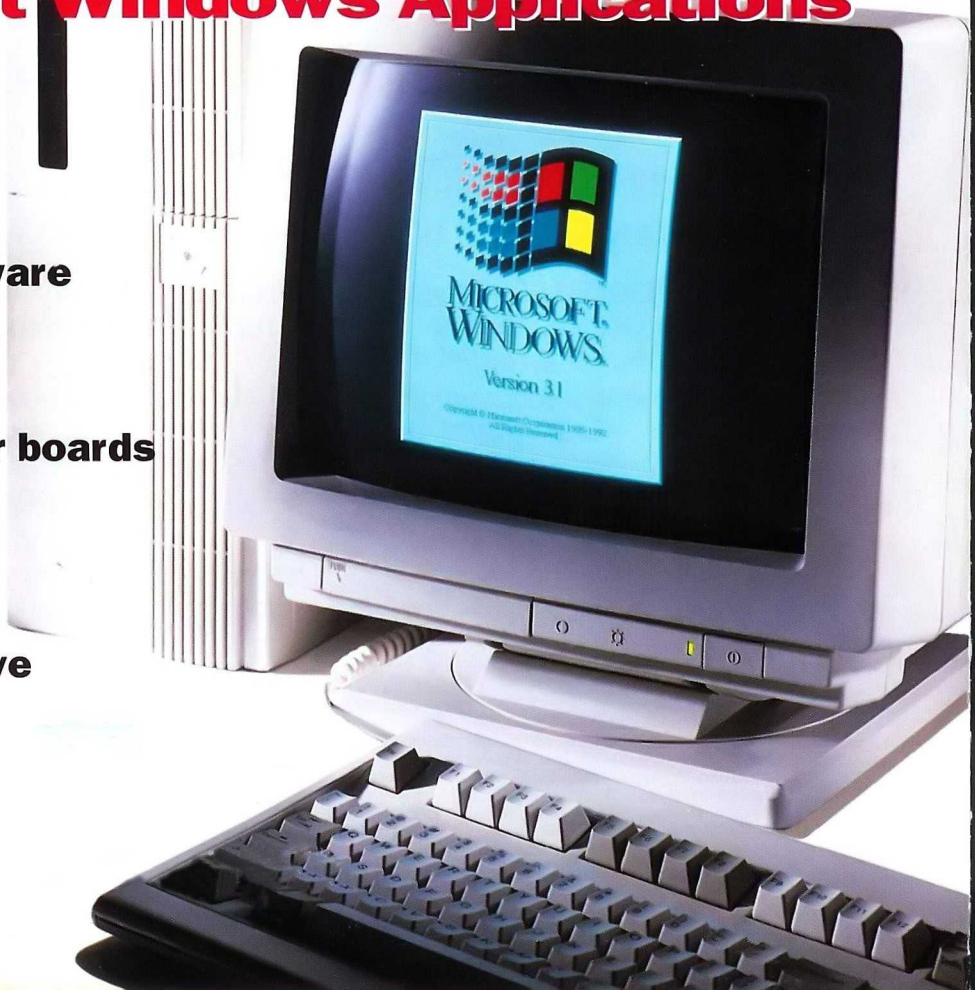
ESSENTIAL GUIDE TO WINDOWS

128 Hot Windows Applications



REVIEWS:
Image-editing software
Spreadsheets
Word processors
Project managers
A dozen 24-bit color boards
15 Windows books

FEATURES:
Windows NT
The OS/2 Alternative

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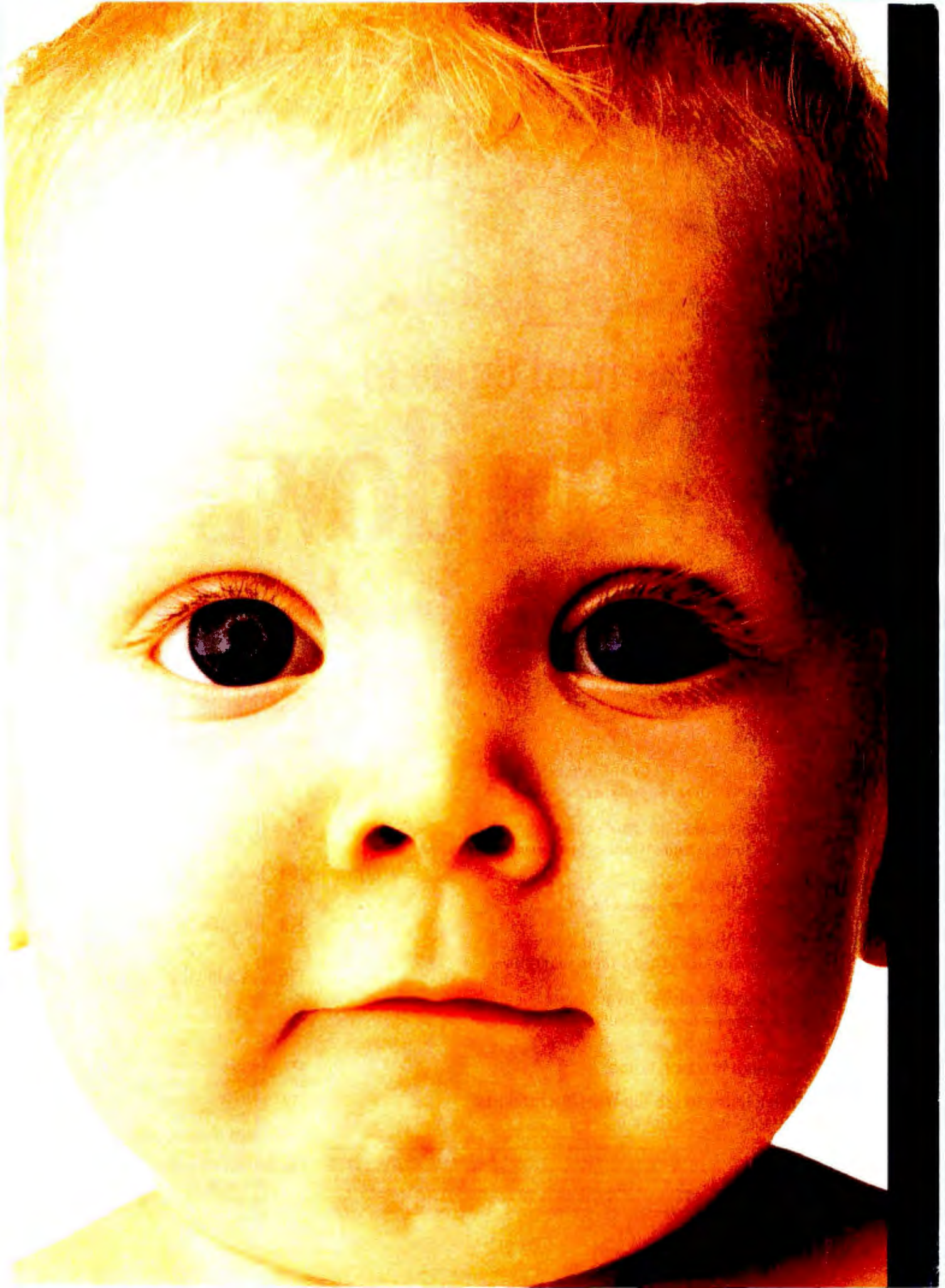
There's One Small Difference Between Us And The Competition.



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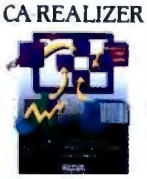

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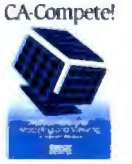

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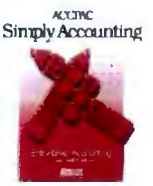

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BYTE's Essential Guide to Windows

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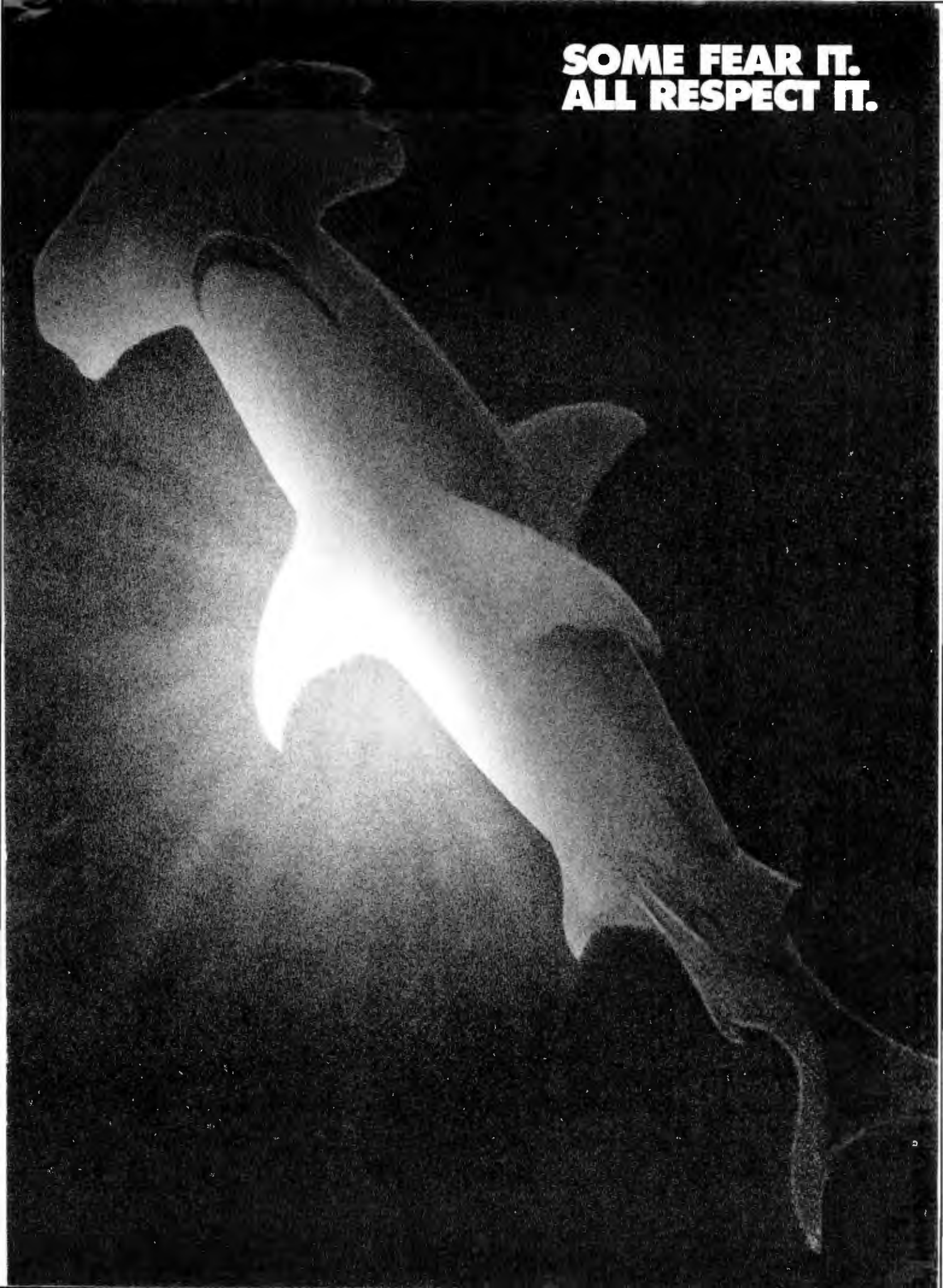
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BYTE Focuses on Windows

No, BYTE has not gone Windows-specific. We are still the world's leading authority on multiplatform computing, and it's for this reason that we are bringing you this Essential Guide to Windows.

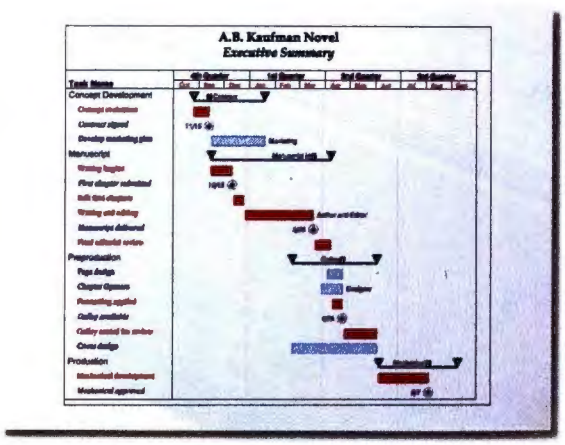
In this special issue, you'll get the usual in-depth BYTE features on topics including NT, multimedia, OLE, and OS/2. We also feature our well-known literary critic, Hugh Kenner, with a timely review of 15 Windows books. And you'll find reviews of important new products, in addition to a bonus buyer's guide to 128 Windows applications. We've pulled together the most essential information for you on this leading operating system so that you can make your own choice—or, if you are already a Windows user, so you can use it to its full advantage.

Why Windows? Look, for example, at our News & Notes on page 12: The numbers speak for themselves. Windows has permeated every corner of the computer market and has changed the face of computing forever. And Microsoft is continuing to build on its DOS/Windows foundation with a new object-oriented version in the works and the networking capabilities coming with NT and Windows for Workgroups. Long ago, someone at Microsoft had the idea that Windows could someday rival the Mac OS as a GUI. Now that vision is seeping into all aspects of the industry.

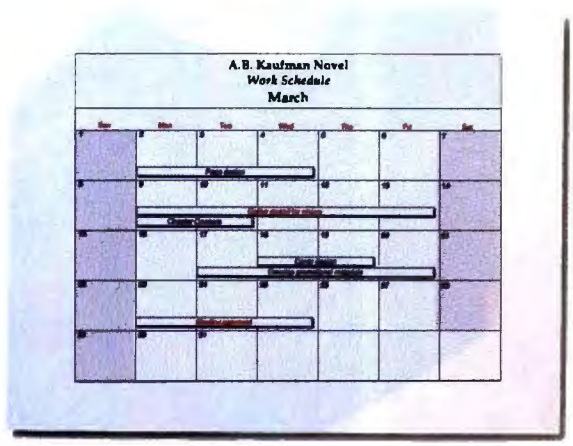
Microsoft is now credited for its software vision, but this was not always the case. As recently as 1989, industry analysts criticized Windows for being clumsy and slow. Many, including IBM, saw it as a mere stepping stone to OS/2 with Presentation Manager. Few doubted the continued predominance of DOS software giants like Lotus, WordPerfect, and Software Publishing, and almost no one imagined that the little DOS shell from Redmond, Washington, would contribute to a fundamental redefinition of operating systems.

Two and a half years after the introduction of Windows 3.0, no one doubts its impact. More than any other factor, Windows was responsible for the historic split between Microsoft and IBM. Now, as IBM struggles to make OS/2 2.0 a viable contender, Microsoft is preparing to ship its own 32-bit operating system, NT. The battle of the operating systems is far from over, but NT, of course, still not a shipping product, has already elicited an unprecedented amount of interest.

The CEO wants to know when it will be finished.



The staff wants to know when they can start.



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On a Roll

Windows has shifted the balance of power among software vendors and put Microsoft on a roll. Its Excel, Word, and PowerPoint applications have wrested market share from Lotus, WordPerfect, and Software Publishing. Microsoft's Access, FoxPro, and SQL Server database tools target Borland and Oracle. And with the upcoming NT providing networking capabilities, Microsoft will be redoubling its efforts to compete with Novell.

Of course, in addition to Microsoft, almost every software development company is jumping on the Windows bandwagon. The latest report from the Software Publishers Association shows the dollar value of the North American Windows software market in the first half of 1992 at $857 million, a rise of more than 141 percent over the first half of 1991. By comparison, DOS programs fell 8.7 percent to $1.3 billion, and Mac programs rose 32 percent to $490 million. SPA research director David Tremblay expected Windows software sales to top those of DOS for the first time in the third quarter of this year.

The impact on PC hardware has been equally great. Windows has dramatically changed the baseline system configuration: Whereas a 286 with 1 MB of memory and a 20-MB hard drive was once ample for most users, now a 386-class machine with 4 MB of RAM and a 60-MB drive barely suffices. Analysts expect that 50 percent of new systems will go out the door this year bundled with Windows. An increasing number of systems will also incorporate technologies (e.g., graphics accelerator boards and local bus video) that help meet Windows' performance demands.

In the long run, Windows' most significant impact will be on the very definition of an operating system. Windows is more than a GUI: It controls the screen, supplies drivers for devices ranging from printers to video recorders, and provides a mechanism for user-defined interapplication communication.

These capabilities are not unique; the Mac has long implemented many of them and continues to provide the most seamless GUI implementation. But the Mac OS runs on only one system (that may change if Apple and IBM deliver PowerOpen as promised). According to Microsoft, Windows will soon run on top of both DOS and NT, and the company plans to implement NT for Intel, Mips, and DEC Alpha processors. Windows may become a vehicle for heterogeneous computing.

Multiplatform Standard?

Microsoft may not have planned to port Windows to so many platforms when it was developing version 3.0, but with this change in direction, the nature of future operating systems has become clear. The user interface and the programming interface will remain constant across different platforms, and the operating-system kernel will take responsibility for making the hardware invisible to the user.

Although we concentrate this issue on Windows, we are not thinking for a minute that it's the only solution. More than 10 million copies reportedly have been sold, but even Microsoft admits that perhaps only 30 percent of those are in use. That puts the Windows user base at about half that of the Mac and less than one-tenth that of DOS.

Keep reading BYTE for our coverage of all these platforms. And stay tuned for more exciting *Essential Guides*, in which we will provide you with all you need to know about multiplatform computing.

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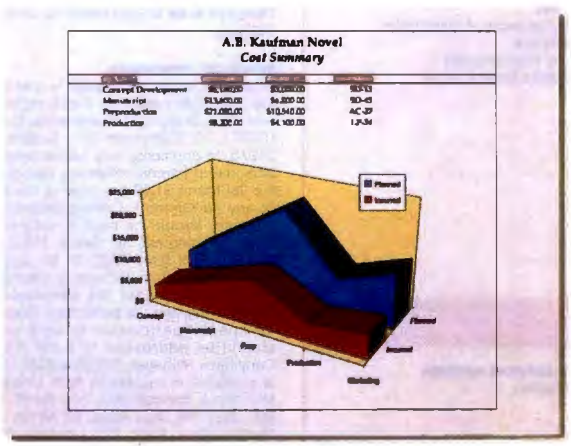

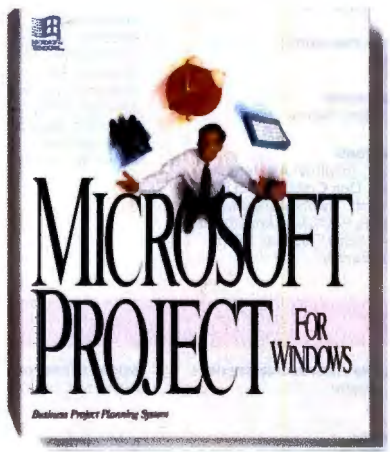

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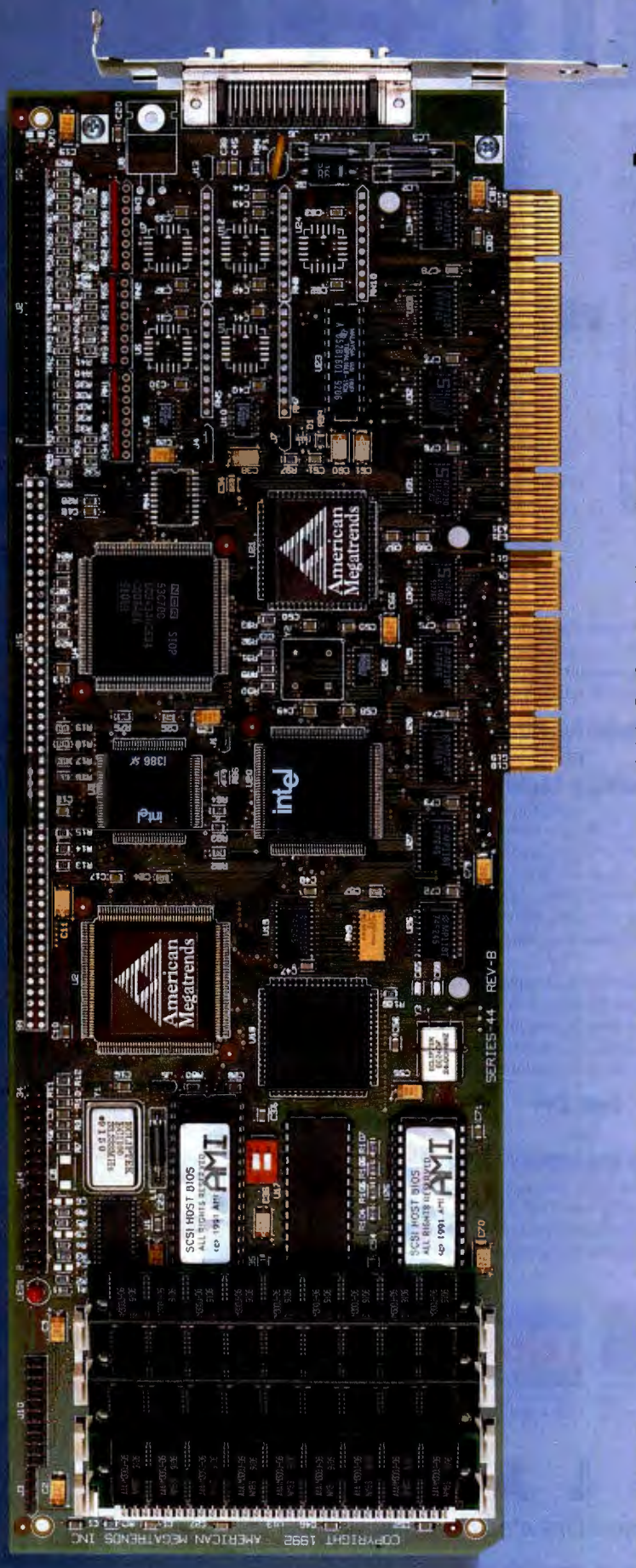

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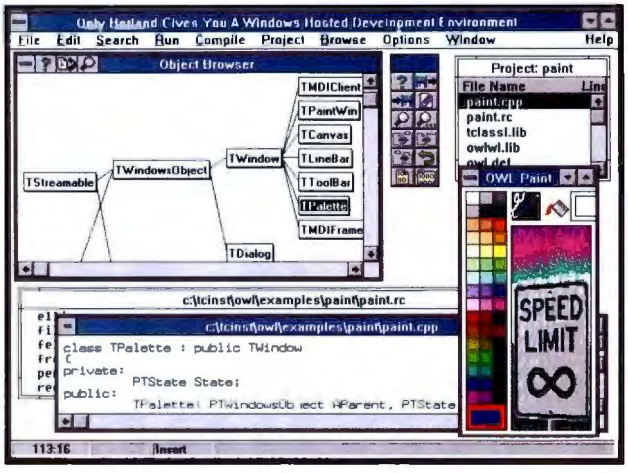

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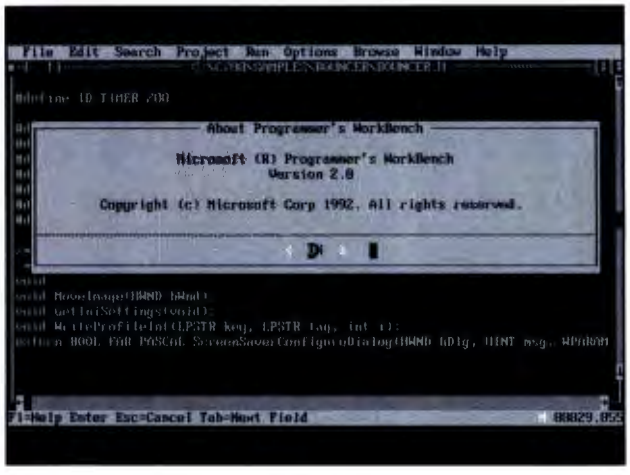

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WINDOWS BETTER

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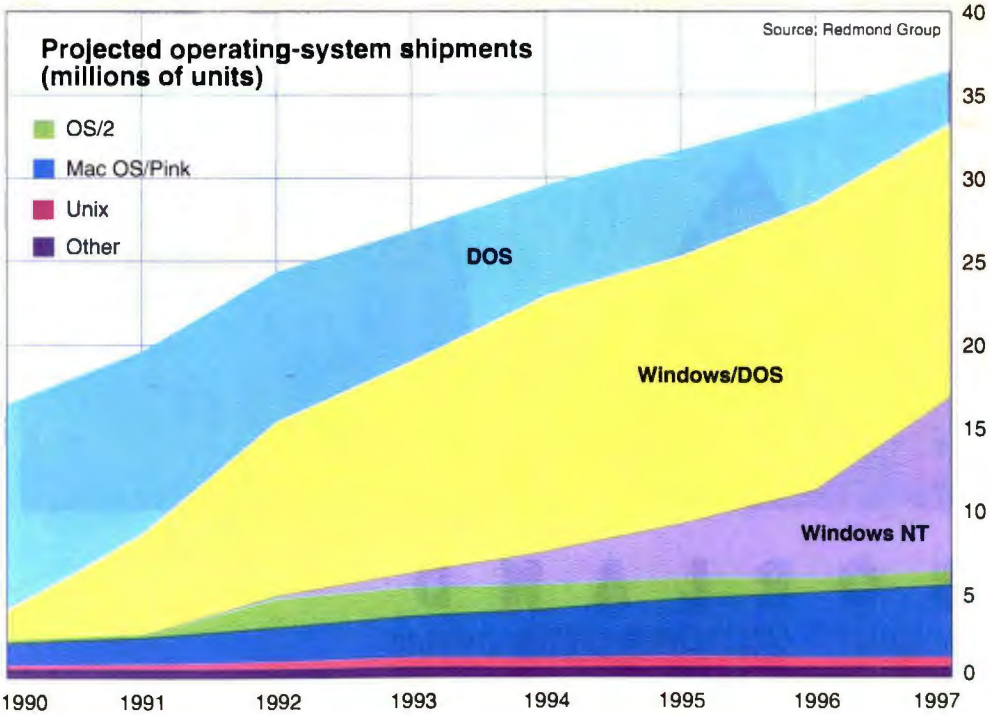
WINDOWS WILL DOMINATE, PREDICT ANALYSTS, BYTE READERS

The Redmond Group is bullish on Windows and bearish on OS/2 and Unix. The consulting firm forecasts that OS/2's best year of market share will be 1992, while Unix will top out in 1993. Note that The Redmond Group predicts that, as late as 1997, DOS will still be the basis for more than half of new operating-system shipments.

Analysts predict a rosy future for Microsoft Windows for both DOS and the Windows NT operating system. A report by The Redmond Group, a consulting firm in Redmond, Washington, projects that by 1997, the two versions of Windows will together command 83 percent of new operating-system shipments, compared to less than 2 percent for Unix. Of the Windows units that will be shipped in 1997, 61 percent are expected to be for DOS, and the balance for NT.

Respondents to the semiannual BYTE tradeshow poll on the future of operating systems—who may be less bullish by nature than analysts—take a slightly more conservative view. Of these, 47 percent predict that DOS extended with Windows will be the dominant operating system in 1997. When you toss in the 17 percent who predict that NT will dominate, it adds up to a comfortable majority for Windows-based platforms. Poll respondents are more optimistic about the chances for OS/2 and Unix than many analysts are, awarding the 32-bit operating systems 16 and 7 percent of the vote, respectively.

Another way to measure the market strength of various platforms is by the number of applications expected to be available for each. Forrester Research projects that the number of Windows applications will double between now and 1995, from 5000 to 10,000. OS/2 applications will grow at a faster rate but are projected to total only 3000 in 1995. Macintosh programs will rise from 4000 to 5000.



WINDOWS PROGRAMS PRICES PLUMMET

Are prices softening for Windows software packages? The decline is not as significant as the plummet in hardware pricing, but as vendors race to gain market share in the Windows segment, they are forging aggressive deals with large customers. Says **Jeffrey Tarter**, editor of *Soft•Letter*: "The dynamics are clear: As soon as Lotus and WordPerfect came out, Microsoft reacted by slashing prices, specifically to high-volume accounts." The result, he says, has been deals of less than $100 for Excel and Word for Windows to customers who buy Microsoft's whole Windows suite.

Tarter cautions that this is only a "specific softening of prices," not a permanent collapse. "When my supermarket runs a special on tomatoes," he says, "that doesn't mean a fundamental change is occurring in food prices." Sooner or later, Tarter believes, Microsoft will have to raise prices; otherwise, it won't make enough profit. And, he says, there hasn't been a major softening in retail street prices for top programs.

Dataquest analyst Bill Kesselring takes a slightly different view. He has measured a decline in retail prices for Windows applications of about 6 percent over the last six months, and he projects that the figures will fall another 10 percent next year. But Kesselring points out that the decrease has been mostly at the retail, not wholesale, level and is attributable to fierce competition in that sector. While users enjoy the savings, resellers are taking a big hit on margins. □

CAIRO IN MICROSOFT'S FUTURE

Windows NT may have grabbed the spotlight among 32-bit operating systems, but in the mid-1990s Microsoft will face new competition from object-oriented operating systems such as IBM/Apple Taligent and the rumored Spring project at Sun. To respond to these perceived challenges before they even arrive, Microsoft is now outlining a program to add object orientation to Windows by 1994.

At the Windows NT Developers Conference in San Francisco last July, and again a few weeks later at the ObjectWorld conference in San Francisco, Microsoft previewed an object-oriented future version of Windows, codenamed Cairo, that it expects to beta-test in 1993 and ship in 1994. Unlike object-oriented systems that start from scratch, Cairo will build on the existing DOS and NT kernels and the Windows GUI and API. Skeptics charge that this hybrid ancestry will constrain Cairo's object orientation, but Microsoft replies that its design permits security, scalability, distribution, and migration from today's programs—all features it says an object-oriented system must supply.

Cairo will consist largely of a layer of software services nestled between the operating-system kernel and the Windows API. Many of the basic mechanisms for Cairo are already in place. It builds on Microsoft's OLE protocol, extending OLE's model for communication among applications to span systems and networks. It will also take advantage of the object orientation now written into the NT kernel, which implements a consistent model for passing objects between processes, whether on one machine or across a network.

What's the benefit of an object-oriented operating system? In the short term, object orientation will help developers create applications faster and better because code can be more easily reused. This should lead to more innovative applications. For users, object orientation will permit greater flexibility in how programs are put together and used.

In addition, Cairo promises to free developers and users from dealing with inconsistent data types and interface models. In other words, users will be able to concentrate on their work, not on tracking down and translating data. □

Cairo's Main Features

- Object-oriented file system
- Builds on MS-DOS and Windows NT kernels
- Uses Windows GUI and API
- OLE over networks

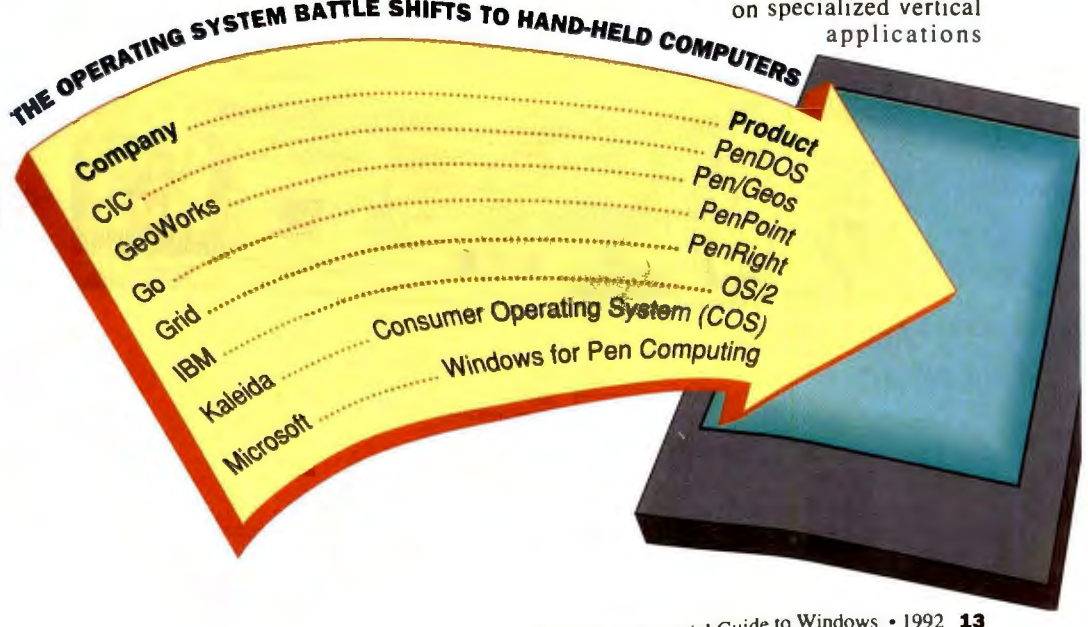
WILL WINDOWS BE THE CHOICE FOR HAND-HELD COMPUTERS?

Whether you call them personal communicators, palmtops, or PDAs (Personal Digital Assistants), tiny portable systems are the latest vogue among computer makers. But like the shift from hosts to client-server PC LANs or from character-mode DOS to Windows, the move to hand-held PCs could alter the power balance among industry players. In particular, it could loosen the virtual stranglehold that Microsoft now has on the mass market for operating systems.

Will Windows and DOS remain preeminent when (and if) the user community shifts from traditional notebooks and desk-bound PCs to pocket-size devices? The competition is heating up: Although Microsoft is shipping a version of Windows with extensions for handwriting recognition and pen input, called Windows for Pen Computing, players such as Go Corp., Grid, Computer Intelligence Corp., IBM, Apple, GeoWorks, and Kaleida are moving aggressively to stake out their own turf in the hand-held market.

Go Corp. is shipping its non-DOS PenPoint operating system and has signed up an impressive list of OEMs, including IBM, that plan to use the software in pen-based computers. The roster of third-party software providers committed to PenPoint contains few household names but many innovative and well-funded start-ups.

Grid and CIC are taking a more conservative tack, selling pen-based software environments (PenRight and PenDOS, respectively) that build on DOS but don't use the Windows API. The advantage of these products is that they can run on simple, low-cost 8088-/8086-based systems, whereas both PenPoint and Windows for Pen Computing require 386s with ample RAM. Not only are 386 systems larger and more expensive, but they also use more power. If the market for pen systems stays focused on specialized vertical applications



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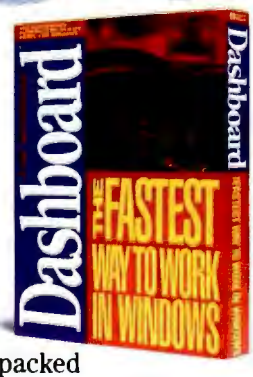

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and eventually migrates to the price-sensitive consumer sector, reduced hardware requirements could prove to be a vital asset.

At the other end of the spectrum, IBM is reportedly working on pen extensions to OS/2's Presentation Manager, with an eye to scaling down the operating system to work on hand-held computers. It seems a rather unlikely combination, but by the time IBM has the job done, 32-bit hand-held systems with huge amounts of RAM may be feasible.

Apple's approach is even more radical. The **Newton** hand-held system, being codeveloped with Sharp and expected in early 1993, will use both a new CPU—the ARM RISC chip—and a new operating system dubbed Newt-OS. Apple is thus forgoing compatibility not only with the DOS/Intel standard but also with its own Macintosh line. That it is willing to do so indicates how distinct Apple believes the market will be for hand-held systems.

Apple is also indirectly involved in yet another consumer computer initiative: the Kaleida multimedia software joint venture with IBM. Kaleida has said that it is working on a so-called Consumer Operating System, or COS, that will run on several brands of PDAs. Along with COS, Kaleida is creating a language called Script X; programs written in it will be able to execute on Macintosh, Windows, OS/2, and Unix platforms.

Another company betting on the possibility that hand-held systems may not be based on Intel chips is Go Corp., which announced in July that it will port PenPoint to AT&T's new Hobbit RISC processor. The Hobbit is designed specifically for personal communicators and includes built-in voice, fax, and data communications features. "We chose PenPoint because it is written from the ground up for the pen," said Rob Franzo, a member of the technical staff at AT&T's microprocessor architecture group.

Microsoft's response to the competing developments is multifaceted, according to Pradeep Singh, group product manager for Windows for Pen Computing. First, the company is creating a version of Windows 3.1 that system makers can build into ROM. By putting Windows in silicon, vendors can boost performance and save disk space—an important attribute for systems that may not even include a disk drive. ROM Windows will still require a 386 processor, but its major selling point will be Windows' desktop heritage.

Microsoft is also continuing development of Windows for Pen Computing, with an eye to bringing out mobile solutions compatible with desktop applications. Singh's group is addressing features such as deferred communications, better handwriting recognition, improved connectivity to host systems, drivers for PCMCIA cards, and, through participation in the Portable Computing Initiative, power management.

Another project at Microsoft is focused specifically on solutions for the hand-held market. Singh says this project's group is less concerned about staying compatible with Microsoft's desktop offerings. "The big difference between the two groups is that the user model—how the user interacts with the application—is different," he says. "This implies that the nature of the operating system is different." For that reason, he adds, "it's unlikely that [desktop Windows] apps will run unmodified on the PDA."

A common theme among vendors of both hardware and software is that the new category of pocket computers represents a once-in-a-decade opportunity: the chance to level the playing field after years in which power has increasingly flowed to Microsoft and Intel. Faced with increased competition and eroding profits on their traditional desktop and laptop offerings, companies are now looking at pen and pocket computing as the growth engine for the next decade. The key question is whether users of pen-based hand-held computers will be drawn from the same group of users who are now pounding on desktop keyboards. □

PEOPLE ARE TALKING

"The only thing object-oriented about OLE today is its name."

—Philippe Kahn, chair and CEO, Borland International

"I hate the way the word 'object' is being used in the industry. It's an internal technology, not a market opportunity."

—Bill Gates, chair and CEO, Microsoft

"Within three years, televisions will have either a Windows or Mac interface."

—Nolan Bushnell, chair, Octus

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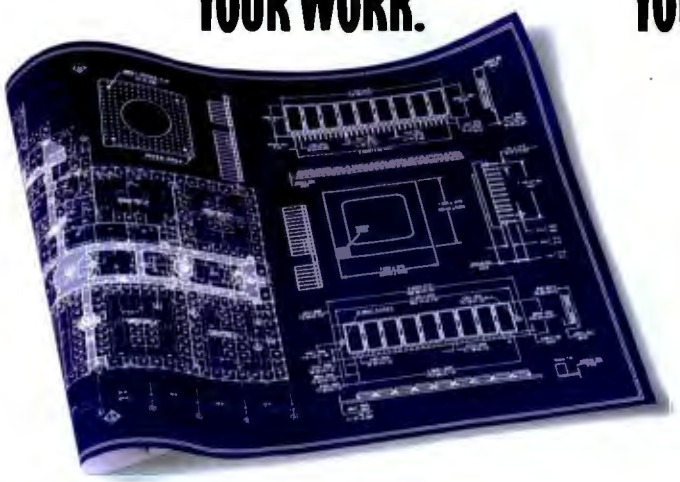

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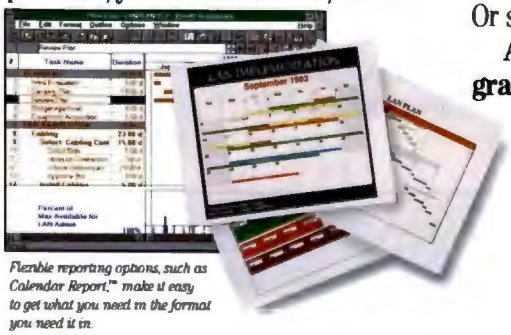

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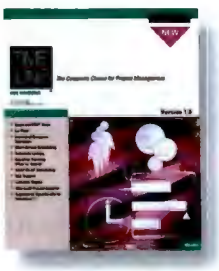

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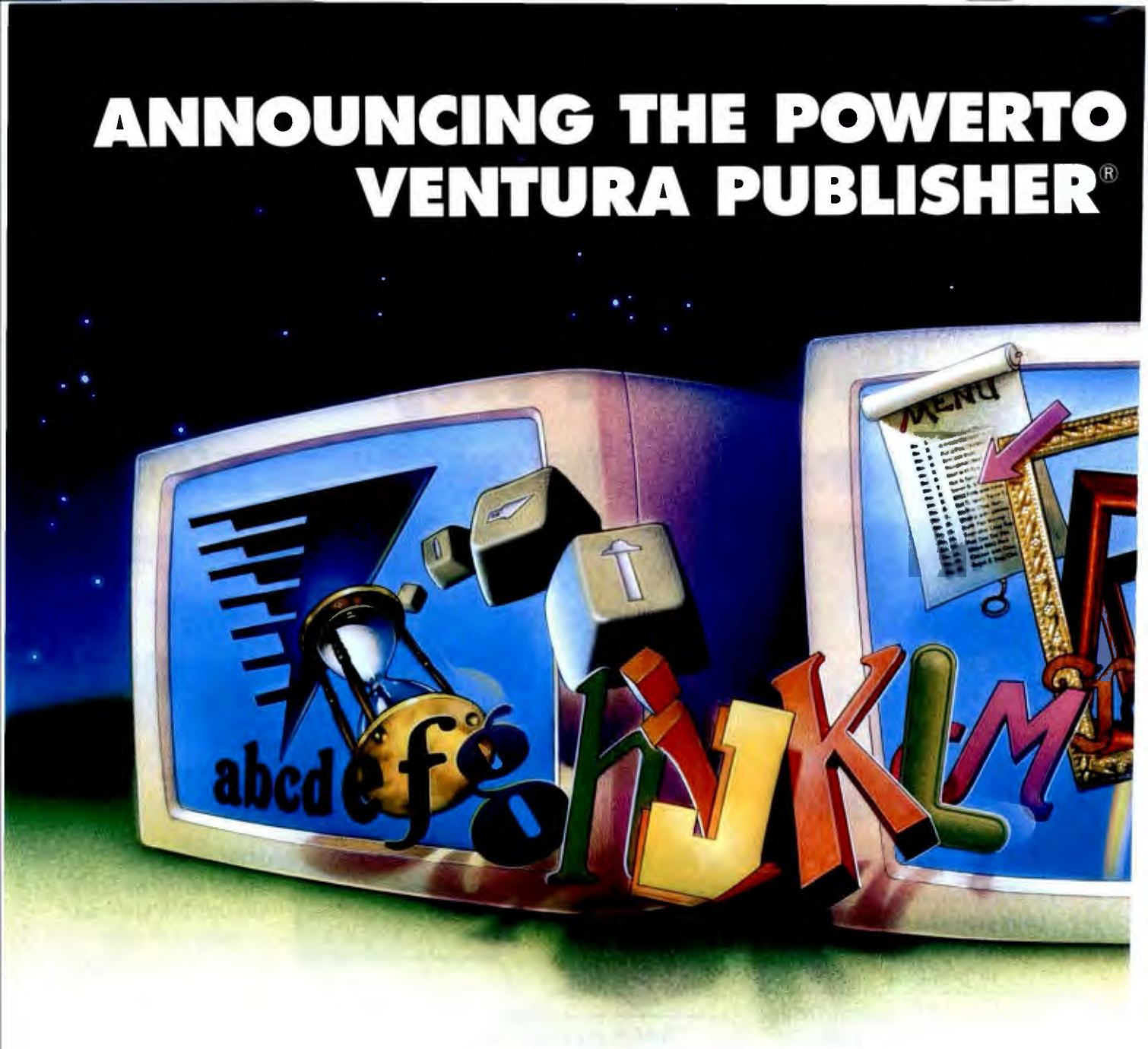

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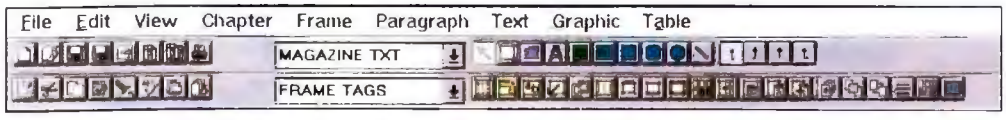

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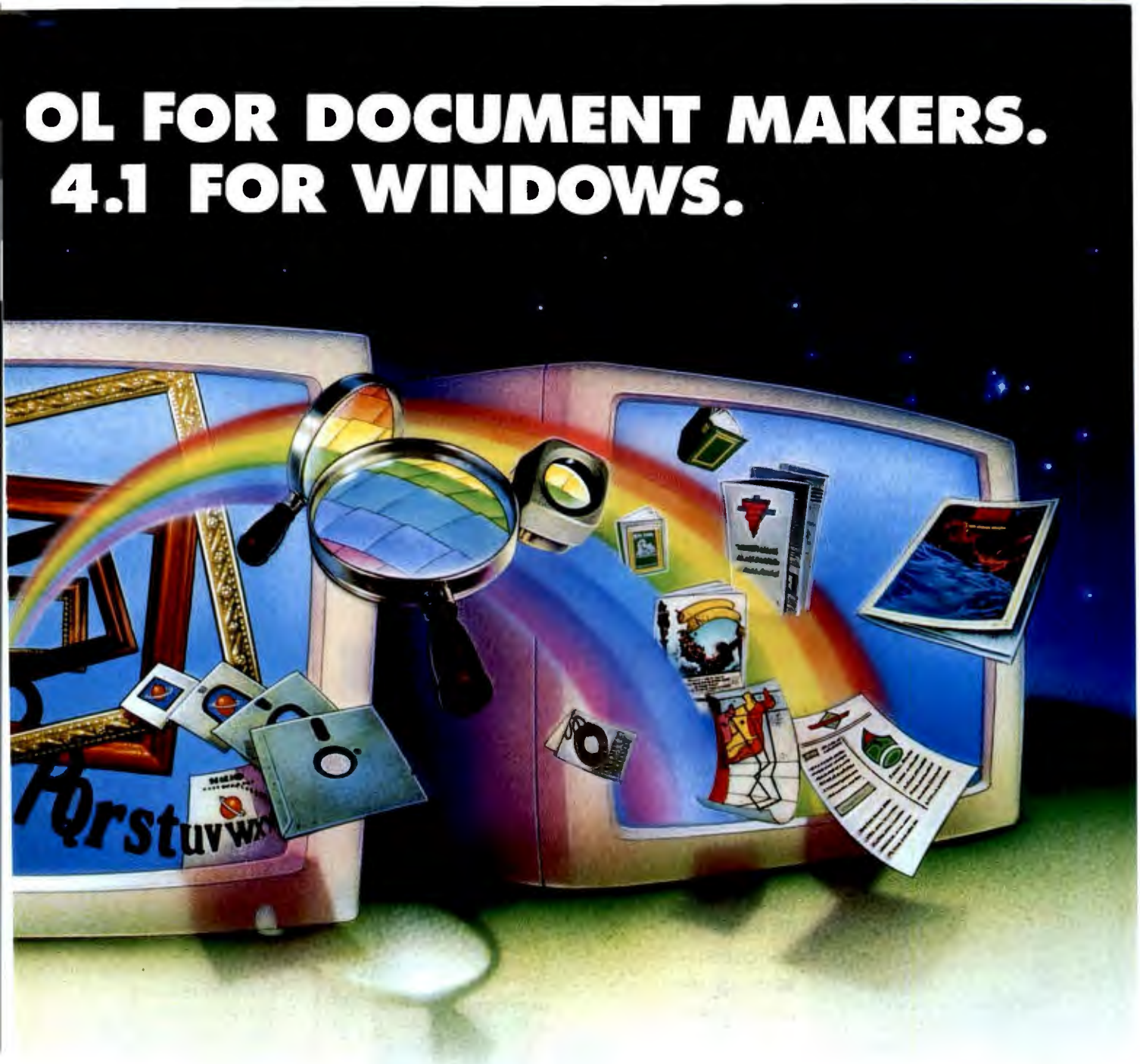

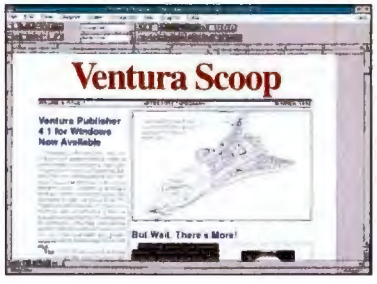

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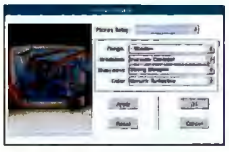

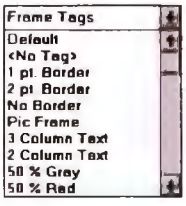

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WINDOWS SELLS HARDWARE

Only a few years ago, a standard desktop system typically included a 286 or 386 processor, 1 MB of RAM, a 20-MB hard drive, and 640- by 480-pixel VGA graphics. While the trend lines had already projected an inexorable shift toward more powerful processors and systems configured with more RAM and larger drives, the market acceptance of Windows has hastened this process. At the same time, it has created a need for graphics accelerators.

With the growth of 32-bit operating systems such as OS/2 and Windows NT, demand will solidify for 32-bit processors and virtually disappear for 8- and 16-bit machines, says market researcher Dataquest. The only exception will be a small demand for 8088/8086 chips in hand-held systems (see figure 1). Dataquest doesn't see Intel's pending P5 chip gaining a significant share through 1996.

The amount of mass storage space that users need has always grown over time, but "Windows has accelerated the move to higher-capacity rigid drives," says Bob Katzive, a vice president at storage researcher Disk/Trend. With programs now routinely taking more than 10 MB of space each, drives smaller than 60 MB simply aren't large enough to satisfy customers. Disk/Trend forecasts that sub-30-MB drives will effectively disappear next year, while drives in the 30- to 60-MB range will be on their way out by 1994 (see figure 2). Drives with capacities between 60 and 300 MB will constitute 70 percent of the market in 1994. Disk/

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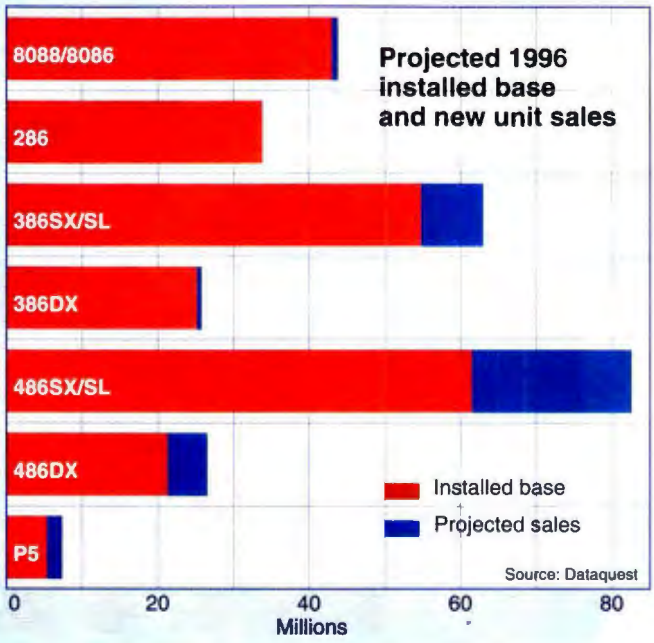

Figure 1: By 1996, says Dataquest, systems based on 486SX/SL-class processors will have the largest unit sales and highest installed base among Intel compatibles. Sales of 286-class machines will be zero, and 8088/8086 and 386DX systems will barely break the surface. The 386SX/SL-class systems will be in second place, the 486DX will be fading, and the P5 will be only beginning its ascent.

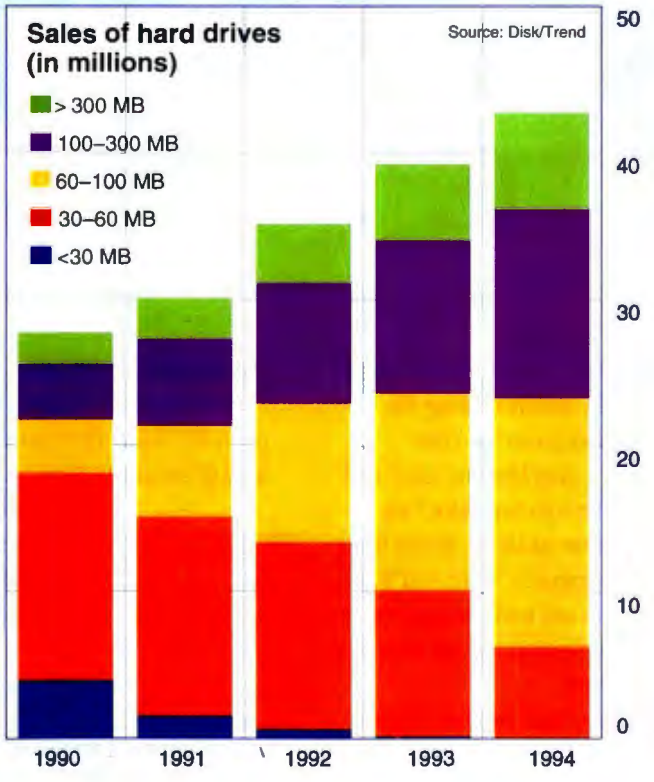

Figure 2: Windows and OS/2 are pushing up the demand for larger hard drives as application programs—and the operating environments themselves—get bigger every year. Even more space will be required for imaging and multimedia programs—one reason Disk/Trend projects that by 1994 more than 30 percent of drives sold will have capacities of 100 to 300 MB.

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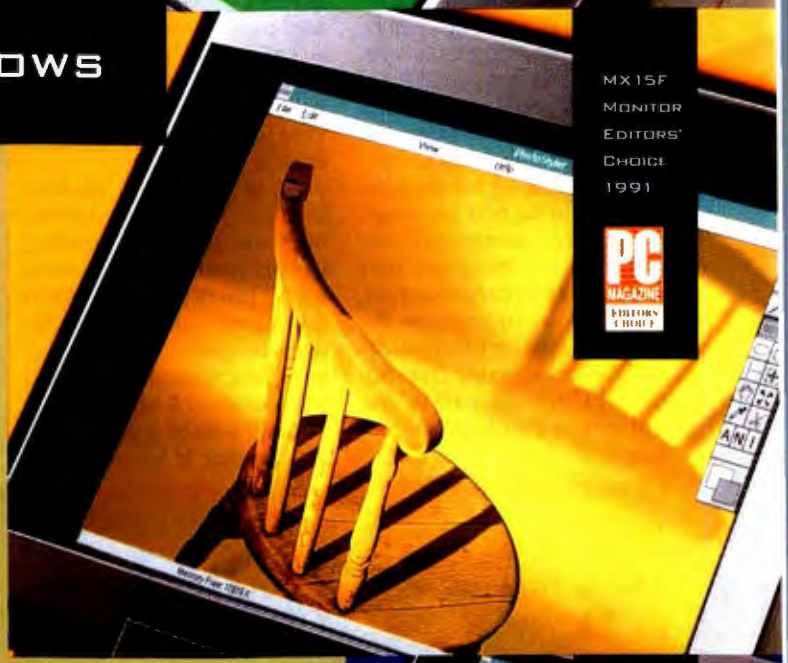

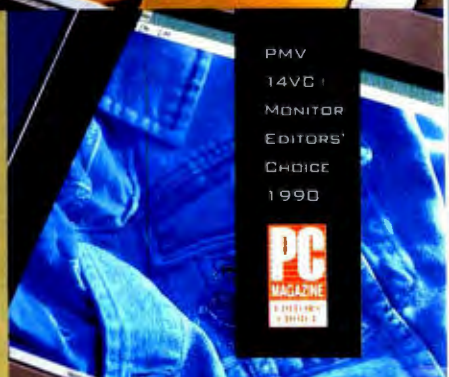

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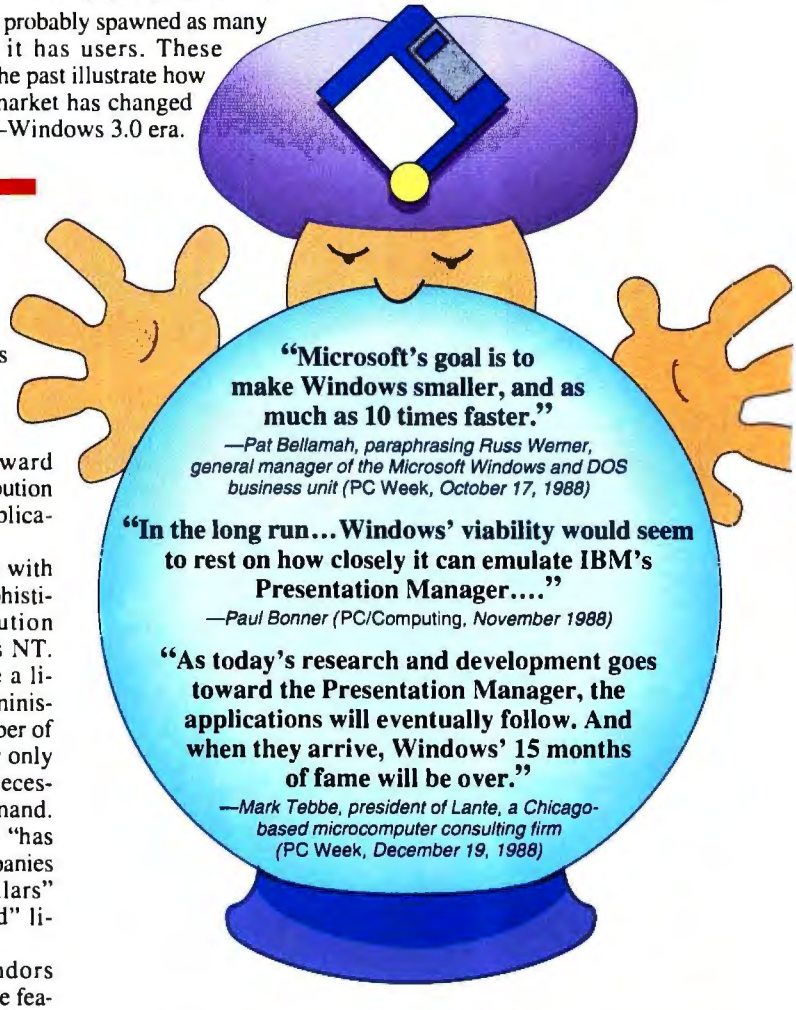
HOW THINGS CHANGE!

Windows has probably spawned as many prophets as it has users. These quotes from the past illustrate how quickly the market has changed since the pre–Windows 3.0 era.



Trend predicts.

In systems running GUIs, the speed of the graphics display has become a major performance bottleneck. Even a 50-MHz 486 won't run Windows optimally if graphics are being squeezed through a slow bus interface or processed entirely by the CPU. Hence the growing demand for two new performance boosters: local-bus video and graphics accelerator chips.

Local-bus video removes VGA or higher grades of video from the 8-MHz ISA bus and integrates it onto a special bus synchronous with the processor. Both the Video Electronics Standards Association (VESA) and Intel have put forth schemes to standardize the local bus in PCs so that it can be used not only for graphics but also for other peripheral functions that would benefit from higher throughput. Systems incorporating local bus are expected to gain significant market share in the next few years.

Graphics accelerators encode in silicon basic functions such as BitBlt, cursor support, and drawing operations. By processing those functions itself, an accelerator frees up the CPU for other tasks and optimizes graphics performance. □

COMING: SMARTER SOFTWARE

The two most interesting things that are taking place in the Windows arena right now, according to *Windows Watcher* newsletter editor Jesse Berst, are the move toward electronic software distribution and the rise of smart applications.

Microsoft is working with DEC to implement a sophisticated software distribution technique for Windows NT. The system will include a licensing meter so that administrators can track the number of concurrent users and buy only as many licenses as are necessary to meet typical demand. According to Berst, this "has the potential to save companies literally millions of dollars" now wasted on "unused" licenses.

In applications, vendors have shifted away from the features war and toward making their programs smarter about users. The trend, which Berst says started with graphics packages, is now working its way into applications such as Word for Windows. A future release of that package will be much smarter than it is now, he reports. Berst says that the software will know some syntax and will help to enforce basic rules such as the inclusion of closing quotes and parentheses. It will be a true word processor, rather than simply a character processor. □

WHO'S USING WHAT?

Is there a difference between the profiles of Windows and OS/2 users? John McCarthy, director of computing strategies research for Forrester Research, thinks so.

"OS/2 people are higher-end power users and connectivity users," McCarthy says. "Windows people are mass-market, multipurpose users." OS/2 tends to be concentrated in large IBM accounts, he adds, "but in very few accounts does OS/2 dominate all desktops. Even in the largest OS/2 accounts, you'll find a few people using Windows. The reverse is not true."

Analyst Rikki Kirzner of Dataquest agrees with McCarthy: "The only people buying OS/2 are IBM installed accounts," she says. ■

MISCELLANEA

- Analysts estimate that in 1992, roughly 50 percent of PC-compatible systems will go out the door with Windows preinstalled on their hard drives.
- The Gartner Group assesses the probability that OS/2 will succeed in the market at only 35 percent. If OS/2 fails, The Gartner Group says, not just Microsoft but also Apple will benefit: The Mac will gain 17 percent of new operating-system shipments by 1995, versus 11 percent if OS/2 succeeds.
- Microsoft is reportedly selling about 60 percent of Windows units outside of the U.S.
- Microsoft says it has shipped 3 million units of Windows 3.1, and in most software categories, that would signify a major hit. But according to Jeff Tarter of *Soft•Letter*, the upgrade rate from Windows 3.0 to 3.1 is running at a paltry 10 percent to 15 percent. This may indicate that actual use of Windows is lower than expected.

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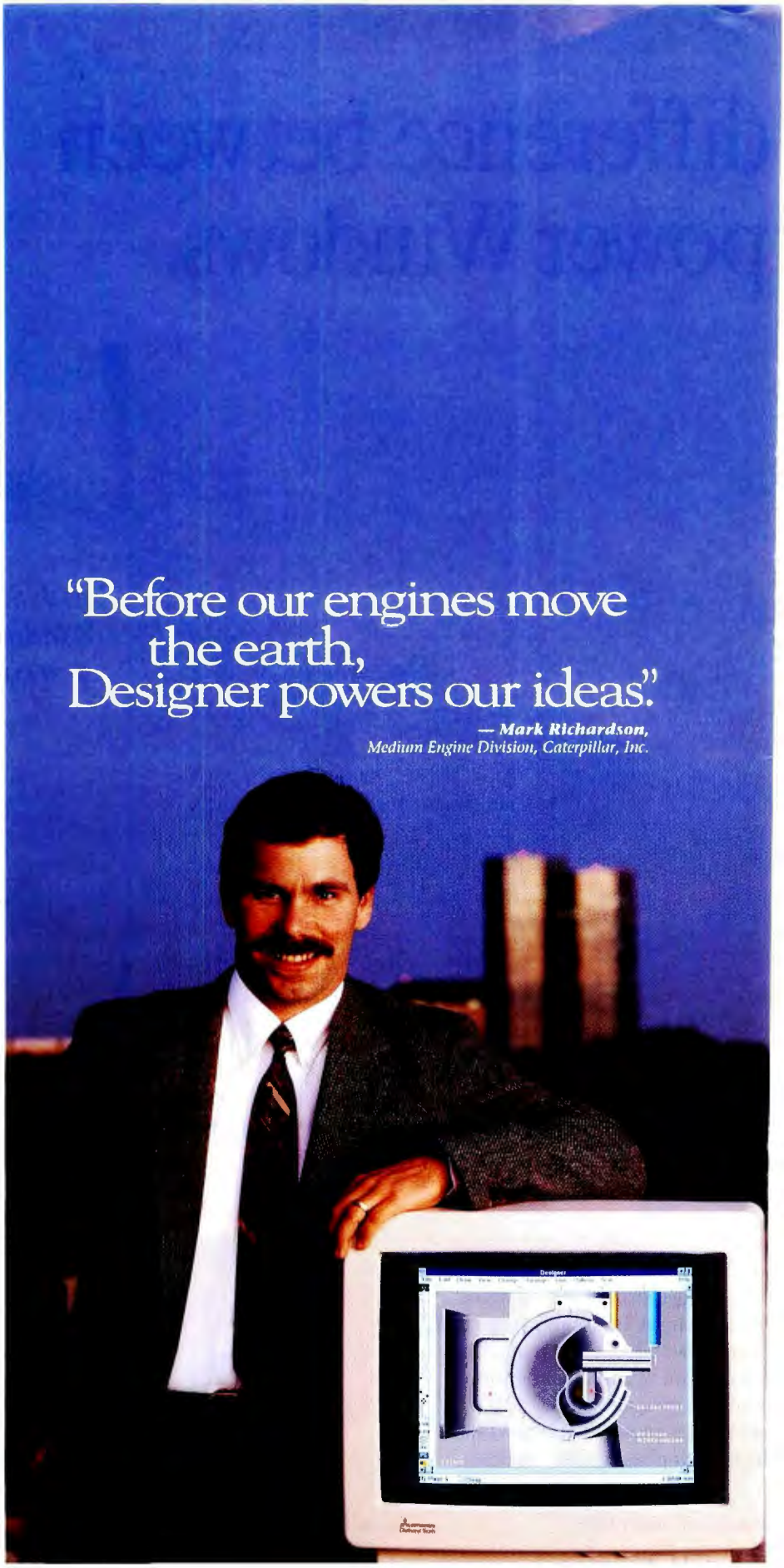

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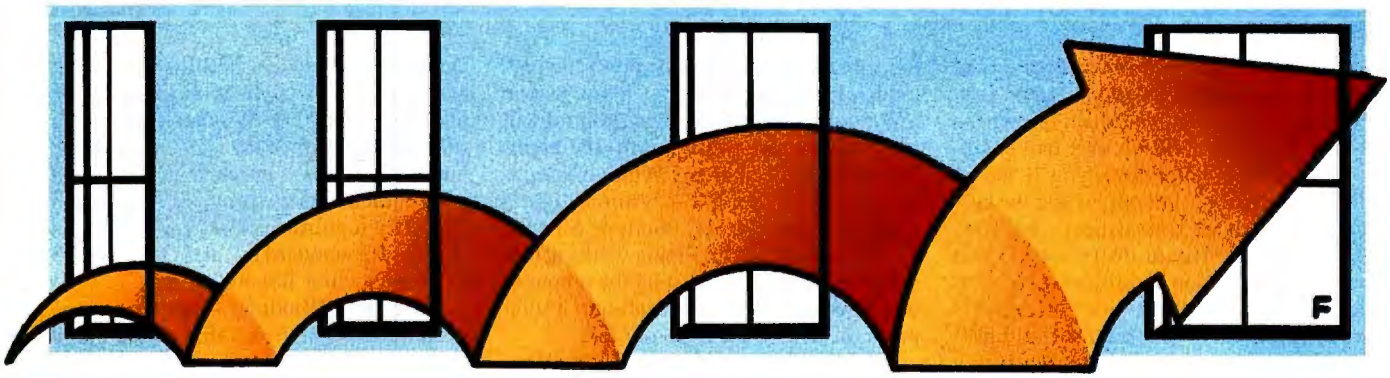

Using Windows NT

A behind-the-wheel report on what it's like to use Windows NT

JON UDELL

If all goes according to Microsoft's plan, Windows will soon be a family of products: Windows 3.1, Windows for Workgroups, Windows NT, and LAN Manager NT. The evolutionary Windows for Workgroups, a long-rumored peer-networking version of Windows 3.1, will debut in the spring of 1993. The revolutionary Windows NT (and its server edition, LAN Manager NT) is due even sooner—by the end of this year. In "Windows NT Up Close" (October BYTE), I wrote at length about the key technologies—such as symmetric multiprocessing and layered device drivers—that lurk underneath NT's hood. Here I'll tell you what it feels like to *use* Windows NT.

A machine that's running NT looks for all the world like a machine running Windows 3.1. Windows applications such as Excel and CorelDraw launch and multitask under the control of File Manager and Program Manager. Multiple DOS applications like dBase IV can run as well, in windowed or full-screen sessions.

Although Microsoft has overhauled the plumbing completely, NT's familiar face proclaims continuity with the DOS/Windows installed base. How can you tell the difference between Windows NT and Windows 3.1? One giveaway is Program Manager's File menu. The Exit Windows option in Windows 3.x becomes a Logoff option in Windows NT. If you select it, NT shuts down and asks you to use Ctrl-Alt-Del to log on again.

The log-on procedure (also required after a cold boot) will be familiar to users of Unix, VMS, OS/2 Extended Edition, and many other operating systems. If your only experience has been with DOS and Windows, however, you may suffer momentary culture shock. Even when you're running a stand-alone NT system and you're the only user of that system, you've got to "authenticate" yourself to use it.

Note that while you can log in as administrator of your own system (the equivalent of *superuser* in Unix), it's probably wiser not to. One of the benefits of NT's security system is that it can protect you from yourself. Wielding administrative power can be dangerous, since you're free to damage valuable programs or data. The DOS/Windows user, automatically and always a superuser, all too frequently does just that. In NT, just as in single-user Unix, it's better to run with a powerful set of user privileges most of the time and to assume administrative status only when absolutely necessary.

If your password checks out, you'll land in a version of Program Manager that's nearly indistinguishable from its Windows 3.x counterpart. NT boots directly into the GUI environment—you don't land in DOS (or rather, the NT command console) and then run Windows as an option. Since porting Program Manager to NT was straightforward, it's reasonable to expect that your favorite replacement shell (e.g., Norton Desktop for Windows, WinTools, and NewWave) will be available as well.

Subtle Changes

When you launch a program from Program Manager, you may notice a subtle behavioral change. Windows 3.x turns the cursor into an "I'm busy" hourglass while you wait for an application that you've launched to load into memory. NT, however, returns control to you immediately. While the application loads, the cursor becomes an arrow/hourglass hybrid called the *startglass*, which means "NT's loading something, but you can keep working." You can start three or four programs with a rapid-fire sequence of double-clicks and then switch to an already-active application while you wait for the programs to load in the background.

As with OS/2, applications have to be specially written to exploit NT's multithreading. If the Windows version of your favorite application can't print or recalculate in the background, a naive port of that application to NT won't be able to, either. Over time, if NT gains sufficient market share, developers will offer a family of Windows products. High-end versions will target NT and exploit its advanced multithreading and graphics features. Low-end versions will make do with what Windows 3.x provides, optionally using an NT-like 32-bit flat-memory model by way of a Windows 3.x add-on called Win32s.

While applications that exploit multithreading will be optimally responsive, a single-threaded NT application does behave more intelligently than its OS/2 Presentation Manager equivalent. OS/2, although multithreaded, inherits the Windows input model. All applications share a common message queue. If any program fails to pull messages out of the queue, the whole PM interface hangs. But NT gives each application its own message queue, so if one program doesn't fetch its messages, the others don't suffer.

This rather arcane technical distinction

ILLUSTRATION: MARK FISHER © 1992

has an immediate and obvious practical benefit. If you start a lengthy recalc in your favorite Windows spreadsheet (either the 16-bit Windows version or a naive, single-threaded NT version), you'll see an hourglass cursor—but only while the cursor remains in the spreadsheet's window. As soon as the cursor drifts outside that window, you regain control and can interact with other applications. NT delivers on the promise of preemptive multitasking: The user can preempt the system.

DOS and Windows

One of the items in Program Manager's Main group (as of the July beta version) is the same MS-DOS Prompt icon that appears in Windows 3.1. As you'd expect, it launches a console window. The command shell running in that window supports the MS-DOS utilities and batch language, but it's really a 32-bit NT console application (as are external utilities like CHKDSK and XCOPY).

From the command line you can launch any flavor of application that NT supports: DOS, 16- and 32-bit Windows, OS/2, and Posix. (Support for all but Posix shipped in the July beta.) NT automatically invokes the subsystem needed to support the program whose name you type. If you launch a Windows program this way, control will not return to the console until the application quits. To spawn a Windows application—say, CLOCK—without losing control of the console, you type START CLOCK (as in OS/2). Piping works across subsystems, so you can send the output of the NT-native DIR command into a filter program written for DOS or OS/2.

Ideally, you'll run native 32-bit Windows applications on NT, but DOS and 16-bit Windows applications work fine, too. That's just what you would expect on 386/486 hardware, but rather surprising if you happen to be running NT on a non-Intel computer like the Mips R4000-based Magnum. How does it work? The foundation technology is Insignia Solutions' 286 emulator, SoftPC.

You're not stuck in the emulator all the time, however, since DOS and Windows API calls (e.g., file I/O and memory management) map through to their native NT counterparts. That's especially significant in the case of Windows. A typical Windows application spends more time executing Windows code than it spends executing its own. Under NT, therefore, that 16-bit Windows application spends most of its time in a 32-bit Windows kernel that runs natively on both CISC and RISC hardware. If this approach pans out—and early indications are promising—it could suddenly legitimize RISC processors as engines for standard business PCs as well as exotic technical workstations.

NT's DOS/Windows support is, in one respect, less ambitious than OS/2 2.0's: On Intel machines, real-mode software, including device drivers, can't touch the 80x86 hardware. You'll need native NT drivers for SCSI drives, network adapters, and other peripherals. Two factors work in NT's favor here: Drivers are portable, and they conform to a layered model that cuts down on the work needed to support specific devices. One early hopeful indication is that NT already supports nearly all the printers that Windows 3.1 does.

Networking

Windows NT is workgroup-capable right out of the box. As with Macintosh System 7.0, every machine can play the role of server, client, or both. The similarity extends to the point-and-click graphical tools

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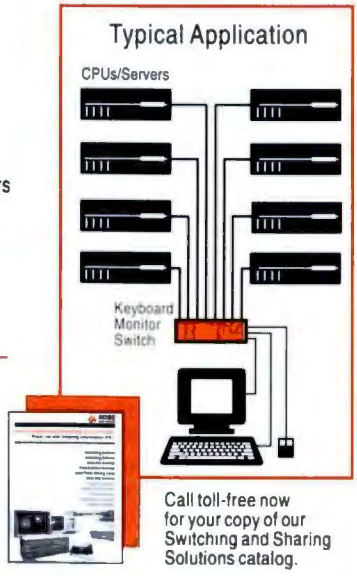

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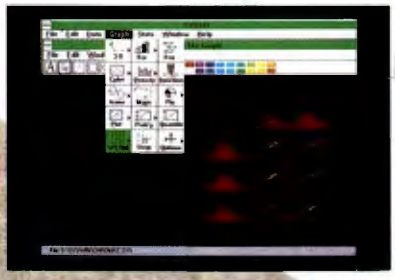

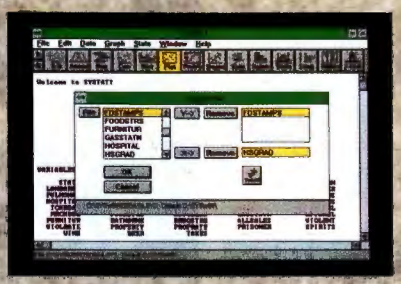

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NT provides to manage users and groups that can access the file and print services it exports and to control the sharing of files and printers. (These tools are packaged as extensions to File Manager and Print Manager.) If you're running an SMB/NetBIOS LAN already (e.g., LAN Manager 2.1), NT will plug into it. You can also tap into Unix networks, since NT bundles the TCP/IP protocol and standard utilities.

My NT machine was well connected to the BYTE networks from day one. I read my Internet mail using the NT version of Windows Terminal. While I can't access our Novell servers directly—there's no NetWare client for NT yet—I can move files between NetWare servers and NT from my DOS/Windows machine, thanks to LAN Manager 2.1's dual-shell NetWare connectivity feature.

Windows 3.1 defines a set of common network services to support activities like browsing for and connecting to remote drives and printers. NT extends these and supplies an umbrella network driver so that a third-party service provider such as Novell's NetWare can seamlessly merge with the interface presented by NT's native network services.

NT's intrinsic peer networking isn't an enterprise solution, of course. Larger installations will use LAN Manager NT to provide one or more dedicated servers and to augment the basic network services with high-end features like domainwide (i.e., multiserver) administration, fault-tolerant storage, and Macintosh support.

A less visible aspect of NT networking is the distributed capability built into many of the tools. NT's RPC (remote procedure call) protocol enables all sorts of wonderful magic. The new Print Manager illustrates the point nicely. With Windows 3.1, every client using a networked LaserJet IIIsi has to install the HPPCL5A driver. With NT, only the server that connects to the printer needs to install that driver. The client's Print Manager uses RPC to ship print jobs to the server's Print Manager.

RPC-enabled tools also promise to radically simplify the management of NT networks. For example, all configuration data for an NT machine—CONFIG.SYS, AUTOEXEC.BAT, .INI files, and every additional scrap of user or machine or application data—lives in a single *registration database*. You'll be able to point the tool that views and edits that database at your local machine, or (with the right privileges) any other machine on your network.

The Big Picture

So what's the catch? Well, Windows NT has a hefty appetite for resources. The current beta version requires 12 MB of RAM and prefers 16 MB. Although it's likely to shrink some by final release, NT obviously doesn't target the 4-MB 386 that is standard for today's corporate desktop.

Will NT play the role of server? Clearly it will. But effective enterprise computing requires capable clients as well as capable servers. Putting a robust and manageable operating system on the desktop just might be worth more to your company than the cost of the hardware to run it. Moreover, today's multiprocessor, drive-array-equipped superservers will probably become the desktop PCs of tomorrow. If you find yourself with multiple CPUs and disks at your disposal, NT will put them to good use. ■

Jon Udell is a BYTE senior technical editor at large. You can contact him on BIX as "judell" or on the Internet at judell@byteph.byte.com.

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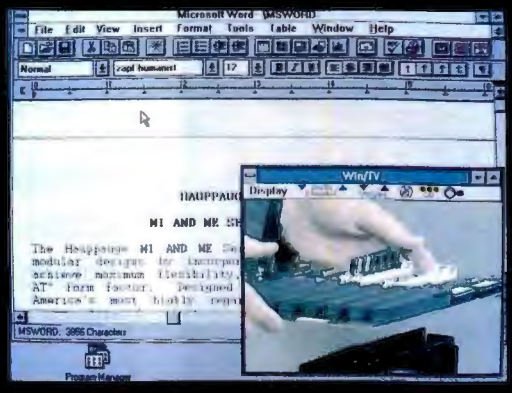

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Windows Speaks

Bring multimedia to your desk

TOM YAGER

With the release of Windows 3.1, Microsoft tantalized users of this popular graphical environment by including, as standard, the Windows Multimedia Extensions, a set of drivers, libraries, and applications that bring the impact of multimedia to everyday computing. With a little added hardware, you can listen to CDs; embed sound, graphics, and animation into your database or business presentation; learn a new skill with unaccustomed ease; or be entertained in a manner previously reserved for noisy arcades.

As interesting as all that sounds, multimedia isn't automatic. True, some applications make multimedia seem effortless, but even basic multimedia requires a little preparation. In a previous article (see "The Multimedia PC: High-Powered Sight and Sound on Your Desk," February BYTE), I discussed MPC-compatible hardware; now it's time to discuss the software in some detail. So many media types are supported by the Extensions that it would be foolish to try to cover them all in one article this size. Instead, I'll focus on the most commonly used media type: audio.

As a user, you should understand what multimedia brings to you and how to put it to work. As a developer, at least a moderate understanding of what it takes to build multimedia capabilities into your programs will help you stay competitive. In this article, I'll try to provide enough detail to help you decide—be you user, developer, or both—whether the Extensions are worth the trouble to use and implement.

The View from Above

Although the most visible portion of the Extensions is their set of standard applications, the package's reach extends deeper than that—into the heart of Windows itself. The Extensions patch themselves into Windows through two layers of software (see the figure). At the bottom level, drivers provide software pathways to direct control of hardware. Some multimedia devices, particularly digitized audio boards, are demanding. The driver's job is not only to control the device but also to hide as much as possible of the device's complexity from the layers of software above it.

Multimedia drivers are loaded, unloaded, and configured through the Control Panel interface under the new driver's icon. This works better than hand-editing SYSTEM.INI to configure new drivers. Now vendors can package their drivers on disks structured to install easily from the Windows Control Panel. Loaded drivers are tagged with a brief mnemonic identifier, such as *wave* for the digital audio device and *midi* for the onboard sequencer. You can have multiple drivers of the same type loaded simultaneously, allowing for complex multiboard configurations.

In the BYTE Multimedia Lab, I use this feature to use Roland's GS Sound Card professional music synthesizer in addition to the FM synthesizer on my system's Sound Blaster Pro or Pro Audio Spectrum card. The FM synthesizer is configured as *midi*, and the GS Sound Card as *midi1*. Not all software allows you to choose from among installed drivers; the default is to use the first installed driver of a given type.

Also listed among the drivers are the MCI (Media Control Interface) drivers. These aren't all drivers in the traditional sense: Not all of them are responsible for controlling hardware. But all the MCI drivers support a marvelously simple command architecture (which I'll describe later). This reduces the complexity of multimedia applications and allows them to maintain a high degree of device independence.

Sitting above the device drivers and tying them together is the MMSYSTEM module, which takes in application requests, loads the drivers as necessary, and passes traffic to and from the drivers as requested. This provides a standardized low-level path to the device drivers, and it's exclusively with this module that well-behaved applications converse to make multimedia happen.

The MMSYSTEM module maintains law and order: Vendors who wish to make their hardware part of the Extensions *must* plug it in through this module. That's why, even though the Extensions are new, an incredible number of audio boards are already on the market. You can buy any one of them, and unless the manufacturer did a botched job on the drivers, it will immediately work with all your multimedia applications.

If the Extensions were built around selected vendors' hardware instead, capabilities would be frozen at 1992's state of the art forever. As it stands now, vendors have plenty of room to innovate in hardware, as long as they provide drivers that give the MMSYSTEM what it wants. This is the kind of proprietary standardization that's worked so well for Apple for so many years, and it is among the things that make the Extensions so likable.

continued

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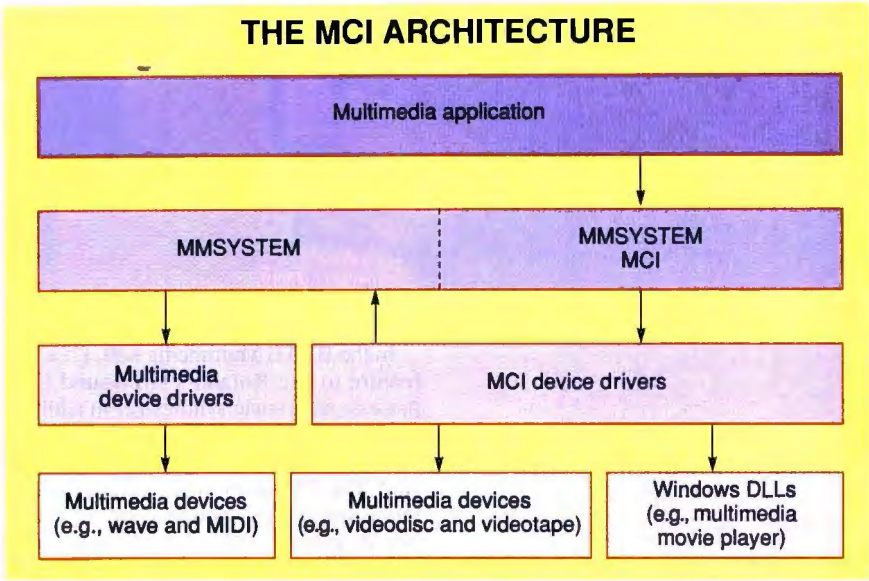

Multimedia applications operate through two intervening layers, greatly simplifying the interfacing of hardware and software. (From Microsoft Windows Multimedia Programmer's Workbook. *Reprinted by permission of Microsoft Press. Copyright © 1992 by Microsoft Corporation. All rights reserved.)*

Use Your Ears

Making multimedia a part of your everyday work requires some adjustment. First, you have to change your attitude: It's so strange to listen to your computer. In fact, I think that one of the reasons speech recognition never took off is that most people are embarrassed to talk to a machine. And you'd be surprised how difficult it is to get used to having your computer "talk" to you. At BYTE, where some editors are stationed in low-walled cubicles, I'm bashful about turning the volume on my system's speakers up high enough that I can hear them. Once I got used to it, I still drew chuckles and visits from those nearby because of the sounds that my machine made. Macintosh and Amiga users have had sound as part of their systems for years, but it takes a while for PC users, unaccustomed to anything more than beeps and squawks, to grow used to the clear voice, sound effects, and music that the Extensions bring to your desk.

The other adjustment requires that you recognize where multimedia might help you in your work and find a way to use it. Microsoft provides some help in this area by including standard applications with the Extensions. There's nothing fancy about them, but through them, you can explore the audio portion of your system's multimedia capabilities. There is also support for animation, but because the animation (for now) has to be created on a Mac, I see little point in discussing it.

The standard applications primarily play back material created elsewhere and control how that material is reproduced. The most versatile application is the media player; it plays anything as long as there's an installed MCI driver for the type of data that you want to hear or see. The media player presents a row of buttons like those on a VCR.

This calls out one of the benefits of the MCI: Every multimedia device supports the same basic set of commands. Insert an audio CD and press the play button, and you'll hear the music. Pull down the File menu and open a digital audio file, and the play button will play it. The same is true of MIDI. Remarkably, you needn't understand anything about any of the technologies to put them to use. The play, stop, and pause buttons all do what you'd expect them to, regardless of the type of device the media player is controlling.

The only standard means of creating your own material is the sound recorder, which lets you capture up to a minute of digital audio from your sound board's microphone jack. Some audio boards (e.g., the Pro Audio Spectrum) include a proprietary mixer application that lets you record from any of the sound board's sources—the microphone, line ("aux") input, and CD audio. The sound recorder brings sounds into memory and lets you save the audio in the standard Extensions format, using a .WAV filename extension.

Again, thanks to MMSYSTEM's influence, every multimedia application that uses the Extensions can exchange data with every other application. All the file formats are strictly defined, so the sound you record in the sound recorder can be played back in the media player or whatever program you choose.

The remainder of the standard programs are more fun than practical, but they still have their place. The Extensions divert the standard Windows `MessageBeep` routine, which on a dull machine pops up a warning or informational dialog box and signals its arrival with a beep from the PC's internal speaker. With the Extensions, you can associate (through the Control Panel) a different digital audio file with each type of dialog box. You can also specify that certain sound files be played on Windows start-up and shutdown. The files must fit in memory to be played this way, but this feature adds a new dimension to using Windows. Finally, a revised version of the alarm-clock application plays specified sound files as hourly/half-hourly chimes and as alarms.

Clearly, the standard programs don't create a full-fledged multimedia solution. Commercial multimedia applications will help you take better advantage of your system's multimedia faculties. For those programs not specifically equipped to take advantage of the Extensions, you can use OLE (Object Linking and Embedding) to embed multimedia objects in your data. The media player is an OLE server, so you can embed a multimedia object in, say, your word processor document and play the associated file by double-clicking on the icon. Of course, this assumes that your word processor uses OLE.

The more complete solutions come in commerical applications. Using the Extensions to develop those applications is the focus of the next section. You need not be a developer to derive some value from what follows; understanding how the Extensions are implemented in programs may help you use them more effectively.

All Singing, All Dancing

Compared to the rest of the Windows API, Microsoft's multimedia support seems out of place. It is, for the most part, remarkably well designed and easy to implement. So, unlike with Windows in general, it's possible for programmers of any skill level to incorporate multimedia into their applications. In fact, if you use a programming system that eliminates the necessity of your making Windows calls to put up buttons and text, you can count on being able to build multimedia programs with relative ease. Using the command-message interface (which I'll describe shortly) is more of a job for C or C++ programmers.

There are roughly three levels of programming support in the Extensions. At

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the bottom are the low-level services, which give you minute control of devices but also make you do a lot of the grunt work yourself. Low-level services talk directly to the MMSYSTEM module, so you retain the benefits of device independence and enforced standards. But you pay for that degree of control: Using this level, for example, you have to shovel data into the sound card on schedule to get a digital audio file to play. If you're planning on writing an application that needs access to the data streams that run to and from your devices, the low-level services are your only choice. These calls aren't as useful as the calls at the higher levels because they make you worry over every little detail, but when you need them, you need them.

The next level up is less trying. Dubbed the *command-message interface*, this intermediate level uses the MCI drivers to indirectly control multimedia devices. A standard set of commands, most of them associated in action to the buttons on the media player, are applied to all MCI-compatible devices. One notable difference is that, unlike the media player, the command-message interface can record.

The sequence required to drive an MCI device through the command-message interface varies depending on the type of device, but not by much. Some devices, such as the digital audio and MIDI support, have files associated with them that must be opened before any command can be issued. These are called *compound devices*, and they contrast with *simple devices* (e.g., CD audio and videodisc players) that aren't associated with files.

Opening a compound device is only a little more complicated than opening a simple one: First, you fill in a data structure (of type MCI_OPEN_PARMS). You must specify the filename, called the *device element*, used to hold the data to be played or recorded. You can also set the device type from a list of predefined constants, but this might be somewhat limiting. For example, what if you have installed a new compound device not associated with one of the Microsoft-supplied constants? One way to avoid this is to specify the data filename and leave the device-type element of the structure set to NULL. As long as the name includes a three-character extension that's uniquely associated with a device through SYSTEM.INI entries (the Extensions set up the standard devices for you this way), the MCI will figure the device type automatically. You can avoid using constants for simple devices by specifying the filename of the driver instead.

Another element of MCI_OPEN_PARMS holds the handle to the window that's set up to receive the MCI messages. On request, the MCI will notify you when a command is completed, posting a message (of type MM_MCINOTIFY) to the window procedure associated with the specified handle. It can also notify you if an error occurs or if a command that you were expecting a message on was interrupted.

Once you've filled in the MCI_OPEN_PARMS structure, you pass a pointer to it, along with a constant that describes the command you wish executed (MCI_OPEN) to the MCI through the `mciSendCommand` function. The open command returns a device identification that you can use to send other commands to the device.

Other commands are executed similarly. When a command requires additional data, an appropriately filled associated structure must be passed to the MCI to provide that data. The MCI also returns data through these structures. In addition to the requisite open, play, stop, record, and

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close commands, the MCI offers detailed information about the MCI system, device types, and specific devices. Using the information and status commands, you can find out how many MIDI ports you have, whether the MCI device you specify can record, or what the playback location of a playing device is. Applications should make liberal use of this feedback. Although it's possible to create working programs that are "blind," it's better to know what your environment is in case the user wants to change or adapt it somehow. The previously mentioned principle bears repeating: Your program should know how many devices of a given type are installed on a system and allow the user to choose from among them at run time.

The MCI on a String

The top level of the MCI is the *command-string interface*, and this is the level that's most accessible to programmers (and nonprogrammers) of all backgrounds. It places a command interpreter at your disposal, building the MCI control structures and issuing commands based on simple, readable command strings. This reduces virtually any MCI command to a one-liner. Instead of loading a data structure and specifying command constants, you build a string containing a command, named parameters, and flags and pass it to the MCI through the `mciSendString` function. The MCI parses the string into data suitable for the command-message interface and sends it along. Because it's an additional layer and because string parsing is involved, the command-string interface is measurably slower than the command-message interface. But on a capable machine, that difference is usually a fraction of a second and not worth worrying about.

The command-string interface doesn't hold you back—all the status and information requests and commands that you find one level down are available here as well. In addition to turning your strings into commands, the MCI also formats returned data into strings. The command-string interface supports notification by way of a specified window handle; it lets you know when an error occurs and offers you a description of the error.

To save you even more time, the MCI provides shortcuts for those things that you might do often. You can open, play, and close a digital audio file with one command. You can also use the `mciExecute` command to make a simple call that returns no data and leaves error handling in the hands of the MCI. The simplest MCI command-string-interface call looks like this: `mciExecute` ("PLAY BERMUDA .WAV"). If the file doesn't exist or if other errors occur, the MCI will automatically pop up a dialog box describing the error—your application need not lift a finger.

Building multimedia Windows applications doesn't take much. In C or C++, it takes one header file and one import library. These are included in Microsoft's Multimedia Developer's Kit and are part of Microsoft's new C/C++ 7.0. In other environments (e.g., Asymetrix Toolbook and Visual Basic), you either use vendor-supplied add-on support or manually declare the DLL functions you intend to use. If you choose to do it yourself, the `mciSendString` function may be the only one you need to declare. Microsoft's Professional Toolkit for Visual Basic includes packaged support for the Extensions (see "Power Tools for Visual Basic," August BYTE). To prepare for this article, I used the Professional Toolkit to create two multimedia applications: a wave/MIDI file player (see the screen) and a CD player. The programs came together quickly. I

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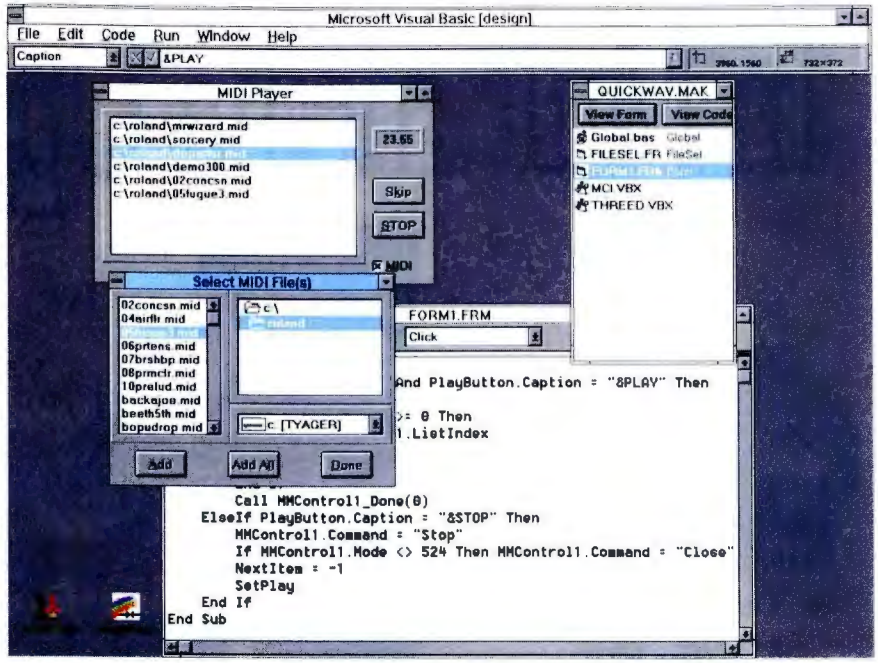

My wave/MIDI file player, one of two Visual Basic programs developed for this article. Microsoft's MCI makes quick work of building Windows multimedia applications in any language.

spent more time making the interfaces attractive than getting the multimedia aspect right.

The CD player was easy to create because the Visual Basic custom control that handles the MCI is a row of pushbuttons like those found in the media player. By default, the buttons' behavior is tied to the actions that their bit-mapped faces represent. Pushing on the play button sends a `play` command to the open MCI device. All I had to do was wire in some feedback and build in a repeat feature.

The feedback proved to be a bit of a challenge. The idea was to periodically poll the CD audio MCI device for its position and display that information in a special field. The MCI will let you pass and receive position values in a number of formats, including one that's perfect for CD audio (i.e., track, minutes, seconds, and frames). Unfortunately, the Professional Toolkit returns this data packed in a 32-bit integer. Visual Basic lacks the bit-shifting operators that would have made quick work of dissecting this value. Instead, I had to divide an expensive operation for an interpreted language.

It turned out fine, but perhaps only because I have a fast system and decipher the time value just once per second. Microsoft thoughtfully added an automatic timer to the MCI control, which dispatches status events at tunable intervals. I didn't have to build delay loops into my program or use a separate timer control to keep the feedback display updated.

The wave/MIDI player came together quickly. These projects reinforced what I had known all along: Microsoft deserves a lot of credit for its design of the Extensions and, more specifically, of the MCI. The device-independent nature of the Extensions leaves unlimited room for future enhancements, and vendors are already stepping up to the plate.

Tip of the Iceberg

What you've just read of the Extensions is only the tip of the iceberg. Its true value lies in its role as a foundation for future development. Already, there are extensions popping up, including support for Intel/IBM's ActionMedia II digital video board and software. Microsoft wisely made its extensions easy to access from applications. It's so effortless; even applications that aren't multimedia-centric will take on multimedia capabilities simply because the Extensions are so easy to use. Besides, once people get used to them, support will become a checklist item for future Windows programs. ■

Tom Yager is director of the BYTE Multimedia Lab and author of Multimedia Producer's Handbook *(Academic Press, forthcoming). You can reach him on BIX as "tyager" and on the Internet at tyager @byteph.byte.com.*

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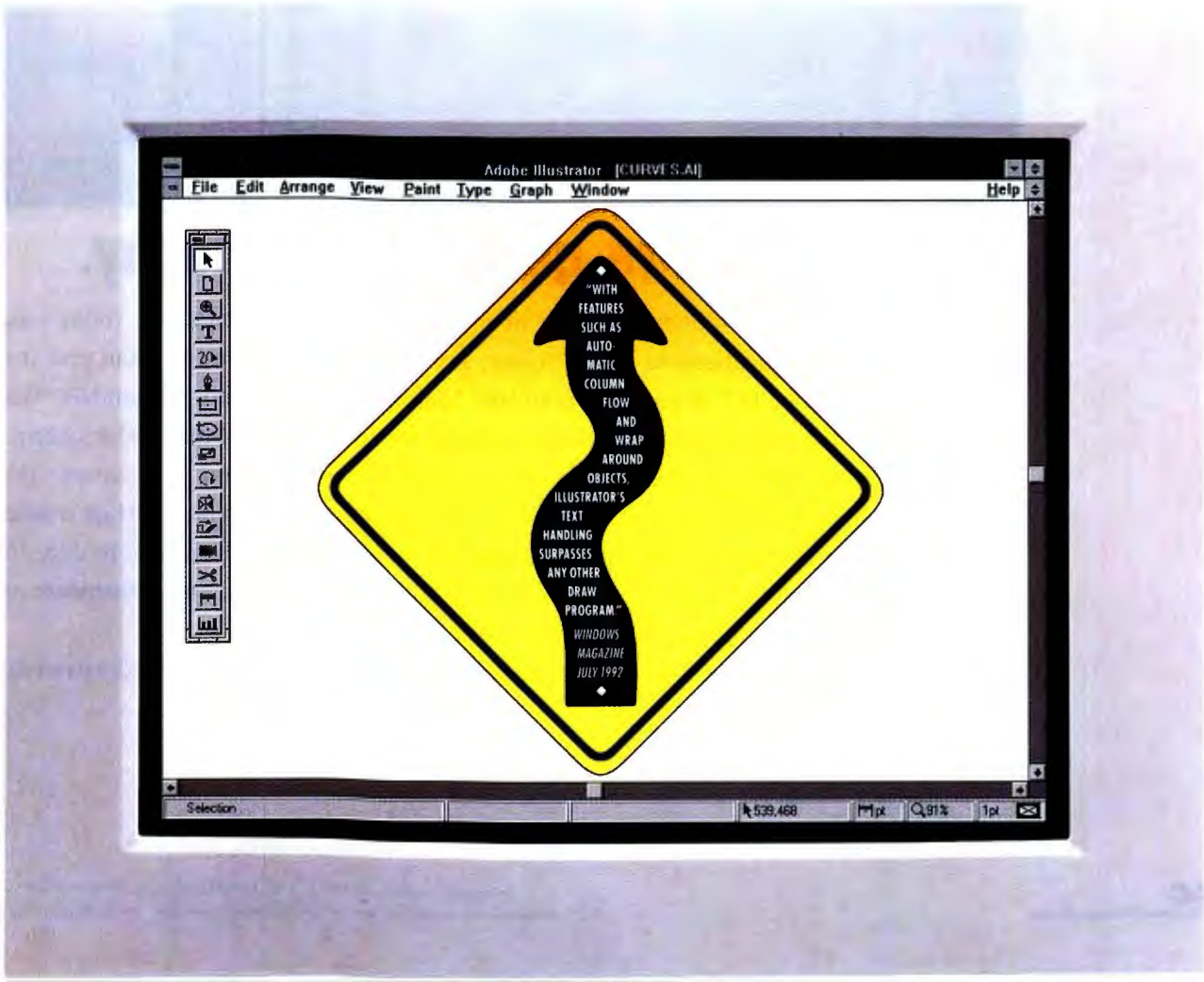

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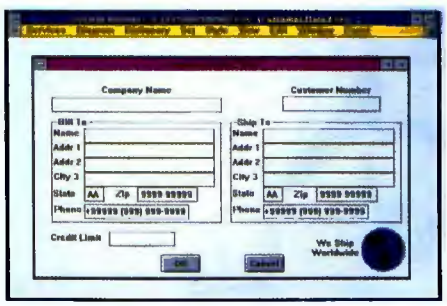

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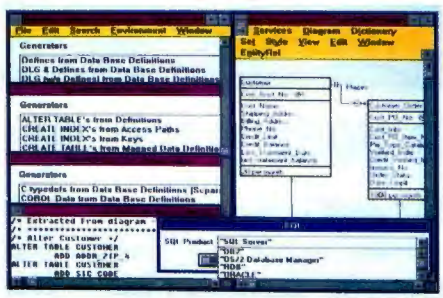

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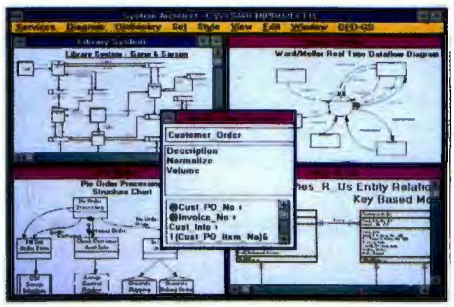

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How OLE Works

It's not as easy to use as advertised

BARRY NANCE

According to Microsoft, OLE is supposed to enable different applications to communicate and share information. OLE doesn't replace DDE, however; its purpose is to make interapplication data transfer easier to manage.

With OLE, you create documents that contain other documents, either by reference (*linking*) or directly (*embedding*); a copy of the additional document resides in the main document (see the figure). You can also combine information from several applications into a single document. You still use different software to edit or update the objects you link or embed, but OLE saves you from having to recopy and repaste the data each time you make a change; OLE invokes the appropriate application automatically for you.

In addition to exploring OLE from a user's viewpoint, I wanted to find out how OLE might fare in the real world. If OLE is as useful as it sounds, it would give me the ability to let Borland, Microsoft, and Lotus products talk to each other easily and productively. The text box "Putting OLE-Aware Applications to Work" on page 50 describes the varying degrees of success I had connecting these programs with OLE.

Exploring OLE

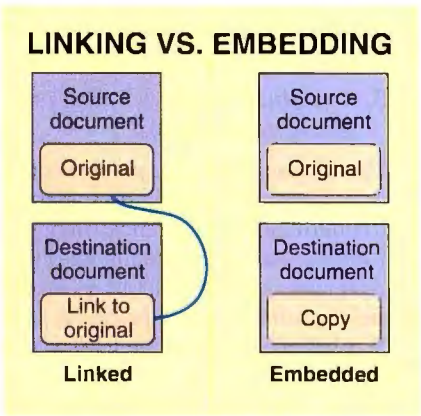
OLE lets you create a document, spreadsheet, database, or other data structure in which various parts are owned, edited, and updated by different applications. One application is responsible for the overall structure; individual applications participate by owning sections of the structure. Once you've created a link or embedded something, you can double-click on the section to invoke the application responsible for that section. The update occurs in a window within the framework of the overall structure. The result is a *compound* document containing one or more elements from other applications. A compound document is also called a *destination document*. The original structure or document in which you create the object is called a *source document*. The screen shows how a linked or embedded object appears to an end user.

When you embed an object inside a data structure, you essentially make a copy of the original object. The copy exists inside the overall data structure. Linked objects, on the other hand, do not get copied; only a reference to the linked object exists inside the overall structure. If you update the original data, the copy automatically reflects the update via the link.

The basic user interface for creating links and embedding objects is an extension to the Edit menu's familiar Cut, Copy, and Paste operations. OLE-aware applications have a new command for the insertion of links: Paste Link. An application might also have special commands, such as Paste Special or Insert Object, to facilitate linking or embedding. Paste Special displays a dialog box in which you can specify a data type for an object—Rich Text Format, sound, or something else. Insert Object lets you embed a "blank object" of a type you specify; this then executes the appropriate application to let you edit the new object. When you choose Insert Object, you see a list of OLE-aware applications that have registered themselves with Windows. You may even sometimes see an application that has the ability to accept OLE objects through drag-and-drop operations.

OLE objects pass through the Windows Clipboard. To embed an object, you select (with the mouse or with Shift-cursor moves) and copy the appropriate part of the source file. An instance of the object appears in the Clipboard. In the application that owns the destination document file (e.g., a spreadsheet, word processing file, or database), you use the Paste command to embed the object or the Paste Link command to link the Clipboard data. If you use Paste Link, the main file stores a reference to the original object. In applications that don't support OLE, a Paste operation inserts a static copy of the object, just as it did under earlier versions of Windows. You get the same result as with OLE, but you can't double-click on the static pasted object to bring up the original application for editing purposes.

You can create links to links. For example, you might link a chart or drawing into a word processing document. You can also copy or select the linked drawing and Paste Link the object into yet a third file. The links in this case, however, do not



A linked object has only a reference to the original object; an embedded object is a one-time copy of the original.

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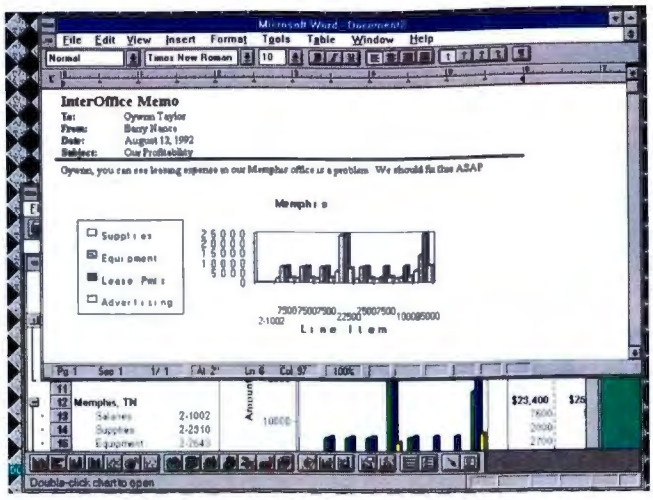

How OLE appears to users. In this case, an Excel calculation rippled into a Word document, prompting the written response. OLE copied the Excel chart into the Word document. Clicking on the embedded chart runs Excel, allowing you to update the chart without leaving Word.

always update the way you'd expect. Microsoft has corrected the problem in the latest version of the OLE specification, which I'll discuss later.

Distinguishing OLE Servers and Clients

It isn't enough to simply put "OLE awareness" on your checklist of must-have features for the Windows software you buy. Before you spend any money, you'll want to see whether the software can be an OLE server or merely an OLE client. Which kinds of objects can you link or embed with the software? Does the application also support DDE, OLE's precursor? In some situations you may find that DDE does the job when OLE can't.

The OLE specification distinguishes between OLE servers and OLE clients. A server module can edit an OLE object, while a client can merely accept a link and display the object. Obviously, you need an OLE server to do anything with OLE; an OLE client by itself is of no use. If you plan on using OLE, you'll want to make sure the edit/update software you buy can act as an OLE server.

Keeping Track of Links

Mainframe systems designers draw large charts to illustrate automated information flow and disk file interrelationships. These charts often cover entire walls, and the designers always have a formal plan for distributing changes to the charts to data processing operations and other personnel.

Typically, a personal computer user doesn't have to resort to this kind of system documentation. You load a file into your spreadsheet application, update the data, save the file, and perhaps export the data into another application. You probably document the export action in some sort of informal way for those days when you aren't in the office.

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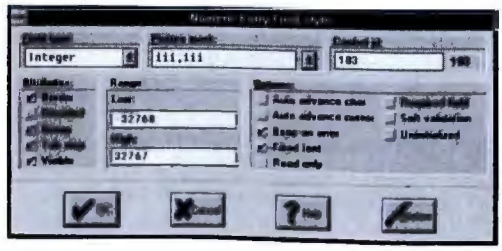

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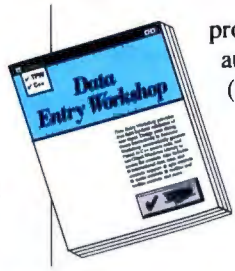

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between files, you need to borrow some of the techniques of the mainframe systems designers. You need to document the data dependencies you've expressed in the OLE connections so other users will be aware of them. And, naturally, you need to keep the documentation up to date.

A description for an OLE connection might consist of a set of comments you place in a spreadsheet, or perhaps some hidden (i.e., nonprinting) text that you insert into a word processing file. The documentation you maintain should include the name of the source file, a description of the object, the type of connection (i.e., linked or embedded), and whatever other information you can use to tell yourself or others about the connection.

A few months after you create the OLE connection, you or a colleague will probably need to make changes to it. If people forget the connection exists, confusion and frustration may cause someone to erase the files and force you to start the entire project all over again. An organized, methodical approach to your use of OLE will make OLE effective and useful in your office. To help you keep track of linkages, some advanced applications have a Links menu item (under the File selection) that lists the source files for any links in the file you're editing.

Discovering OLE's Shortcomings

Keeping track of the links in a file is a minor chore, but, as with any new technology, you'll run into a few problems as you use OLE. The increase in the sizes of disk files that contain embedded objects is usually a manageable problem, but OLE's memory usage is a more difficult issue to overcome. The Clipboard and the OLE mechanism in general can handle only so much data. Linking or embedding large objects can result in out-of-memory error messages from Windows. Inadvertently deleting a source document file confuses OLE when links to that file exist; you'll get "File Not Found" error messages when OLE attempts to refresh the destination document file data.

When using OLE, you'll find that you want it to do things that it can't. "DDE offers an Execute option that you can use to invoke operations in other applications, and this option works well. OLE is less useful in this area," says Anders Vinberg, vice president of Computer Associates. Even when using Visual Basic and the Professional Toolkit for Visual Basic to create your own OLE client module, you'll likely get frustrated. OLE is nonintuitive to understand and program for.

Despite the "object" in its name, OLE doesn't support *inheritance*: the creation of another object, as a subclass of the original, whose behavior is governed by selected attributes and characteristics of the original. OLE also needs to support the negotiation of object size and object-handling capabilities between client and server modules. OLE can carry raw data (e.g., spreadsheet cell values), but it can't yet transfer column widths and some other formatting options. For example, if you perform a global font change in the source document file, OLE does not ripple the changes into a linked destination document.

OLE is not an efficient mechanism, according to Rob Dickerson of Borland International. You'll pay a penalty in slower performance if OLE connections are active while you use your computer. OLE isn't the sort of link you'd use to exchange data across even high-bandwidth data communications lines.

Nonetheless, Dickerson believes OLE is a good way to sidestep some of the limitations of DOS. OLE bypasses the usual

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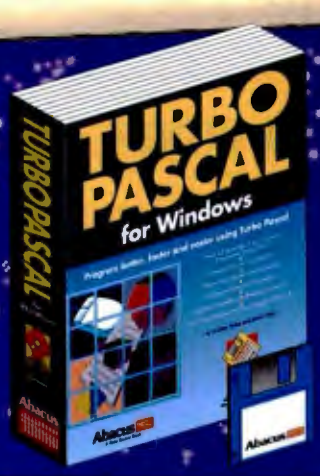

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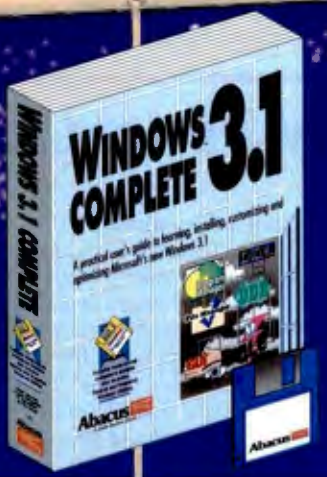

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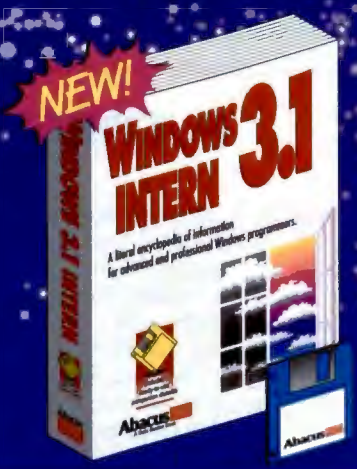

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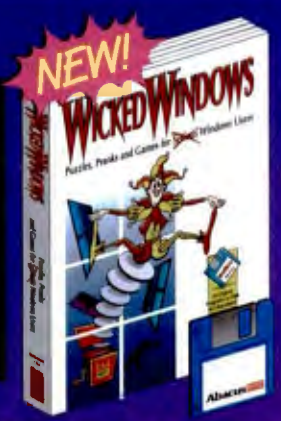

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DOS file-storage conventions, so you don't have to think in terms of 11-character filenames as you use OLE; you can identify your OLE connections with more meaningful names. OLE also enables you to think of the work you do on your computer in terms of a document model rather than an application model. Dickerson says that technologies like OLE will enable us to become *document*-centric instead of *application*-centric.

The biggest problem with OLE on a network is that it doesn't do a good job of helping you share data among workstations. The Windows Clipboard, the vehicle that OLE uses for data exchange, doesn't operate across a LAN. You can't, for example, copy an area of a document and then tell someone else on the network that it's now available for linking. You'd think you could at least embed an object in a file, store the file on the server, and make the file available to other people. In practice, though, this doesn't work very well. Both the OLE server module and client module must exist on the file server in the same directories for both workstations. Two workstations can't have the same compound document file open at the same time.

continued

PUTTING OLE-AWARE APPLICATIONS TO WORK

To evaluate the merits of OLE in Windows 3.1, I used some shrink-wrapped applications from a variety of vendors. These applications consisted of Microsoft's Excel 4.0, Word for Windows 2.0, Publisher 1.0, and Works 2.0; a beta version of Borland's Paradox for Windows; Borland's ObjectVision 2.0; and Lotus's Ami Pro 2.0 and Notes 2.1.

Additionally, I used Microsoft's Visual Basic to find out how to program my own OLE links. You'd want to do this to help integrate office-automation tasks in your company when standard shrink-wrapped applications don't quite give you what you need.

The Bookstore Manager

As manager of an imaginary retail bookstore, I used my set of OLE-aware applications to try to automate many of my store's functions. I forced myself to forget that I'm a programmer; I wanted to see how I could put shrink-wrapped software to work without resorting to designing and coding the application myself in C or Pascal. I tried to create an environment that would let the applications work together—through OLE—as I sold books to customers.

The first thing I needed was a cash register. I used Visual Basic to construct a simple cash-register interface, with menu items for enabling (at the start of the day) and disabling (at closing time) the OLE links. It only took about an hour with Visual Basic to create the cash register itself. The OLE connections, however, took a couple of days; Visual Basic programs can be only OLE clients, not servers, and I had to work around the inability of the Visual Basic application to edit and update a source document file. I could have written a DLL in C that allowed the cash register to be an OLE server, but I was a store manager, not a programmer.

The data I wanted to share among the applications consisted merely of sales transactions that originated in the cash-register function. By recording stock numbers (i.e., the ISBN for each book) and prices, I hoped to feed the financial data into Excel and the sales data into Paradox. Excel would show whether I made a profit, and Paradox would keep track of my inventory (by ISBN). I also wanted to use the information to produce customer follow-up letters in either Word for Windows or Ami Pro. Microsoft Publisher would prepare my storewide best-seller list.

In Paradox for Windows, you designate the data type for each field in a table. One of the available data types is "OLE," meaning that the data really exists somewhere else and is maintained by an OLE server. A field of type OLE can't be a key in the table, so I had to generate a unique sequence number in Paradox to act as a record key for each sales transaction. My roster of fields included the sequence number plus the OLE-linked ISBN and price information from the cash register. The same linked fields would flow into Excel. In both cases, each data field became a separately linked item to OLE; I couldn't get the items to flow through OLE as a group (i.e., as a single record).

Most bookstores are part of nationwide chains these days. I wanted to use Lotus Notes as the vehicle for communicating my sales data back to national headquarters. Why not use OLE to give headquarters exactly the same data I captured at the cash register? Granted, I should have done my design first and then purchased the software. But people often use the software they have at hand to accomplish tasks. I'm confident that I'm not the first person—nor the last—to put shrink-wrapped software to work in unusual ways.

After some attempts at finagling the Visual Basic OLE client software (the cash register) into feeding data to Excel and Paradox, I gave up and used DDE links instead. DDE proved to be much better at exchanging data among the applications. Paradox for Windows and Excel became DDE clients, and the Visual Basic cash-register application became a DDE server—a role it couldn't play under OLE.

Once I recorded the sales transactions in a database and a spreadsheet, I found that OLE wouldn't let me transfer the DDE-linked data into Publisher, Notes, Word for Windows, Works, ObjectVision, or Ami Pro. OLE will link to "real" data in a source document, but not to DDE-linked data. The designers of OLE must not have taken the possibility of an extra level of indirection into account. So it was back to the drawing board.

I told Excel, through a formula consisting of a simple reference to the set of cells, to reflect the incoming data as new values elsewhere in the spreadsheet. This approach caused "real" data to exist in the spreadsheet, and I could use OLE to create connections between the data and the other applications. The rest of the project became a series of straightforward tasks to create the form letters, best-seller-list page layout, and other output documents I wanted to automate. And, of course, I reminded myself I should someday take the time to document the linkages I had created.

With this bookstore automation effort, I discovered OLE isn't quite as easy to use or as universal a tool as I had hoped. In your own work, you'll probably want to wait until Visual Basic and other Windows software comply with the OLE 2.0 specification before you spend a lot of time trying to create significant OLE-aware systems.

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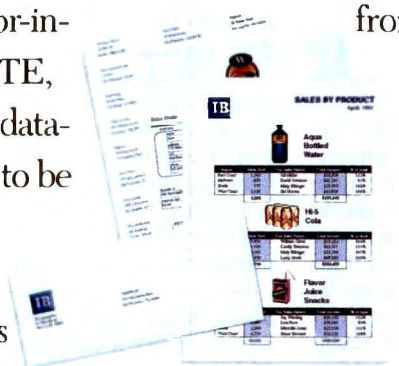

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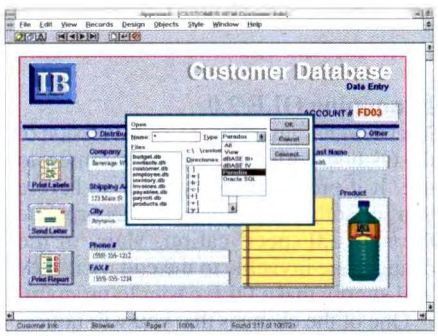

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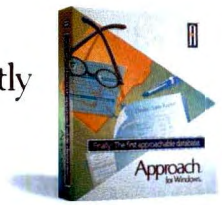

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Company	Product	Client/Server
Aldus	PageMaker	Client
Borland	ObjectVision	Client
Borland	Paradox for Windows	Client
Computer Associates	CA-Compete*	Server
Computer Associates	CA-dBFast*	Client
Coromandel	Integra SQL*	Client
DesignView	ComputerVision	Server
Gupta Technologies	SQLBase*	Client
Gupta Technologies	Quest*	Client
Lotus	Ami Pro	Server
Lotus	Notes	Client
Microsoft	Excel	Server
Microsoft	Word for Windows	Server
Microsoft	Publisher	Client
Microsoft	Works	Client
Microsoft	PowerPoint	Client
NewQuest Technologies	Ascend for Windows	Client
Ventura Software	Ventura Publisher	Client

* Company says the product will be OLE-aware sometime in 1992.

Examining OLE 2.0

Microsoft has just released a new version of the OLE specification for programmers to use. It'll probably be a year or so before you see software products that incorporate the new 2.0 specification. Many of the changes are invisible to the end user; they will simply make OLE easier to program.

One of the changes that you will notice, however, permits a secondary link to refer to an embedded object. When you edit the embedded object, the link will update the secondary destination document file. Another change that will make OLE easier to use is better storage management. You will encounter fewer memory-error messages with version 2.0. You will also get more predictable behavior when two or more server modules attempt to edit the same object at the same time.

The most visible change with OLE 2.0, however, occurs with "in-place interaction." If both client and server modules support this feature, you'll be able to use the Open menu item to create a window in which you can edit an object. You'll get more display space and control tools for performing the update. When you activate an object, the menus and tools will change to reflect what's appropriate for the object. And you won't get so confused about how to get the object "back into the container." Viktor Grabner, Technical Evangelist at Microsoft, indicates that many of the usability difficulties introduced by OLE 1.0 will simply not arise under 2.0, at least in the most common cases.

How Useful Is OLE?

You'll have to wait for OLE 3.0 or higher to share Windows application data across a LAN. Until programmers implement the version 2.0 changes, you will have to put up with a somewhat awkward interface for using OLE. When you buy or upgrade Windows software, you'll want to determine carefully whether the programs can be an OLE server or client. (See the table for a list of OLE-aware software.) But OLE can be a good tool for linking or embedding pictures, charts, tables, graphs, and subsets of documents from one Windows application to another.

A methodical approach to OLE and the careful organization of your source and destination documents will, over time, let you effectively share object data among your applications. But be aware that OLE is a limited tool that you won't be able to use every time you have two applications that need to exchange information. ■

Barry Nance, a programmer for the past 20 years and a contributing editor for BYTE, is author of Using OS/2 2 *(Que, 1992),* Network Programming in C *(Que, 1990), and* Introduction to Networking *(Que, 1992). He is the editor for the IBM Exchange on BIX, where you can reach him as "barryn."*

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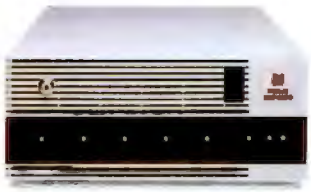

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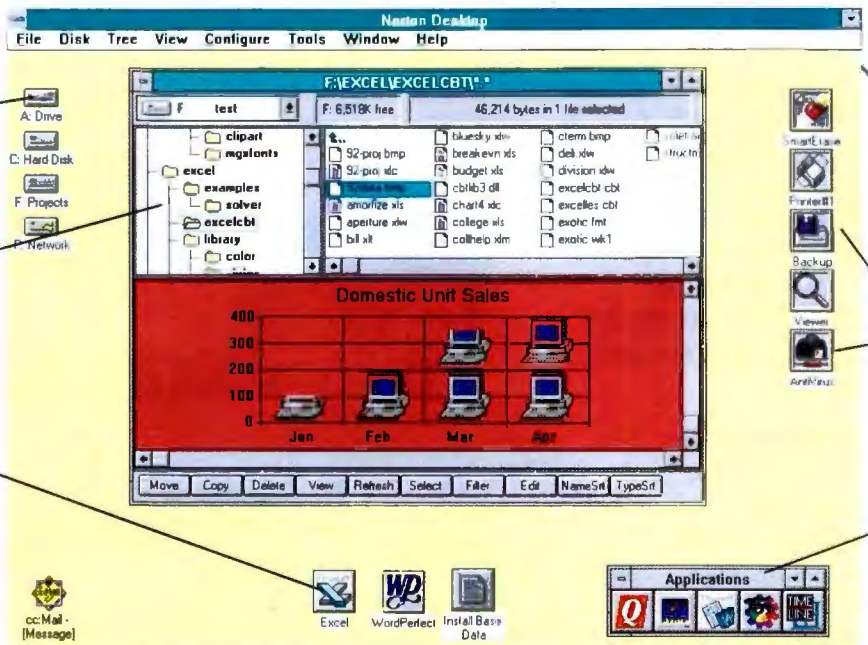

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The OS/2 Alternative

How to decide whether OS/2 or Windows is better for you

MARK MINASI

Is OS/2 a better alternative environment than Windows? That depends on which Windows you mean. OS/2 2.0 has a better structure than Windows 3.1, but Windows NT offers OS/2 2.0 some real competition. That's not really the big question, though. Perhaps a better one is, Which environment will work better for you or your business?

The answer to that question is based on several important considerations. What are the environment's technology underpinnings? Will it work with your other environments? And what kind of software will be available for the environment? I'll examine each of these questions in turn.

Dueling Architectures

The most significant advance that OS/2 2.0 or Windows NT provides is access to the 32-bit memory capabilities of the 386 family of Intel chips (i.e., the 386DX, 386SX, 386SL, 486DX, 486SX, or 486DX2 chips). Intel chips up to and including the 286 cannot handle data or code segments larger than 64 KB because the chips require the system to manipulate memory one segment at a time. The trouble with the segments is that the registers that refer to them are only 16 bits wide, and 2^{16} is 64 KB; hence, the limitation.

Although the 286 chip can address 16 MB of memory, it must do so in 64-KB increments. Imagine how annoying and time-consuming it is to have to write a program that controls megabytes of memory but must do it 64 KB at a time. That's what Windows (when I say *Windows* without a version designator, I'll mean version 3.1 or any successor DOS-based products) programs must do. Windows was built around the 286 protected-mode memory architecture, so it's hobbled by this nuisance barrier.

It's a nuisance for programmers and users alike. First, any 16-bit program must include lots of overhead for the code needed to play the shell game with memory. Second, some programs don't get written simply because it's too much trouble to do within a 16-bit architecture—and lacking software is a pretty big nuisance.

In contrast, with a 386-based system, segments can be addressed with 32-bit registers, and each segment can be 4 GB. That nearly eliminates the segment-arrangement game, which means faster code and code that addresses larger data segments.

If you peruse a programming manual for either OS/2 2.0 or Windows NT, you'll see that there's more to 32-bit architectures than just memory sizes. Even though it's bad practice, designers of operating systems and languages tend to mold their creations around the target CPUs, imbuing the characteristics of the languages and operating systems with the limitations of the CPU.

For example, take a look at the string variable type on most of the implementations of the BASIC language. In the Apple II BASIC, there's a maximum string length of 255 characters; the PC world has 64-KB strings in QuickBasic. There's no good reason for this except laziness on the part of the compiler implementers—they just wanted to make the variable that keeps track of the length of a string no larger than the word of the target machine, which was 8 bits on the Apple's 6502 and 16 bits on the PC's 8088. An example relevant to Windows is the 192 KB of system resources, a constraint that most Windows users eventually come to know. The 192 KB is actually three 64-KB areas, each restricted to 64 KB by the segment-size barrier of a 286.

The benefits of 32-bit architectures extend indirectly to other parts of the PC, such as the file system (it's easier to maintain 32-bit sector numbers) and the video system (it's simpler to handle objects—bit maps in particular—larger than 64 KB). If you believe that either Windows NT or OS/2 2.0 will win the battle of the desktop, you can see that battle as a win-win situation: 32 bits either way. So the first benefit of using OS/2 2.0 instead of Windows is access to more memory—4 GB versus Windows' 16 MB—and easier access to that memory.

Multitasking and Multithreading

Under Windows, multitasking is *cooperative*. Once the Windows scheduler yields control of the CPU to an application, the scheduler can't regain control of it until the Windows program yields it. Each application is on its honor not to hog the CPU. The catch is, some Windows applications are more honorable than others.

Under OS/2 2.0, programs have *threads of execution*, or units of program activity. A thread is basically a virtual instruction pointer, a data structure within the operating system that keeps track of where you are in a program. What is interesting is the OS/2 2.0 notion of *multithreading*: the ability to have a number of parts of your

ILLUSTRATION: MIKE MCGURL © 1992

program running at the same time. For example, you could have part of your word processor accepting keystrokes, another part of your program printing text in the background, and a third part automatically and transparently saving what you're doing every few minutes—simultaneously.

This is a relatively new notion in programming, so many third-generation languages do not support it very well. Ada, Modula, and SmallTalk have multithreading built into them, but most other programming languages must have it added on. Because of that, and because most developers don't have any idea how or why to multithread, you don't see very many multithreaded applications for OS/2 2.0.

Windows knows nothing of multithreading. OS/2 2.0 has supported it since version 1.0, and Windows NT supports it as well. Further, Windows NT is smarter than OS/2 2.0 at using multithreading. When I described how three threads could be running simultaneously in a word processing program, I wasn't telling the whole truth. If there's only one CPU in the computer, there's going to be only one thread running at a time. The trick with a good multitasker is to provide the illusion at the user level that there are several processors, each a bit slower than the single actual processor that's under your PC's hood.

Windows NT goes further because it supports multiprocessor systems: Build your application to be multithreaded, and the operating system will automatically distribute the threads among the various processors. A well-designed graphical program that places its interactive parts in a thread other than the one that updates the graphical screen will look better on a single-processor PC because the program can respond to commands without having to first wait to repaint the screen. That same application will look even better, however, on Windows NT because its transparent support of multiple processors for multithreaded code would mean an instant, free-of-charge boost in real power with every added processor.

In addition, multithreading is preemptive, not cooperative. Unlike in Windows, a system hog can be yanked off-stage after it has overstayed its welcome in the CPU's spotlight. In this regard, however, Windows NT outstrips OS/2 2.0. Although OS/2 2.0 itself uses preemptive multitasking, there is a single main thread that can become congested, leading to unnecessary waits. It is an old design flaw that comes from the original OS/2 1.1 Presentation Manager. Under Windows NT, the hourglass disappears when you move the mouse cursor off the window of the program that is busy, restoring the old arrow pointer.

GUIs Great and Not So Great

All advanced operating systems offer three important things: multitasking, a lot of memory, and a GUI. If you work with the Windows GUI for a while, you get the feeling that it was designed by someone who'd really rather be using a command-line interface. Want to install a printer font? Well, there's a program called the Print Manager, but that's got nothing to do with fonts. If you open the Control Panel, you'll see an option for fonts, but it's the option for installing screen fonts or a True Type font, not a printer font. And if you want to have more fun, try out the File Manager.

The OS/2 2.0 betas that I saw from November 1989 to October 1991 were, on the whole, stable, well-built products that ran OS/2 code and multitasked DOS programs

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well. I opined in print that I could not understand why IBM continued to call this a *beta* product; why didn't it *ship* it?

The answer, of course, was Windows. Support of Windows programs was essential in the eyes of the marketplace and for IBM's own sense of well-being. IBM and Microsoft had split up, but in Big Blue's eyes, Microsoft had suffered the greatest loss—and IBM would show it. So Windows support slowed the whole process. And somewhere in there, the WPS (Workplace Shell) was born.

The WPS wasn't a stake through OS/2 2.0's chest, but it came pretty close to impromptu open-heart surgery. Released with the 167 beta, it revolutionized the OS/2 GUI and annoyed nearly every OS/2 developer. It broke much of the existing code, forcing the few remaining true believers in the "OS/2 way" to rewrite and recompile their code. This was probably the worst thing that happened in the whole OS/2 development cycle.

The good news is that WPS is really neat when it works and once you have grasped its paradigm. Everything on the OS/2 desktop is an object, and every object has things that you can do to it. You access those options with the right mouse button. To learn WPS quickly, just start clicking the button on everything.

For example, there's only one item on the desktop relevant to the printer: the Printer object. Select it with the right mouse button, and you can control its Options (i.e., a menu on most objects). Within Options, you add and subtract fonts, change printer drivers, control queue options—the works. But try selecting the Printer object with the left mouse button. The object opens to a small window that contains objects that represent the print jobs in the queue. Select any of them with the right mouse button, and you will see the Open option. Select it, and a graphical viewer shows you the print job before it prints.

With this option, there is no need for WYSIWYG or print preview. Just work from a fast, sleek text editor, print to a job queue—be sure to Hold the queue first—and preview the job using the right mouse button. Sound silly? It isn't. I've found that DeScribe works nicely that way.

What about Windows NT? Sadly, it has been saddled with the look and feel of its little brother. If Microsoft is smart, it will change that.

Developer Developments

What's going on with OS/2 development? Well, not much. According to John McFetridge, the former head OS/2 developer for Corel, "This is the difference between Microsoft and IBM. I had a guy practically living in Redmond, working with Microsoft and learning about NT. IBM, on the other hand, wanted me to pay $2000 to come to a conference so that they could tell me why the late beta didn't work. We needed some device support extensions from IBM, extensions that IBM had written for Corel. We wanted to include them in CorelDraw for OS/2. We asked for the rights to include the extensions from IBM; it took four months for IBM to respond. Now, don't misunderstand—when the right people at IBM found out how long it had taken, they were horrified. On the other hand, we needed the WLO [Windows Linking Objects] from Microsoft. They faxed us an agreement, we faxed it back, and we had the code the next day.

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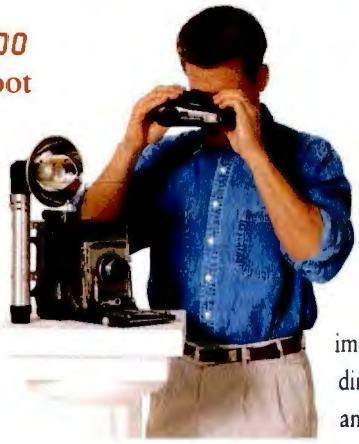

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making it an excellent product on the Windows platform, which in turn will make it an excellent product under OS/2—and whatever version of Windows takes off."

A survey of software vendors indicated that they either wouldn't discuss their OS/2 plans (which meant that they didn't have any), said they had some great software that ran under Windows that would also run under OS/2, stated that they had some great software that ran under OS/2 1.3 that would (and often didn't) run even better under OS/2 2.0, or (rarely) said they had some great OS/2 software, which they were willing to demonstrate.

What sort of OS/2 2.0 end-user applications are available? Only CorelDraw 2.0 and Lotus 1-2-3. Some terrific packages are coming soon from Micrografx, Draw and Designer, WordPerfect, Ami Pro, Borland, and DeScribe.

For developers, there are only few OS/2 2.0–specific tools. Borland C++ seems to be the El Dorado that everyone's waiting for, but it sure wasn't around during the beta period. It will, no doubt, be out by the time you read this article.

Who is using OS/2 nowadays? The bulk of my OS/2 training business comes from people who are downsizing. For example, there's a big bank in Florida that approves a lot of loans. Over the years, banks have had many loan approval programs, from simple portfolio assessers to whizbang expert systems. Many of them, however, are encased in COBOL on a mainframe. But there's nothing being done there that a few 486s can't do on a LAN, and at a small percent of the cost. Therefore, they take their mainframe COBOL, move it to a PC running OS/2, and compile with Micro Focus COBOL/2. It works like a charm.

The bank in Florida uses only the OS/2-based PCs to compile and test the code. It continues to do business on the mainframe. But it's getting more bounce for the ounce from each mainframe cycle because it's just about moved testing off the mainframe. Folks who've lived on a steady diet of mainframe COBOL just about fall off their chairs when they are introduced to COBOL Animator. It almost makes writing COBOL fun. Other firms are quite happy running their operation from OS/2.

"If you're building strictly for OS/2, you've got a simple, solid foundation," one MIS director told me. "It works, and that's that. It's better than DOS, with the big memory and all, and it's more understandable than the mainframe."

Whither OS/2 2.0?

I believe that it's chiefly in the mainframe shop where OS/2 2.0 will win. The interoperability that OS/2 2.0 offers is fantastic.

continued

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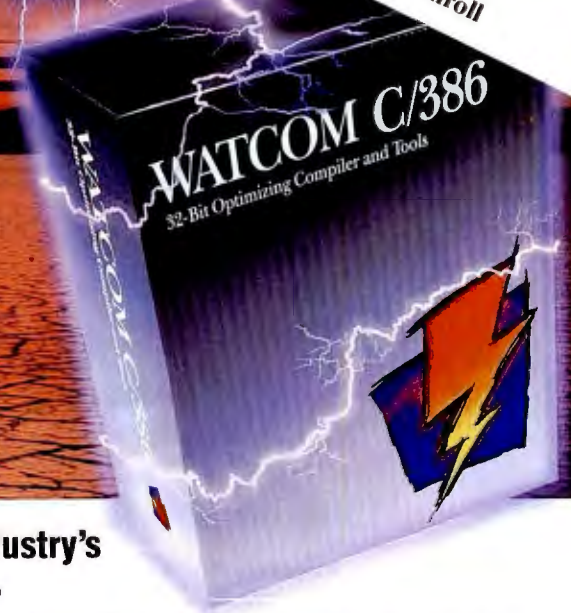

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It's probably the most reliable DOS multitasker I have ever worked with, and its Windows compatibility is stunning. For a comparison, I ran the Spectragraphics Windows benchmark, a suite of 125 speed tests, on OS/2 2.0. It outpaced Windows in 25 of the tests, was about equal in 80 of them, and was more than 20 percent slower for the remaining 20 tests. Not bad considering that OS/2 2.0 shoots for compatibility with the slower Windows 3.0.

That's all well and good, but that's technology. What's going to win here is marketing. These days, it appears that IBM marketeers couldn't sell fire extinguishers to Joan of Arc. The first set of OS/2 ads were incomprehensible and dull, based on pictures of Olympic athletes. And then came the new ad that shows rows of computers. It reminds me of a graveyard.

Then why develop for OS/2? Because IBM is committed to it. If your customers are from Fortune 100 companies, people with IBM mainframes and databases built around those mainframes, they will be looking seriously at OS/2 if they're not already committed to it. IBM is not fooling around either. There are some nice microcomputer-to-mainframe products available, not the least of which is support for APPC (advanced peer-to-peer networking), which is impossible under DOS (it takes too much RAM for DOS to use it beneficially).

But what of the rest of you, the folks who are trying to solve specific problems for clients? The reliance on C-based systems means that there are plenty of cross-development tools. However, what if you are going to build the next great word processor? There's only one tool: assembly language—hand-tuned—and hard work.

And how about the techies, the support folks, the office kibitzers? What should you recommend for the office's operating-system direction? Here are a few tips. First of all, relax. Nothing's going to become a standard unless the market says it is—and that means you and me. If it's that great (as Windows was), you will know. Nothing happens quickly in the PC world anymore. Second, it'll support your existing applications, or the market will crush it. No matter which of the two "leading-edge" operating systems, OS/2 2.0 or Windows NT, becomes king, you and I will end up the beneficiaries. ■

Mark Minasi writes and conducts seminars on Windows, OS/2 2.0, and OS/2 1.3 to 2.0 migration and is the author of the book Inside OS/2 *(New Riders Publications, 1992). His firm, Mark Minasi & Co., is based in Arlington, Virginia. You can contact him on BIX as "mjminasi."*

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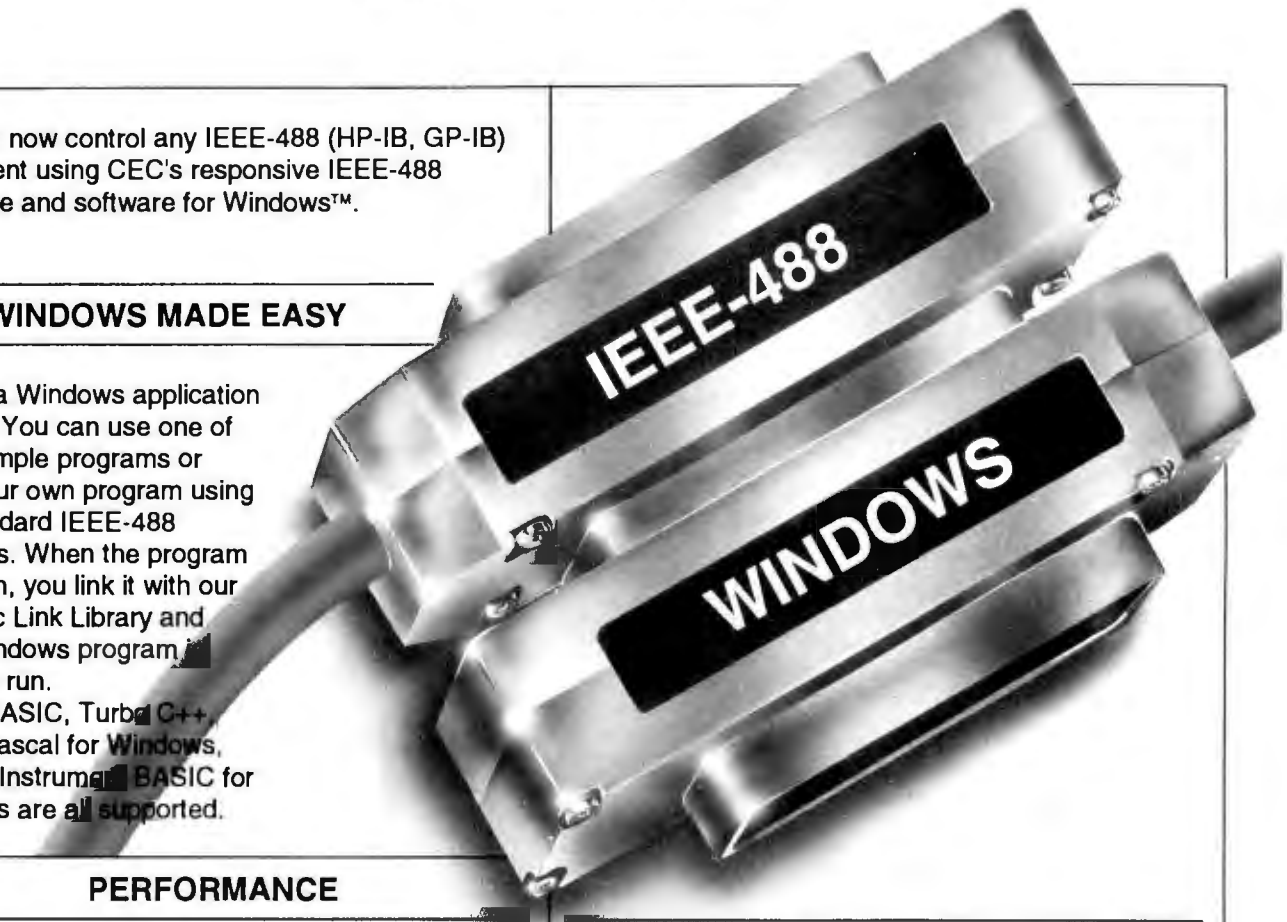

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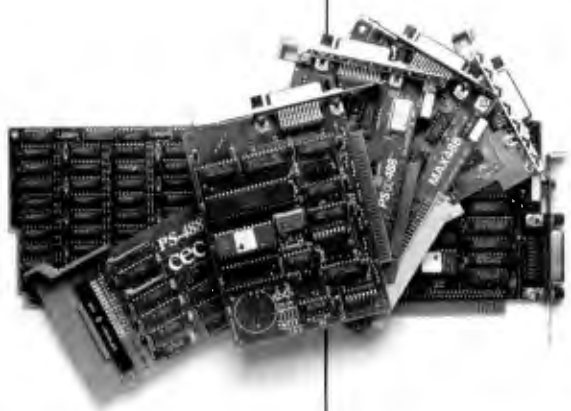

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The Pick of Windows

Fifteen books (and some disks) run the gamut from Windows beginners through experts

HUGH KENNER

October, and we've entered the Second Year of Windows. Year One seems to have started in the summer of 1991, when Windows books began to crowd the shelves and consultants began to get windowing queries from clients. And that was in the era of version 3.0, still so clumsy it was plausible to dismiss Windows as fallout from a multimillion-dollar temper tantrum off in Seattle. One man I know who has committed his career to Windows says he'd never have touched it prior to version 3.1 (April 1992).

What have we here? By one extreme account, we have an effort to make a wheelchair behave like an outboard motor. MS-DOS versus Macintosh, you see. In the standard example, a Mac spares you the bother of pecking out DEL JUNKFILE.TXT (16 keystrokes—17 including Enter). Instead, your mouse just drags JUNKFILE's icon over to a Trashcan icon; whereupon, *ZzzAP!* (Oddly, Windows doesn't emulate that famous example; you select the file from a list and pick the word Delete from a menu.)

This all gets entangled in McLuhanesque wrangles about names versus icons, linear letter-after-letter versus all-at-once look-and-zowie. "People are visual creatures," one book assures us. "Most of what we learn comes through our sight. We remember best what we can place in a unique location, not what we tag with a text name." Translation: If icons are giving you trouble, you've not yet come to terms with your own essential nature. (But relax, you don't need a shrink, you just need This Book.)

Which book? Dozens, literally dozens, are crying out to be needed. Odd: Wasn't Windows supposed to deliver us from the tyranny of text?

If you're new to Windows, the first one you need, in my opinion, is Kay Yarborough Nelson's *Little Windows Book*, an easy, illustrated, low-key walkthrough with a Here's How appendix, meant to get you comfortable and started. Which it will do. And when you feel more ambitious, you'll be ready to look at some of those other books.

A number of them sufficiently resemble a big general-purpose manual to prompt the suspicion that they're meant for people who've pirated the software. Rethink that idea. The software comes from Microsoft, and Craig Stinson's *Running Windows 3.1* comes not from some cunning parasite but from Microsoft Press (which confidently labels the very first printing "Bestseller!"). It's a 526-page rewrite of Microsoft's anonymous 650-page Windows 3.1 manual; moreover, it comes shrink-wrapped with—"Free!"—Kris Jamsa's *Concise Guide to Microsoft Windows 3.1*, a mere 195 pages.

If we need Jamsa as a crib to Stinson helping us with Anon, that totals 1371 pages just for hand-holding: by a plausible word count, over half the length of the King James Bible (in which, by the way, the word *windows* appears 30 times; "For death is come up into our windows," the prophet Jeremiah was crying about B.C. 630, responding to some vision of Unrecoverable Application Errors).

It grows perfectly clear that Windows will never be as intuitive as its pushers let on. That's been sensed even off in Darkest Microsoft. So the 3.1 manual is a vast improvement on 3.0's (which suggested Solitaire for painless practice with some Windows commands, but forgot to spell out how to get Solitaire running).

And while such fuss was going on in Seattle, in other parts of the country a *lot* of big hand-holder books were being derived from beta copies of 3.1. One reason for Microsoft's prodigality with betas was a hope for a deluge of books to accompany the program's release. But beta users couldn't examine the final version of the program's manual, in part because no final version existed till the eve of press time. So, uncertain what they might be competing with, they typically followed a strategy of exhaustiveness. (And many were updating their own books on 3.0, users of which really did need structured help.)

Thus, *Windows 3.1 Revealed* by Robert Mullen, Paul Hoffman, and Barrie Sosinsky weighs in at 1252 pages. Among its seven "reasons why Windows is sweeping the world" it lists "Windows can run applications that offer high-quality output," and what that may mean remains the authors' secret. The *look* of the output, maybe? Those scalable fonts? Ah well, the countdown against which a monster text got assembled no doubt explains its patches of flabby prose.

Such a book runs in slow motion, very slow. By page 42 we've just gotten Windows installed; by page 53 we know how to get in and get out; by page 97 we've mastered "basic concepts," like using the mouse, moving or resizing windows, and what's to be found inside a dialog box.

Still, useful tips abound. "Selected files can be so far down the file contents list

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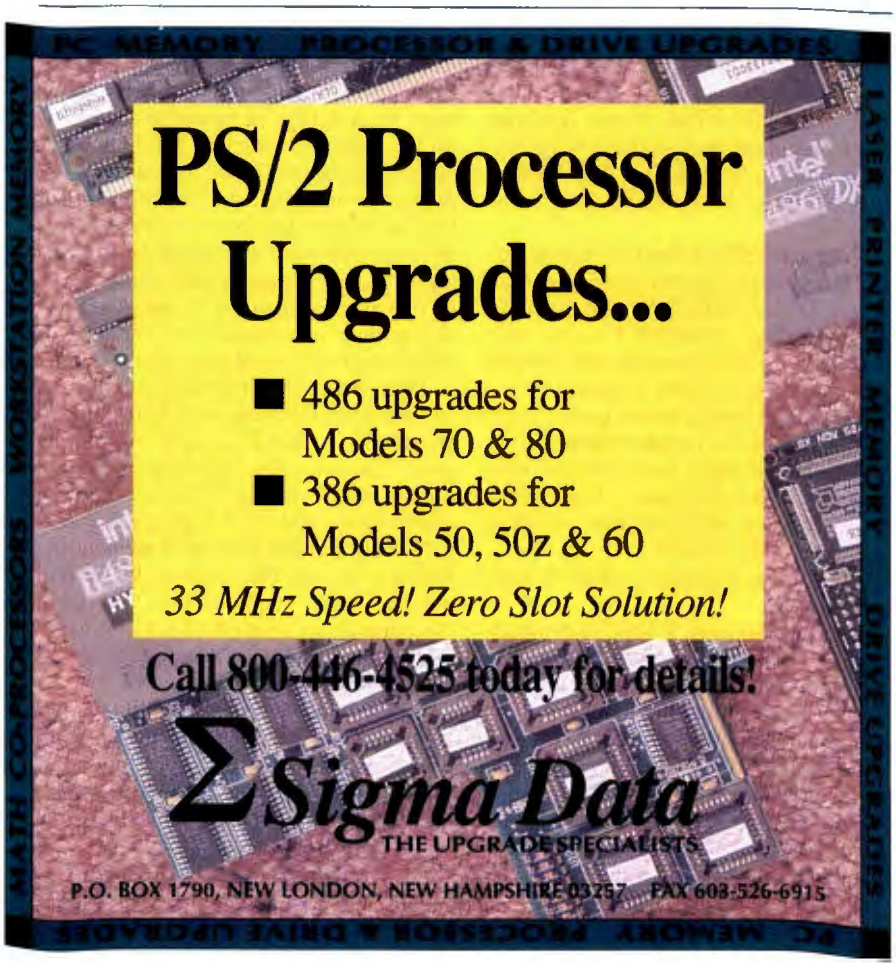

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that you may not realize they are still selected. It's best to check the file contents list one last time before you do anything unrecoverable." Implying as it does the unfenced edge of a pit, that's a warning Microsoft is unlikely to issue. It's easy to imagine being grateful for it at delete time.

Such is one example, perhaps the biggest, of many big books that pretty well follow the outline of the manual. A commendable exception to their formula is *Inside Windows 3.1*, by Jim Boyce, Forrest Houlette, Ellen Dana Nagler, and Michael Wirsching. The authors have targeted their reader: an experienced DOS user who either is new to Windows or has used only pre-3.1 versions. And they're careful never to waste such a reader's time. The 50-odd pages on DDE and OLE are worth the price of the book. Highly recommended.

Next, the advanced books, the ones that assume you're up and running with Windows but feeling a mite hemmed in. My pick would be Brian Livingston's *Windows 3.1 Secrets*. A no-nonsense "Read This First" chapter spells out a governing truth: "While Windows' cute icons give it an easy-to-use look, anyone who has used Windows for a while has found there's a lot going on underneath the surface that is not explained in the manual."

Also present is a key to four icons, which will be pointing us from the text's margin to Undocumented Features (there must be dozens), Workarounds, Error Messages Decoded (sometimes "the correct response is the exact opposite" of what the screen suggests), and 3.1-Specific Material. A very user-friendly layout, and a book exemplary for usefulness and lucidity. (The shareware on the disks, by the way, includes an effort, strictly for the homesick, to simulate the Mac's Trashcan delete.)

Another advanced book is Ed Tiley's *Tricks of the Windows 3.1 Masters*. It's notable for the attention it pays to programming and for the inclusion on disk of Realizer Limited, a sample version of a program that lets you develop Windows applications with a structured superset of BASIC and bypass all the niggles that raise the C code for just displaying "Hello, world!" from five lines in DOS to some 80 lines in Windows.

Or there's Jim Boyce's *Maximizing Windows 3.1*. Like its less advanced sibling *Inside Windows 3.1*, it's notably direct. "Users should not be deceived by the apparent simplicity of the Windows interface," since customizing it to your requirements "can require a considerable investment of time and energy." That's the investment the book sets out to minimize. It's well organized, lucid, and replete with undocumented tips.

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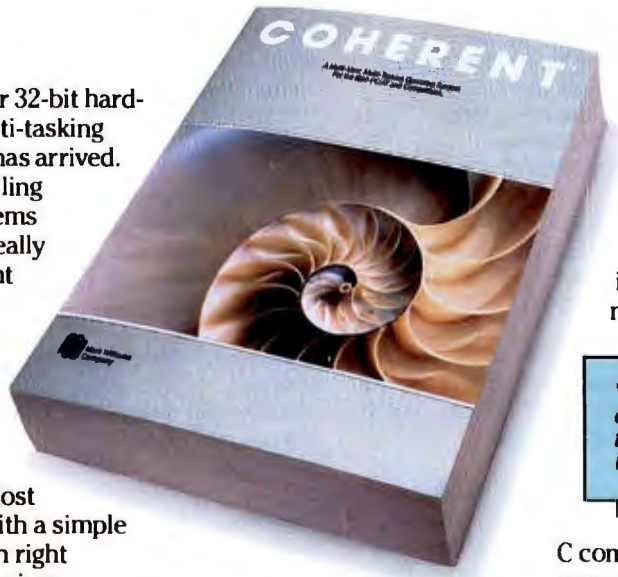

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Windows 3.1: The Pocket Reference, Allen L. Wyatt, McGraw-Hill, 1992, $9.95, 216 pp., ISBN 0-07-881824-9.

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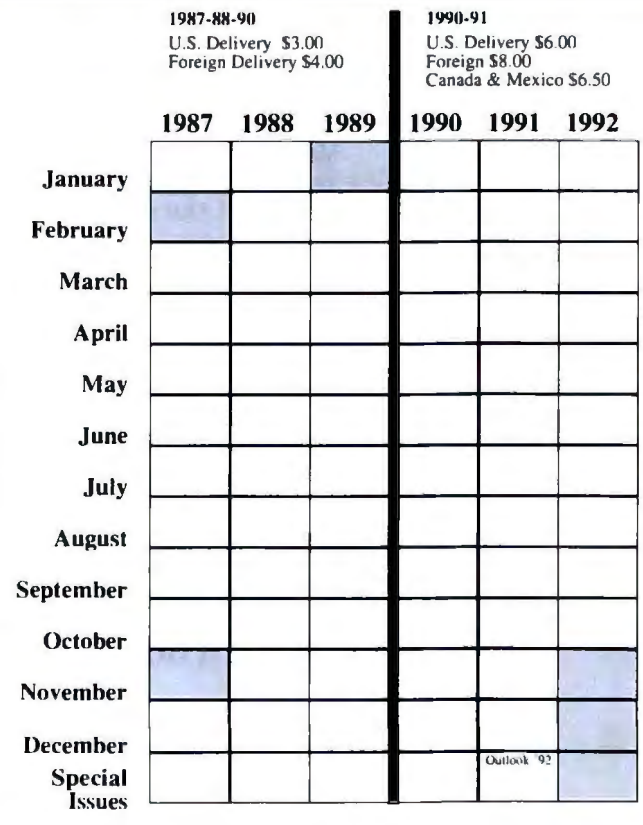

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Windows 3.1 Power Tools by Geoffrey and William LeBlond begins by telling us that Windows is "the platform of choice" for power users: people who want to customize the interface, integrate applications, and optimize system performance. Those are things you spend time doing to save time later. I'm coming to think that's a fair perspective on Windows generally: It can be murder to learn, en route to being dreamy to use. But most of us don't need to learn all about it. We'll mostly run the same software over and over. An accountant juggles a spreadsheet; a writer processes words. So take the time to get your windowed niche optimally comfortable. (The LeBlond book offers much guidance plus a software tool called Oriel.) Then take comfort: All those Windows doodads you are not using need distract you no longer. They're there for other people.

Still, Windows, as Michael A. Banks says, is not perfect, and maybe your niche has shortcomings. Well, a lot of helpful shareware exists if you can find out about it. His *Windows Shareware Book* surveys available stuff by topics, provides prices and contact addresses, and offers a sampling on disk. Ed DiGiovanna's *Windows 3 Shareware Utilities* describes 15 of the programs in the PC-SIG shareware library; the disk samples a few of them. Of the two books, I'd choose the Banks.

Finally, a few special-purpose items. *101 Windows Tips and Tricks* has the cutesiest chapter titles going ("When Your Heart Belongs to Data"; "Icon Get No Satisfaction") and useful stuff like "the fastest way to add a whole bunch of Windows apps to ProgMan." It's for poking around in after you're feeling sort-of-expert.

Or, here's Kay Yarborough Nelson again with *Voodoo WordPerfect for Windows*. Subtitled "Tips & Tricks with an Attitude," it offers things that aren't on any menu, such as the quick way to clear the current document (Ctrl-Shift-F4), or the right way to delete items from tables of contents (be sure to take out mark codes also), or how to wrap text around both sides of a graphic (get the book). Her knowledge of arcana is uncanny; she even reports a "Cinderella Bug" in early releases "that won't let you compile a macro between 12:00 and 12:59 A.M. and during the first minute of every hour." Some programmer, she thinks, had fun with that.

Finally, now that you're comfortable with Windows, you have occasional trouble remembering some procedure. So here's Allen L. Wyatt's *Windows 3.1: The Pocket Reference*, filling a need. "Puts all essential Windows features and commands at your fingertips," says the blurb, accurately. Moreover, the spine is alleged not to split if you crack the book flat. Timothy S. Stanley's *Windows 3.1 Quick Reference* fills a similar need with a different organization but has nothing to say about its spine. Take your pick. Mine's the Wyatt.

Whew, what a list. Books are piled all over the floor. And Lord, the hurry that attended their production! I'll not say which author dedicated a book "to Bets, my adoring wife." That's dated Valentine's Day, 1992, our man presumably groggy from key-punching. Not for me to suggest that what he meant was "adored." He may even have meant what he said. Knowing what you really mean is the beginning and end of Windows. ■

Hugh Kenner is Franklin and Callaway Professor of English at the University of Georgia. He writes for publications ranging from the New York Times *to* Art & Antiques. *His recent books include* Mazes *and* Historical Fictions. *He can be contacted on BIX as "hkenner."*

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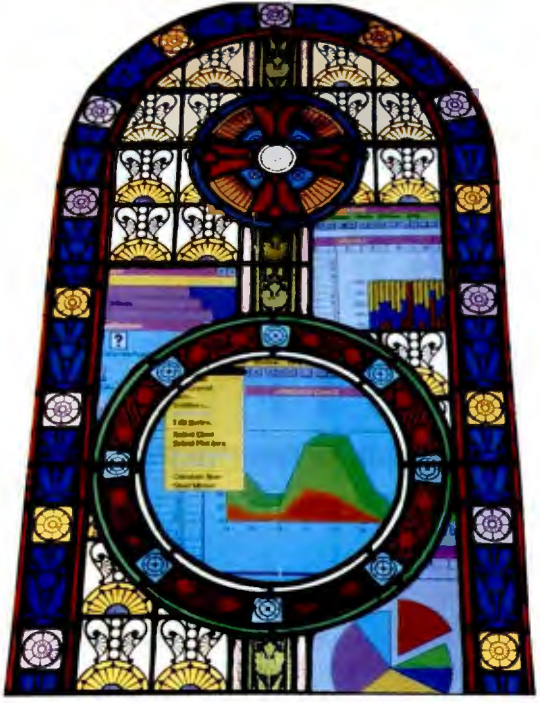

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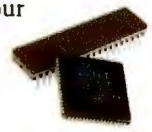

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SPREADSHEETS UNDER SCRUTINY

Lotus 1-2-3 for Windows 1.1, Excel 4.0, or Quattro Pro for Windows 1.0—which one's best for you?

NICHOLAS DELONAS

What do you want in a spreadsheet? Would you rather have the fastest number cruncher or a superslick report publisher? Are you looking for mainframe data access and analysis? Or are sophisticated application development tools more important? Are you a novice or an experienced spreadsheet user? The answers to questions like these determine which of the three heavyweight contenders gets to wear the Windows spreadsheet crown. Lotus 1-2-3 for Windows 1.1 (1-2-3/W), Microsoft Excel 4.0 for Windows, and Quattro Pro for Windows 1.0 all have their strengths and weaknesses.

You'll find a performance comparison for the three programs in table 1. Be aware that I tested Quattro Pro using the second-to-last scheduled beta version of the product. At the time of my testing, Borland stated that the final version should be somewhat faster loading and with file I/O.

Excel proved to be the fastest overall, but results varied significantly by task. If, for example, printing speed is important to you, 1-2-3/W is a better choice than Excel, although it was the slowest on average.

Both Lotus and Microsoft urged me to use "real-world" applications for testing their products. Of course, they had different ideas about just what that means. Both companies supplied testing ideas, and Lotus even sent a sample file. The Lotus file looked like a commonsense application for calculating the cost of a home purchase. I removed all the extraneous sheets that seemed designed to make Excel look bad. Even so, the resulting model ran much faster in 1-2-3/W than in Excel. The results for that file are shown in table 1 under "Recalc 3-D sheet 2." Lotus apparently wasn't thinking about Borland, however, because Quattro Pro proved to be even faster with that "typical" application.

I eventually tested the products using several files of my own design, including single-sheet (2-D) and multiple-sheet (3-D) applications. The 2-D sheet 1 contained a smattering of most of the cell functions available in 1-2-3 release 2.01; the 2-D sheet 2 included simple summations of long columns and rows of values. The 3-D sheet 1 was an expanded version of the 2-D sheet 1 with a few links between sheets; the 3-D sheet 2 was a modified version of the test file supplied by Lotus. The test file had many links between the sheets, a calculating weak point in Excel that Lotus apparently realizes.

Microsoft suggested that a sort operation would be a good performance measure; that sounded fair enough. The file I used to benchmark sorting contained a 4-column by 5400-row table. All three programs had to sort on two keys. The first key column held multiples of about a dozen unique labels, while the second key column held random values. Predictably, Excel did very well on the test Microsoft suggested was most important.

All test files were in the native file formats for each program. For the loading and scrolling tests, I did a series of runs using a stopwatch and averaged the results. For the other tests, a 1-2-3–style macro recorded start and stop times and ran the test between the two. While this seems like a slight disadvantage for Excel, the execution time for the macro was insignificant.

Besides speed, you need to consider the memory and resources a program requires. Table 2 shows the effect on these after I loaded and unloaded each program with two file situations. In the first case, I loaded each program with one open, blank file. In the second case, I loaded each program with 16 open, blank files to check how efficiently the programs use the Windows MDI (Multiple Document Interface).

Resources are an important commodity in Windows—far more so than memory or disk space. Lotus 1-2-3/W came out on top here. In contrast, Excel showed a real weakness when I opened multiple files, using more than twice as much of the Windows resources.

Lotus 1-2-3/W limits you to 16 open

BYTE ACTION SUMMARY

WHAT WINDOWS SPREADSHEETS DO
They bring the spreadsheet metaphor to a GUI. This allows for the inclusion of powerful new visual tools for spreadsheet publishing, data access, and application development.

LIKES
These products make it easy to exchange spreadsheet data with other Windows programs. Icon bars are handy for automating common tasks. Two of the programs let you drag and drop ranges from one place to another using the mouse. Two also provide short context-sensitive menus that pop up when you press the right mouse button.

DISLIKES
They use up way too much hard disk space. All require more powerful computers than their DOS counterparts.

RECOMMENDATIONS
Quattro Pro for Windows is the easiest to use and has the best graphics and development tools. Excel is especially feature-rich and includes many advanced functions not found in its competitors. Lotus 1-2-3/W can connect to the most external data sources and prints the fastest.

PRICE
Lotus 1-2-3 for Windows 1.1, $595
Microsoft Excel 4.0 for Windows, $495
Quattro Pro for Windows 1.0, $495

files. Excel has no such restriction, but it quickly uses up all system resources—I could open only 28 files before exhausting the resources. Quattro Pro also imposes no restriction, and it managed to open 52 files before running out of resources. Speaking of restrictions, table 3 compares the working limits of the programs.

Still, performance and resources aren't the whole story. Table 4 lists a sampling of supported features. While it's handy for checking on specifics that are important to you, it provides no indication of how easy each feature is to use. An operation might require one mouse-click in one product and a long series of commands in another. And just because a product claims a feature, it doesn't mean the feature works well. For example, all three products are DDE-compliant and can function as DDE servers, but Excel usually does a better job of updating links from named ranges if you move those ranges in the source worksheet.

Substantial Differences

The marketing materials for these products are likely to extol the virtues of icon bars, 1-2-3 macro compatibility, and automatic features such as intelligent formatting and series fill. But all three products share these features and perform them well enough to invalidate them as selection criteria. There are, however, some real differences in the everyday operational features of these products.

For example, the products differ dramatically in the way they cut and paste data. The Excel method is the strangest: When you cut, the current selection does not disappear until after you paste. Also, in both Excel and Quattro Pro, a cut-and-paste moves the formula in such a way that all relative cell references point to the original cells. In 1-2-3/W, the operation is more like a copy where relative cell references change to refer to new cells. Because 1-2-3/W's method works like a copy instead of a move, you can cut a range and paste and repaste that range to many new locations. Excel, on the other hand, clears the Clipboard, so you can paste only once.

Quattro Pro takes a compromise approach. You can cut a range and paste it more than once. The first paste behaves exactly like Excel's paste (a move), and all subsequent pastes behave like that of 1-2-3/W (a copy).

A bigger issue is the way the programs handle multiple sheets in a single file. Both 1-2-3/W and Quattro Pro are true 3-D spreadsheets; Excel is not. Excel ostensibly matches 3-D functionality by letting you save multiple 2-D sheets in a single disk file. That works well unless you really push the program.

As a test, I tried loading a 68-KB WK3 file into all three programs. It was a simple 3-D application with a separate sheet for each week of the year. Each sheet contained a screenful of values and one link to the previous sheet. Not only was Excel unable to load the file, but when I tried to do so, it locked the system. I had to press Ctrl-Alt-Del to unload Excel and get back to Windows. Quattro Pro and 1-2-3/W both loaded the file easily. Of the two, 1-2-3/W used less memory and fewer Windows resources.

So, while you can link formulas between sheets in an Excel workbook (like a file link), the result is less effective than the same configuration in either of the competitors. How important is this difference? If you doubt you'll ever use more than a dozen sheets in one file (which is a lot), Excel should work just fine.

Lotus 1-2-3 for Windows 1.1

Lotus 1-2-3 for Windows is at the bottom of the leapfrog cycle. The major releases of Excel and Quattro Pro are more recent.

continued

SPREADSHEET PERFORMANCE COMPARISON

Table 1: *The products were tested on a Tangent 486/33 with 8 MB of RAM, a 420-MB hard drive with an IDE caching controller (a 2-MB cache), and a Super VGA monitor (but with a Windows VGA driver). All tests used Windows 3.1. (All times are in seconds.)*

	1-2-3	Excel	Quattro Pro
Load program	10.6	5.4	15.3
Open 2-D file	11.4	7.0	6.3
Open 3-D file	14.4	16.9	7.5
Recalc 2-D sheet 1	36.0	12.0	12.0
Recalc 2-D sheet 2	74.0	27.0	26.0
Recalc 3-D sheet 1	248.0	161.0	209.0
Recalc 3-D sheet 2*	11.0	136.0	10.0
Run 1-2-3 r. 2.01 macro	131.0	158.0	340.0
Scroll down 500 rows	76.7	51.2	61.9
Scroll right 256 columns	57.4	75.6	79.5
Sort test (2 keys)	11.0	4.0	9.0
Print range with pictures	293.1	422.6	305.7
Print range with formatting	159.3	183.2	290.7
Print plain range	39.9	96.3	57.3

* Based on template provided by Lotus Development.

MEMORY AND RESOURCE HANDLING

Table 2: *Opening and closing the same single file or the same 16 files can produce dramatic differences in memory and resource allocations.*

	1-2-3	Excel	Quattro Pro
Program alone			
Memory used (KB)	785	308	1702
Memory not returned (KB)	16	12	35
Resources used	16%	16%	27%
Resources not returned	3%	3%	3%
16 open files			
Memory used (KB)	949	444	1987
Memory not returned (KB)	21	41	54
Resources used	24%	45%	42%
Resources not returned	4%	8%	8%

SPREADSHEET QUANTITIES

Table 3: *If you're wondering whether that big project might exceed the capacities of one of these spreadsheets, look for their limits here.*

	1-2-3	Excel	Quattro Pro
Maximum characters in formula	511	1024	1022
Maximum characters in label	511	254	1022
Maximum number of viewing panes in a sheet	2	4	2
Maximum number of sheets	256	[1]	256
Maximum sort keys for table sorting	255	3	5
Maximum what-if table variables	3	2	2
Number of cell functions	108	307	116
Number of columns	256	256	256
Number of graph types[2]	60	90	34
Number of macro keywords	86	400+	147+
Number of rows	8192	16,384	8192

[1] Limited by memory. [2] By my count.

Thus, they match and better the most conspicuous innovations introduced in 1-2-3/W (e.g., the customizable icon bar).

Lotus 1-2-3/W is definitely a Windows product. So, for old-time 1-2-3 hackers, this is a new ball game. The Windows version provides a classic compatibility box that lets you use slash commands the same way you did before. But you get the same functionality in Excel and slash-command compatibility via macros in Quattro Pro. Slash commands execute much faster in 1-2-3 than they do in Excel.

Lotus can legitimately claim that the switch from 1-2-3 for DOS to 1-2-3/W is easier than the switch to Excel. Following a recent court ruling, Borland has had to remove its Lotus-like inferface, but Quattro Pro still shares many of the same @ functions and macro commands as 1-2-3/W. Quattro Pro does not provide slash-menu compatibility on-screen, but its Windows menus are easy to master.

For users not familiar with spreadsheets, getting started in 1-2-3/W is easy, and the on-line help system is good. The package does not ship with an on-line tutorial. The company does offer a CD-ROM version of 1-2-3/W that ships with an impressive multimedia help system and an animated interactive tutorial.

Lotus 1-2-3/W is the only product that provides context-sensitive help during formula or macro entry. So, if you type @DDB(into a cell and press F1, 1-2-3/W pops up the help page for the double-declining balance formula. Excel doesn't match this great feature, and Quattro Pro provides it only for @ functions.

Aside from the help features, 1-2-3/W offers little to differentiate it from the competition. It lets you select a range either before or after a menu command. In Excel, you must preselect. Lotus 1-2-3/W also offers true 3-D technology (see screen 1), which is an advantage over Excel for some people. But Quattro Pro offers the same technology with a superior interface. Although Excel doesn't provide true 3-D, its multisheet workbook is easier to grasp than 1-2-3/W's interface, and Excel's system works just as well for all but the most demanding multisheet applications.

If you are planning to go with 1-2-3/W simply because you want to use your old 1-2-3 for DOS files, don't worry about it. All three programs do a good job of importing them. If you want to maintain macro compatibility, all three programs run release 2.01 macros quite well. However, 1-2-3/W provides the only compatibility with the new macro commands in 1-2-3 for DOS release 3.x.

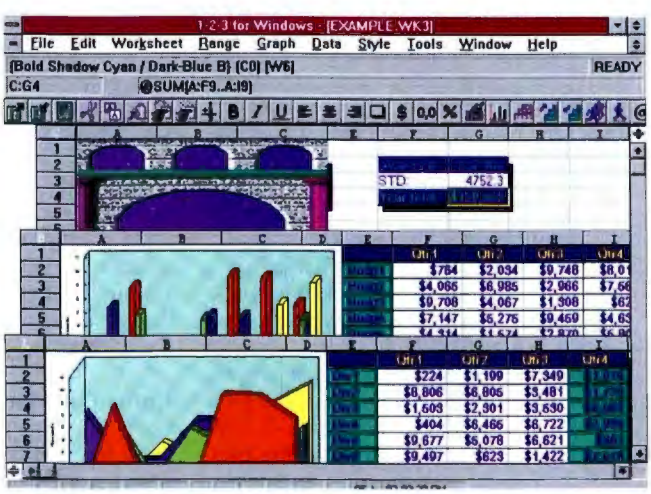
Of the three programs, 1-2-3/W is the least compatible with other file formats Most of the files it can allegedly import and export must first be translated with a DOS-based translation utility, the same utility that shipped with 1-2-3 release 3.1. On the other hand, 1-2-3/W works well with the rest of Lotus's suite of Windows applications—Ami Pro, Freelance Plus, Notes, and cc:Mail.

If file compatibility isn't an issue for you, perhaps development tools are. Although Excel provides a more powerful macro facility than 1-2-3/W, it is unquestionably a more difficult language for a nonprogrammer to learn. Also, if you already know the 1-2-3 command language, switching to Excel results in something akin to culture shock. The same is not true with Quattro Pro. As with 1-2-3/W, Quattro Pro's macro language is a superset of 1-2-3 release 2.01's macro language, and a more extensive one at that. Quattro Pro has 1-2-3/W beat on this front.

Lotus 1-2-3/W also includes the same dialog-box editor that ships with Ami Pro, so you can build custom dialog boxes for macro control. This editor is better than the one in Excel, but it's not nearly as good as Quattro Pro's.

Although 1-2-3/W lacks a good way to create macro libraries, something that's easy to do in the other programs, it does provide good file security, and it is certainly possible to create powerful applications using the macro language alone. If you'd like more power, you can develop add-ins (i.e., DLLs) by buying Lotus's Add-in Development Kit for C or Techno-Jock's Addvantage for Turbo Pascal.

Finally, 1-2-3/W provides some fairly decent, if hard-to-use, tools for manipulating data. You can perform database joins as in the other products, but 1-2-3/W also has a sophisticated facility for creating what Lotus calls *calculated* (i.e., result of function operating on database fields) and *aggregate* (i.e., alternate cross-tabulation)



Screen 1: *Lotus pioneered the 3-D spreadsheet technology. Lotus 1-2-3 for Windows is the only spreadsheet program that gives you a perspective view, as shown here. But the same practical functionality is achievable in Quattro Pro and Excel using the Windows MDI.*

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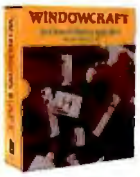

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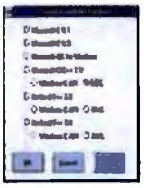

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columns. The other programs lack capabilities for worksheet-based data tables.

Lotus 1-2-3/W can use external data tables via Lotus's DataLens technology. Out of the box, you get hooks into dBase, Paradox, and SQL (Structured Query Language) server tables. In addition, more than 40 other drivers are available through Lotus and third-party vendors, so you can tie directly into a much wider array of data sources than is now possible with either Excel or Quattro Pro.

Microsoft Excel 4.0

In many ways, Excel is the odd man out. While Quattro Pro is obviously modeled after 1-2-3, Excel most definitely is not. Oh, Microsoft does borrow ideas from 1-2-3 and routinely copies the features and even the syntax of some add-ins available in the 1-2-3 aftermarket. Still, Excel is a very different animal.

Whereas 1-2-3/W and Quattro Pro use a plus sign to start a cell formula, Excel uses an equal sign. Functions in Excel have no distinguishing starting character; in 1-2-3/W and Quattro Pro, each function begins with an @ sign. But that's not all. In Excel, you separate the end points in a range reference using a colon instead of the double dots of 1-2-3 and Quattro Pro. OK, that's easy, but it might confuse anyone used to 1-2-3 release 3.x, where the colon separates the sheet identification from the cell range. Excel uses the exclamation point for that.

For example, consider the 1-2-3/W formula @SUM(C1..C:E7). The equivalent formula in Excel reads =SUM('[FILE.XLW]A:C'!C1:E7). Note that Excel first identifies the range of sheets, A to C, and then identifies the range of cells, C1 to E7.

While the 1-2-3/W style looks simpler, you're pretty much stuck with it to create multisheet formula references. Unlike 1-2-3/W, Excel lets you name sheets. If you name them March, April, and May, the formula becomes =SUM([FILE.XLW]Mar:May!C1:E7). Excel also lets you use an alternative style of function display that's more like array notation. Under this global option, the formula becomes =SUM([FILE.XLW]Mar:May!RC[2]:R[6]C[4]).

You'll need to learn this last style if you expect to do anything meaningful with the Excel macro language. It may look scary, but it's not hard to master. The R[6]C[4] part of the formula simply says to select the cell that's six rows down and four columns to the right.

Excel also provides a unique formula type called the *array formula*. It lets you enter a single formula for a range of cells. Array formulas can reduce entry time and

SPREADSHEET FEATURES COMPARISON

Table 4: *Feature comparison made easy: almost everything you'll ever need to know about 1-2-3/W, Excel, and Quattro Pro.* (● = yes; ○ = no.)

General features	1-2-3	Excel	Quattro Pro
Accept Lotus 1-2-3 release 2.01 slash (/) commands	●	●	○
Accept standard date entries without requiring use of function	●	●	●[1]
Access dBase files	●	●	●
Access Paradox files	●	○	●
Access external database tables	●	●	●
Access SQL Server	●	●	○
Add bit maps to graphs	○	○	●
Add graphical images to sheet	●	●	●
Add menu items linked to macro to standard menu	●	●	●
Add-in developer's toolkit available	●	●	●
Adobe Type Manager support	●	○	○
Aggregate columns in data extracts	●	○	○
Interrupt cell entry and switch to another Windows program	○	●	●
Array formulas	○	●	○
Assign macros to graphical objects in sheet	○	●	●[2]
Attach macro to button on sheet	○	●	●
Audit functions	○	●	○
Automatic graph generation	●	●	●
Automatic number formatting based on contents	○	●	○
Automatic number formatting based on reference[3]	○	●	○
Automatic parenthesis completion[4]	○	●	○
Automatic range formatting[5]	●	●	●
Automatic series fill	●	●	●
Automatic database form (dialog box)	○	●	○
Reduce print size to fit on printed page	●	●	●
Autosum multiple columns via icon	●	○	●
Autosum single column via icon	●	●	●
Cascade windows	●	○	●
Cell annotation	●	●	●
Center label across columns	●	●	○
Change 3-D chart orientation	○	●	●
Compatible with Windows 3.1 TrueType fonts	●	●	●
Compute new fields upon data extraction	●	○	○
Context-sensitive help	●	●	●
Create and use named format styles	●	●	●
Create custom cell functions using macro language	○	●	○
Create custom dialog boxes for gathering data	●	●	●
Create custom-cell formats	○	●	●
Create on-screen slide shows	○	●	●
Cross-tabular analysis	●	●	○[6]
Cross-tabular analysis on external databases	○	●	○
Customizable icon bar	●	●	●
DDE compliant	●	●	●
Discontinuous range printing	●	●	●
Display ruler in worksheet frame	●	○	○
Display text vertically in cells	○	●	○
Drag-and-drop range movement	○	●	●
Edit across sheets (group mode)	○	●	●
Execute 1-2-3 release 2.01 macros without translation	●	●	●

[1] Need to first press Ctrl-Shift-D.
[2] Paste bit map onto a button
[3] When a formula refers to other cells with a format other than General, it automatically formats current cell with that format
[4] Enters closing parenthesis if you forget
[5] Smart format.
[6] May ship in final product

SPREADSHEET FEATURES COMPARISON

General features	1-2-3	Excel	Quattro Pro
F1 calls help for function or macro during entry	●	○	○
Float icon bar	●	●	○
Format across sheets (group mode)	●	●	●
Graphical dialog-box builder to create custom dialog boxes	●	●	●
Icon bar	●	●	●
Include returns and tabs in formulas for easier reading	○	●	○
In-sheet graphics not restrained by cell boundaries	○	●	●
Left-align numbers as well as text	○	●	●
Link cell to external file	●	●	●
Macro-record facility	●	●	●
Minimal recalculation	●	●	●
Mix text and graphics on sheet	●	●	●
Model copy	○	○	●
Move and insert cells between other cells (range of cells expands automatically)	○	●	○
Move between sheets in group mode	●	○	●
Move whole sheets in multisheet file	○	●	●
Multimedia tutorial/help system available	●	○	○
Multiple views of same spreadsheet via MDI	○	●	●
Multivariable goal seeking	●	●	●
Name text-format styles for reuse	●	●	○
OLE compliant	○	●	●
On-line tutorial	○	●	○
Outlining	○	●	○
Password: prevent opening of file	●	●	●
Password: prevent saving of file but allow reading	○	●	○
Paste graphics from Clipboard	●	●	●
Preview reports before printing	●	●	●
Print current worksheet range without having to preselect range	●	○	●
Protect cell ranges (disallow changes)	●	●	●
Protect graphical objects (disallow resizing or movement)	○	●	○
Protect windows (disallow resizing or movement)	○	●	○
Radar charts	○	●	○
Read Allways format files	●	○	●
Read/write Impress/WYSIWYG format files	●	●	●
Remove standard menu items via macro	○	●	●
Replace standard menus with custom Windows menus	●	●	●
Right mouse button calls short menu appropriate to current selection	○	●	●
Save appearance of speadsheet workspace (view)	○	●	○
Scalable fonts	●	●	●
Scenario facility	○	●	○
Search and replace	●	●	●
Select discontinuous ranges in sheet	○	●	●
Select whole row or column by clicking border	○	●	●
Single variable goal seeking	●	●	●
Snap icon bar to top, bottom, or sides of screen	●	●	○
Solver technology	●	●	●
Sound-annotation capability	○	●	○
Spelling checking	○	●	○
Tile all windows horizontally	○	●	○
Tile all windows vertically	○	●	○
Tile windows as panes	●	●	●
Toggle between black-and-white and color displays	●	○	○
Translates 1-2-3 r. 2.01 macros to Windows equivalent	○	●	○
True 3-D spreadsheet	●	○	●
Zoom view of worksheet in and out	●	●	●

save memory, and they also come in handy for advanced applications. They're likely to appeal to advanced users while going unnoticed and unmissed by everyone else.

There's a lot in Excel that appeals to advanced users. It is very much a power user's spreadsheet. Microsoft marketers swear up and down that Excel's greatest strength is its ease of use. Don't believe it. While getting started with Excel is certainly easy, getting started with all three products is easy. Excel's easiness ends there, because making the transition from the spreadsheet basics to power use is more difficult than with the other products.

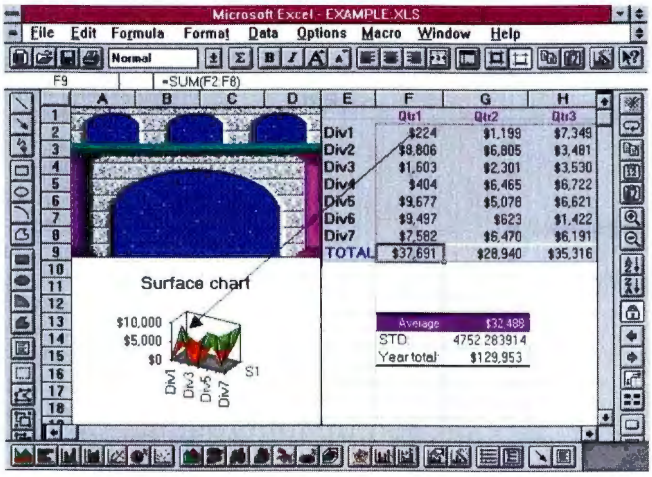
You'd think that Excel would be the prototypical Windows application. But as previously mentioned, the cut-and-paste procedure is anything but typical. Even the copy function doesn't work as expected. When you select Edit and Copy, Excel highlights the selected range. You can then paste multiple copies of the data (unlike with the cut-and-paste procedure). However, if you do something else, like format a cell, Excel erases the contents of the Clipboard. That's most unusual and annoying. Excel also mysteriously lacks the ability to cascade open files—a standard option in most Windows applications. It does provide three ways to tile open files: vertically, horizontally, and as panes.

Excel makes it easy to import data. For example, you can quickly enter data in a block of cells. You just select the range and start entering. The cell pointer automatically moves to the next available cell within the block, switching to the top of the next column when you reach the bottom of the current one. This is a great little feature.

An even better one is the Paste Function command. Paste Function pops up a dialog box that lists all the cell functions both alphabetically and by category. When you select a function, Excel prompts you for the arguments. So, if you select NPV, Excel places =NPV(rate,value1,value2,...) in the formula bar and prompts you for the rate argument. You either enter a value or click on a cell that contains one. Then Excel prompts you for the next argument, value1, and so on.

This system isn't perfect because you often don't need to use all the available arguments. Still, it is a feature that beginners and masters alike will love. Most will also appreciate the fact that Excel provides real information in cell-level error messages. Instead of the simple ERR that you get in 1-2-3 and Quattro Pro, Excel provides seven types of error messages to give you a better idea of what went wrong.

Once you've entered your data and formulas, Excel makes it easy to rearrange them. Unlike 1-2-3/W, Excel lets you



Screen 2: *Excel has one-upped 1-2-3/W with its icon-bar facility. You can display many icon bars or none at all. You can float them as dialog boxes or snap them to any side of the screen. Excel provides some excellent drawing capabilities that let you draw lines, arrows, and so on over any objects on a sheet.*

select and move a range directly with the mouse. Lotus 1-2-3/W requires clicking on an icon to do the same task—adding one extra mouse-click. That icon keeps 1-2-3/W from looking bad in this case. Icon bars are good for that. They quickly add a lot of functionality, and Microsoft was quick to jump on the icon bandwagon. While Excel's icons aren't as pretty as 1-2-3/W's, they are better organized and thus more practical.

Excel organizes icon bars by type (see screen 2). You get tools conveniently categorized for formatting, charting, drawing, developing, and more. You just click the right mouse button on the current icon bar to pop up a menu of all available icon bars and check all the ones you want to make visible. Once they are visible, you can drag them around with the mouse or snap them to the top, bottom, or sides of the screen. You even have the option of creating your own bars.

In 1-2-3/W, you get only one icon bar. You can add and remove icons from that bar, but this is much less efficient than Excel's method. Quattro Pro also doesn't match the flexibility of Excel's icon-bar facility, although Quattro Pro has a better shortcut menu system than Excel that lessens the need for icons. Both Excel and Quattro Pro offer a great time-saver in the shortcut menus that pop up with a click of the right mouse button. With one click, Excel pops up a small menu of commands that are applicable to the current selection. This is handy, but it's better implemented in Quattro Pro.

On the compatibility front, Excel does well, especially with 1-2-3 files. It opens any 1-2-3 file right from the File | Open dialog box. To translate the file to Excel's format, you choose Save File as Type and select Normal before saving. This is far more sophisticated than anything you can do with 1-2-3/W. Quattro Pro offers a similar facility with many more data types, but Excel's is easier to use.

Excel 4.0 also includes a new facility for running old 1-2-3 release 2.01 macros, which works remarkably well. It works better than the same facilities in 1-2-3/W and Quattro Pro, although 1-2-3/W runs the macros faster. Excel is better because of the elegant way it handles old prompting commands like {MENUBRANCH} and {GETLABEL}.

Unfortunately, Excel runs only 2.01-style macros that already exist; you can't create new ones, because there is no way to assign a backslash/letter range name (e.g., \m) and no applicable run command. So, while you could go ahead and write a 2.01-style macro in Excel, you would have no way to run it. You can, however, modify old 1-2-3 macros using 2.01 commands. You also can add calls to new Excel macros from old 2.01 macros.

The fact that you cannot create new 1-2-3-style commands might be important, because Excel macros are completely different from the 1-2-3-style macros found in both 1-2-3/W and Quattro Pro. Excel doesn't make a big distinction between cell functions and macros, the way 1-2-3 does. In Excel, both macro functions and cell functions look pretty much the same.

People used to 1-2-3 macros will have some trouble learning the Excel way of doing things. Undoubtedly, the Excel style of macro programming is much harder for any beginner to learn than the 1-2-3 style. That said, the Excel macro facility is quite powerful. Anyone experienced with Pascal or C is sure to appreciate the Excel way of doing things. Unlike 1-2-3, Excel lets you nest comments and indent lines of code for easier maintainability. The language also encourages a structured approach (more so than 1-2-3), although chaos can still easily reign.

You can use Excel's macro facility to create your own cell functions and macro add-ins. In fact, many whiz-bang features in Excel (e.g., the scenario manager) are actually macro add-ins. The fact that you can use the macro language to create both cell functions and well-integrated add-ins is a big plus for serious applications developers.

You can use the macro language to change the Excel environment pretty seamlessly. From a user's point of view, there is not much difference between an add-in written using C and one written using macros. You can easily make your custom cell functions and macros a regular part of the spreadsheet, because Excel automatically loads any worksheets, workbooks, macro sheets, charts (graphs), or add-ins that are stored in a special subdirectory called \XLSTART. Excel also provides a dialog-box editor that lets you graphically create custom dialog boxes for use with your macros. However, Excel's editor is the weakest of the three programs.

You get the same types of in-sheet data-manipulation facilities in Excel as in 1-2-3/W. Excel has a special dialog box, reminiscent of Lotus Symphony's Form environment, that lets you browse a database a bit more intuitively than is possible in Quattro Pro and 1-2-3/W.

Excel includes Pioneer Software's Q+E for accessing external data tables. Q+E is a decent, though separate, program. Excel supplies an add-in that lets you get to the features of Q+E directly from the spreadsheet. Q+E provides access to tables in ASCII, dBase, DEC Rdb, Excel, Oracle, and SQL Server. You can purchase additional drivers from Pioneer.

Quattro Pro for Windows 1.0

Quattro Pro for Windows is the most recent of the three spreadsheet programs. The test version I used had several crashing bugs, but Borland is aware of them, and I assume that the final version won't have these otherwise damning problems.

Although it's not as feature-rich as Excel, Quattro Pro is one slick product, and it's better integrated than either of the other programs. While Excel carries lots of punch, it feels like a patchwork of functionality—as if Microsoft added layer after layer onto some original core of code. That's OK, but some layers don't seem to fit cleanly. Lotus 1-2-3/W suffers from the same problem—it feels as if the Windows interface had simply been placed on top of 1-2-3 for DOS 3.1. In contrast, Quattro Pro feels fresh, tight, solid, and new.

The big news with Quattro Pro is the notebook interface. Quattro Pro provides the same advanced 3-D technology available in 1-2-3/W in an easy-to-understand

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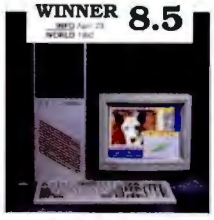

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user interface that looks like a notebook with page tabs at the bottom. This design is far superior to the multisheet interfaces provided in either 1-2-3/W or Excel.

You can treat sheets just like any other object. A right mouse-click on any tab pops up a property inspector for that whole sheet (like Excel's shortcut menu, only better). Press the left mouse button on a page's tab, and you can drag that page to move it anywhere else in the notebook.

This ability provides some interesting possibilities for scenario analysis. For example, you could create a section of pages with summary formulas shown on the cover page and drag pages containing alternative investment possibilities into and out of that series of pages, instantly seeing the effect on the return.

Like Excel, Quattro Pro lets you name pages, which makes formulas that refer to multisheet ranges much easier to read. For example, if you were to name 12 sheets for the months of the year, a typical formula covering the first quarter might read @SUM(Jan:B1..Mar:B12) instead of the cryptic @SUM(A:B1..C:B12) that you'd get in 1-2-3/W. But Quattro Pro doesn't stop there. You can change the global formula syntax from the 1-2-3 style to an Excel-like, alternative style. The result is the more intuitive @SUM(Jan..Mar:B1..B12).

Even better, you can use Quattro Pro's very advanced group-mode features to name those three pages Quarter1. Even when group mode is off, @ functions recognize group names, so the summation formula becomes even clearer and reads @SUM(Qtr1:B1..B12).

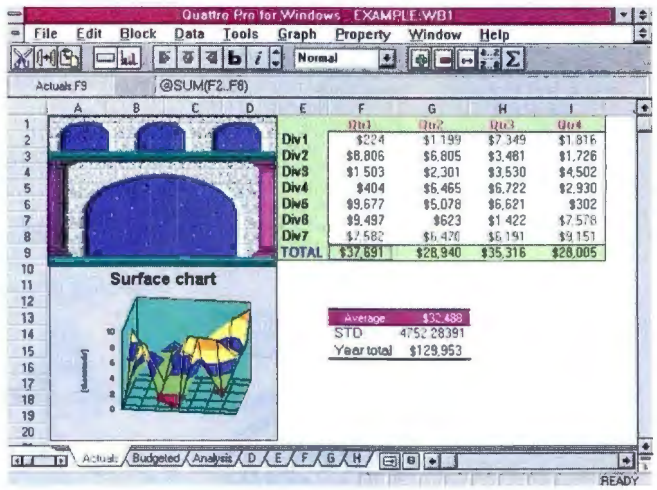
Quattro Pro beats Excel with its "drag-and-drop" facility. In Quattro Pro, you select a range and hold down the left mouse button anywhere on that range to drag it to a new location. In Excel, you have to click on the thin border of the range before dragging, making it a more delicate operation. Excel does let you drag and drop a single cell, though, while Quattro Pro does not. This is a flaw that Borland should fix in the next release, perhaps with a double-click select.

Whereas 1-2-3/W with DataLens and Excel with Q+E can both access dBase files, Quattro Pro goes much further and lets you load a dBase file right into the spreadsheet from the File Open dialog box. You get the file right there in the worksheet, where you can examine and edit it. Choose File and Save, and Quattro Pro saves your edits in the original dBase format. You also can readily translate to any of the other supported formats. This is an example of Quattro Pro's tight integration.

Quattro Pro's graphics capabilities are outstanding (see screen 3). As in Excel, you can place graphics images in a screen show that uses effects such as fades and wipes. Excel lets you place textual information from the spreadsheet into its screen show; Quattro Pro does not. Excel also lets you attach sound to images if you have the requisite multimedia hardware. But Quattro Pro's screen show is easier to use, and the resulting visuals are better.

Quattro Pro provides a familiar superset of the 1-2-3 release 2.01 command language. Experienced 1-2-3 users will feel right at home and will quickly pick up the new commands for dealing with the Windows environment. There's also a macro debugging facility that's superior to what you get in either of the other programs. It lets you set watches, breakpoints, and more. Developers will love it.

As in all the programs, you get a dialog-box editor, but the similarity ends there. UI Builder is actually part of Quattro Pro, and not an external program. It is more attractive than its counterparts, offers more tools, and is easier to use. It even lets you connect objects in the dialog box with objects on a worksheet just by



Screen 3: *Quattro Pro's graphics are super, and the notebook metaphor is a wonderful innovation. To move to a separate page, you just click on any tab. Each tab is a full spreadsheet of 256 columns by 8192 rows.*

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He wasn't famous. He didn't drive a fancy car, but dressed in his favorite Comdex T-shirt and faded blue jeans, he set out to change the course of the computer software industry. Quite a task for a lonely software developer.

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The Global Marketplace

From Paris to Prague, his program was everywhere in Europe. When he got off the plane in Hong Kong he found his program stacked to the ceiling in every computer store. Amazed in disbelief, he bought a hundred cartons of cigarettes and a hundred pounds of Indonesian coffee and flew back to Boston.

Beaten, battered and bruised he went back to the drawing board. This time he would really change the face of the software industry. He would develop a device that would prevent unauthorized distribution of software programs.

Call It What You Like

He developed a hardware key. His peers applauded his efforts. Finally, a solid solution for revenue protection.

But he didn't know what to call it. He thought of naming it after an exotic place he visited in his travels. Madagascar was a bit too long, though.

"Name it after you, Don!", urged his peers. So he did. Soon everyone was calling the key a dongle, after Don Gall — the lonely software developer who did what he had to do.

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pointing and clicking.

Such wonders clearly make Quattro Pro's macro development tools superior to 1-2-3/W's. But are they better than Excel's? Well, it's a toss-up. Quattro Pro's tools for actually creating macros and dialog boxes and then debugging them are definitely better. But Excel lets you do things like write custom functions (@ functions), which is not possible in Quattro Pro. Excel is better for creating custom libraries of functions that integrate seamlessly into the product. While Quattro Pro lets you designate a notebook as a macro library, the code security that's so important to developers isn't as good as in Excel.

Quattro Pro provides a data-access facility similar to Q+E called Database Desktop. DD is really a front end to the Paradox engine, which ships with Quattro Pro. So all the data-access, client-server, and data-integrity features inherent in Paradox come with it. This also means that Paradox users can regain disk space by simply keeping one copy of the PXENGWIN.DLL in the Windows system directory to serve both Quattro Pro and Paradox.

DD has a graphical interface, including an icon bar, and is easier to use than Q+E. As in Paradox, DD lets you query by example. Like Q+E and Excel, DD feels slightly disconnected from the rest of the spreadsheet program, and it uses slightly different syntax for wild cards (the Paradox syntax) in queries. You can't use all the standard data-query and database-cell functions on the external data the way you can in 1-2-3/W. But the biggest weakness is that out of the box, DD connects only with dBase and Paradox files—far fewer than either of its rivals.

Still, the fact that Quattro Pro uses the Paradox engine to connect with data is interesting. Rather than a mere link to requester drivers, Quattro Pro links directly with the database engine itself. This means that as Paradox gets better, so, too, will Quattro Pro's data-access facility. Borland claims that links from the Paradox engine to other data sources, such as SQL Server, are now in development.

Of course, if you can't wait, you could develop your own data connections. Quattro Pro, like its counterparts, provides an add-in development kit. It lets you create custom add-ins (i.e., @ functions), although it's currently not possible to create a custom macro keyword.

Recommendations

There are plenty of good reasons for choosing any one product over the others. If you require access to an unusual data source, Lotus may be the only company with an available driver. If you want on-line training, the multimedia version of 1-2-3/W may be the way to go. You may also want to go with 1-2-3/W if you use any of Lotus's other Windows products or if your company has a particularly good relationship with Lotus. Lotus is investing heavily in its next major release, 1-2-3/W 2.0. However, 1-2-3/W is clearly behind in the GUI spreadsheet war for now.

Much of the same reasoning applies when choosing between Quattro Pro and Excel. Users of Microsoft Mail, for example, have a good reason for favoring Excel, because it provides ties to that mail system. Excel also provides more features than Quattro Pro. If, for example, you are planning to perform sophisticated statistical analysis, Excel provides good tools for that today, although all three products will surely provide similar tools next time around.

Your best bet is to sit down with Excel and Quattro Pro to discover which of these power horses works better for you. I think Quattro Pro for Windows is the best product overall—at least for now. ■

Nicholas Delonas is a consultant based in Boston, Massachusetts. He is coeditor of The Spreadsheet Consultant, *a newsletter for spreadsheet power users. You can contact him on BIX as "ndelonas."*

COMPANY INFORMATION

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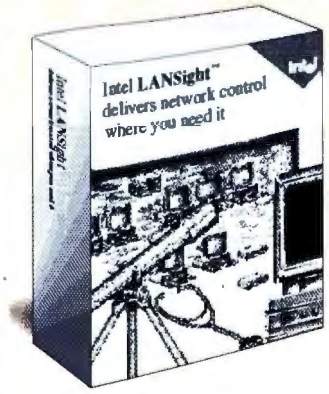
To Manage and to Protect: NetWare LAN Care in 2 Packages from Intel



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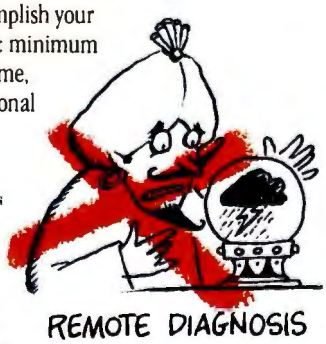

System Requirements LANSight for Windows
NetWare 2.x or 3.1x versions or greater, 512K of RAM, 6K RAM on each workstation where TSR is installed. LANSight package also includes complete DOS interface Single-Server Version (SLAN1225).

LANProtect and LANSight are trademarks and Intel is a registered trademark of Intel Corporation. Other trademarks used by reference are the property of their holders.

List: $395 **The Shop: $345**

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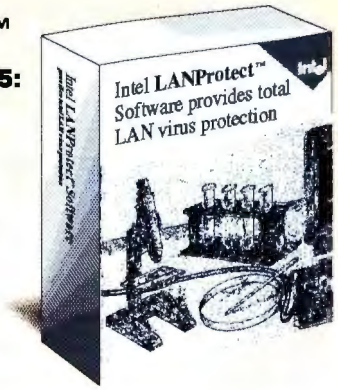
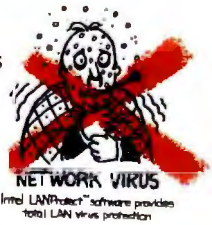
LANProtect™ software v1.5: No better protection against viral infection



LANProtect offers Novell-certified technology that continuously shields your LAN from viruses. It scans all susceptible events and prevents known viruses from getting on the server from all points: workstations, modem servers, and server-to-server file transfers. And it detects and quarantines polymorphic (unknown) viruses with rules-based methods.

Whenever LANProtect finds a virus it notifies you, tracks these encounters by network ID, workstation ID and user ID and makes its updated virus pattern library available to all LANProtect file servers across your wide area network (WAN).



LANProtect offers:

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- DOS, Windows, Macintosh and OS/2 support
- New! Rules-based polymorphic and stealth virus detection
- New! Virus removal
- New! Remote configuration management of other LANProtect
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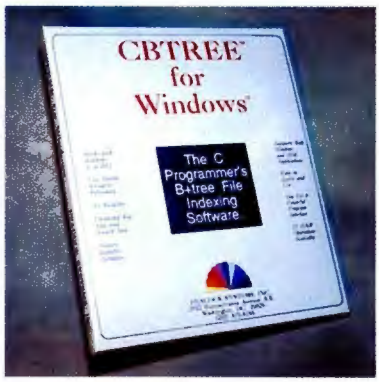

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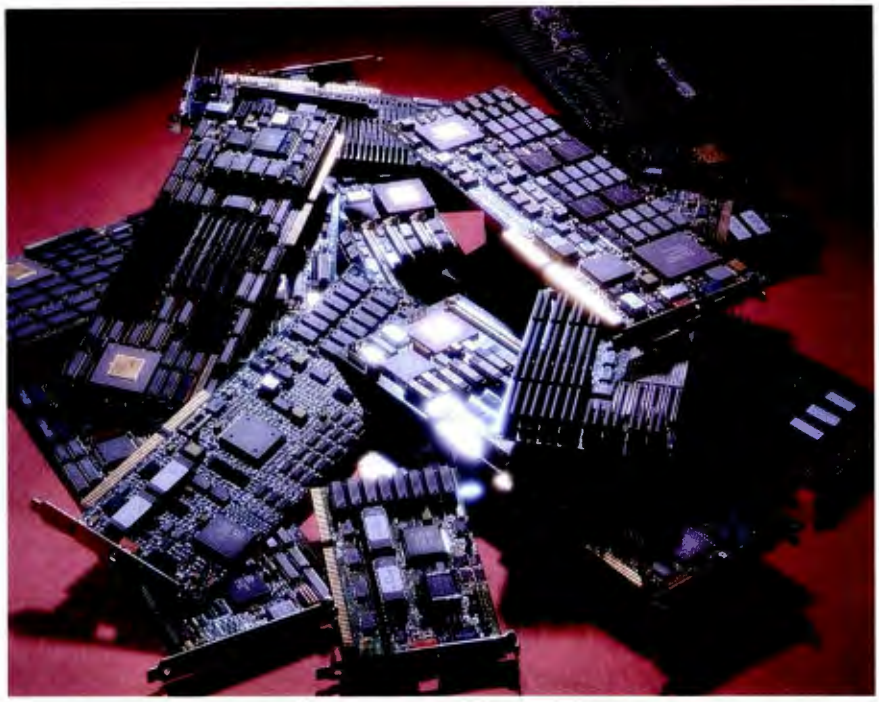


Twelve video adapters offer a true-color alternative for every budget

GREG LOVERIA

In the future, historians may tout the release of Windows 3.0 as the pivotal point for PC display technology. Microsoft programmers, showing great foresight, gave Windows 3.0 the capability of displaying images in full 24-bit (16.7-million-color) digital color. If you are still using an 8-bit (256-color) display adapter for Windows, this may not seem like an earth-shattering achievement. However, once you've used a 24-bit adapter, I think you'll never want to work in an 8-bit Windows display environment again.

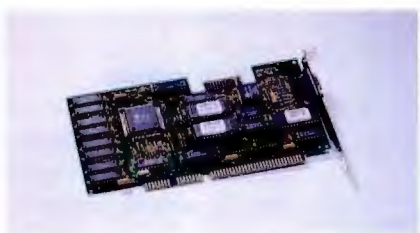
Currently, applications like PhotoStyler, Image-In-Color, and Picture Publisher function like "digital darkrooms," enabling you to manipulate and edit 24-bit Targa, TIFF, and BMP image files using just an 8-bit VGA display. The major drawback is that 8-bit adapters must dither or color-band a 24-bit image to display it. Banding and dithering are necessary because 8-bit adapters must compress a 24-bit image's 16.7 million colors into an 8-bit, 256-color palette to display it. For image editing and graphic art duties, banding and dithering can cause problems; what you see on your 8-bit display adapter may not be the actual colors you'll see when your edited 24-bit image files are transferred to slides or printed. (See the text box "What Is 24-bit Color?" on page 86.)

For this article, I looked at 12 24-bit display adapters. My goals were twofold: to observe the adapters subjectively, gauging ease of installation, and, of prime importance, to scrutinize 24-bit display quality under Windows 3.1. Performance speed was a secondary consideration; I used Texas Instruments' benchmarking utility, WinTach, to test each adapter's Windows throughput for objective comparisons. (See the text box "Benchmarking the Benchmark: How Adapter Performance Speeds Were Evaluated" on page 89.)

I separated the 12 adapters into two key feature categories. Genoa Systems' Multimedia VGA 7900 and Diamond Computer Systems' SpeedStar 24X make up the first. These two boards offer inexpensive 24-bit color under Windows for under $300 but support a maximum Windows resolution of only 640 by 480 pixels. The other 10 adapters make up the second category and support 24-bit true-color output in Windows at resolutions of at least 1024 by 768 pixels. Ranging in price from $1295 to $4495, these cards should appeal to Windows users with professional application display needs. The cards use various acceleration methods to enhance Windows' performance. (See the text box "TIGA vs. Fixed-Function Acceleration" on page 88.)

Inexpensive 640- by 480-pixel Adapters

Multimedia VGA 7900



Genoa Systems' Multimedia VGA 7900 ($199) is a 1-MB half-length adapter. Of the 12 units tested, the 7900 is the only one that is not accelerated; Genoa uses Tseng's ET4000 Super VGA chip set alone, but it complies with VESA's (Video Electronics Standards Association's) BIOS extensions. AT&T's 20C491-80 24-bit RAMDAC is also on board, and it supports 16.7-million-color display in Windows at resolutions of 640 by 480 pixels, 1024 by 768 pixels by 8 bits, and up to 1280 by 1024 pixels by 4 bits. Besides Windows 3.x, Genoa includes AutoCAD 10/11, AutoShade, and a number of word processing drivers.

The 7900 installed painlessly without my repositioning any IRQ (interrupt request) jumpers. Windows 3.x driver installation is equally easy. From two 5¼-inch floppy disks, you copy the drivers into the WINDOWS/SYSTEM subdirectory, and the Windows OEMSETUP.INF file is automatically modified. You then run Windows SETUP to select display resolutions.

Under Windows, at a resolution of 640 by 480 pixels by 24 bits, Image-In-Color

displayed beautifully clean, clear, and crisp 24-bit images. Genoa trademarks its noninterlaced technology as FlickerFree, and, indeed, all resolutions (even 1280 by 1024 pixels by 4 bits at 87 Hz) are absolutely rock steady. The 7900 is a fine bargain, especially with its extensive driver bundle. Although it's not an accelerated board, it performed well. I liked the 7900 and would recommend it as today's most inexpensive 24-bit Windows solution.

SpeedStar 24X

A 1-MB DRAM half-length card, the SpeedStar 24X ($249) from Diamond Computer Systems implements Western Digital's WD90C31 graphics accelerator. As with Genoa's card, Diamond's 24-bit Windows drivers function at a maximum 640- by 480-pixel resolution. It also complies with VESA's BIOS extensions. Higher Windows resolutions include 1024 by 768 pixels by 256 colors in 72-Hz noninterlaced mode and 1280 by 1024 pixels by 16 colors in 43.57-Hz interlaced mode. Autodesk 3D Studio, AutoCAD, AutoShade, and several CAD, spreadsheet, and word processing drivers are also included.

The board installs easily, and resolutions are set using rear-mounted DIP switch configurations. Under Windows, at a resolution of 640 by 480 pixels by 4 bits, you select RUN from the FILE pull-down menu and type A:\INSTALL. You choose display resolutions from a driver menu on the 5¼-inch installation disk and then restart Windows. At 640 by 480 pixels by 24 bits, Windows is clear, crisp, and impeccably steady. Also, 24-bit TIFF and Targa images in PhotoStyler and Image-In-Color look wonderful and are equally crystalline at 1024 by 768 pixels by 4 bits and 1280 by 1024 pixels by 8 bits.

The SpeedStar 24X proved quicker in WinTach's overall RPM (relative performance measurement) results, although Genoa's VGA 7900 had faster CAD ratings (see table 1). Diamond also plans to be shipping its Stealth VRAM (video RAM) 24-bit card for $399 by the time you read this. Diamond's SpeedStar 24X gets my nod of approval for best value-to-performance ratio in low-cost 24-bit 640- by 480-pixel Windows adapters (see table 2).

High-Resolution 24-bit Adapters

Truevision 1024-32

The Truevision 1024-32 full-length adapter implements TI's 32-MHz 34020 coprocessor. It supports 24-bit resolutions of 1024 by 768 pixels in 72-Hz noninterlaced mode and up to 87-Hz interlaced mode. Tseng's ET4000 VGA chip set is onboard, and the 1024-32 replaces your existing Super VGA adapter. Its standard $2295 configuration ships with 1 MB of DRAM and 3 MB of VRAM. Daughterboard expansion modules of 4-MB DRAMs ($1000) or 16-MB DRAMs are also available, although tests with and without the 4-MB module showed little difference in performance speeds. Drivers are included for Windows 3.x, AutoCAD 10/11/386, AutoShade, Autodesk 3D Studio, Lotus 1-2-3, and WordPerfect—along with a VBE (VESA BIOS extensions)–compliant TSR program.

Like Truevision's AT Vista adapters, the 1024-32 performs all operations in 32-bit true color: 24 bits of RGB and 8 bits of alpha data. In video applications, the extra 8 bits of alpha-channel data allows functions like chroma-keying (e.g., what you see when a meteorologist stands in front of weather-map video backgrounds). Currently, Windows supports only 24-bit image manipulation. However, according to Truevision, in Windows applications, the 8 extra bits of alpha data are used for caching functions. In DOS applications using the 1024-32 adapter, you can generate full 32-bit alpha-encoded images.

This is a well-engineered, complex, multifaceted adapter, and several configuration jumpers and rotary switches tailor the 1024-32 to system needs. Although configuration procedures can be intricate, Truevision's excellent documentation explains everything, often in graphic detail.

You install Windows drivers within Windows at a resolution of 640 by 480 pixels by 4 bits from a 5¼-inch floppy disk by selecting RUN from the FILE pull-down menu. You select resolution and monitor frequencies from a Truevision Settings icon and then restart Windows. In 60-Hz interlaced mode at a resolution of 1024 by 768 pixels by 32 bits, the display appears washed out, but at the same resolution in 72-Hz noninterlaced mode, the display is rock solid, clear, and crisp.

Using Truevision's $995 RGB-to-NTSC VIDI/O converter box, you can record Windows or DOS applications directly to a VCR as composite video. I output and recorded 24-bit Windows sessions as NTSC interlaced video to my VCR in three resolutions: 756 by 486 pixels, 720 by 480 pixels, and 640 by 480 pixels. The 1024-32 and VIDI/O combination enabled me to render and then record 24- and 32-bit images directly to videotape.

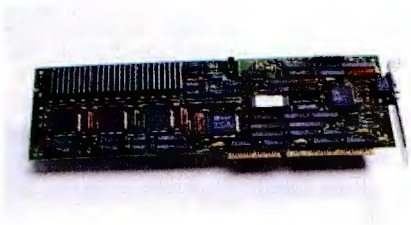
I hold the Truevision 1024-32 in high esteem. By adding a single-frame insert-editing videotape recorder and controller board, animators could generate 32-bit video animations on a single VGA monitor. If your needs dictate using 24-bit Windows imaging applications as well as 32-bit rendering functions, consider building your PC imaging system around this adapter.

continued

BYTE ACTION SUMMARY

- **WHAT 24-BIT COLOR BOARDS DO**
  For image editing and professional graphics applications in Windows, they let you display and accurately edit 24-bit Targa, TIFF, and BMP image files using a color palette of 16.7 million colors.
- **LIKES**
  Besides eliminating dithering and banding problems, the majority of adapters implement acceleration chips that also speed Windows applications and productivity.
- **DISLIKES**
  Difficult TIGA installations and poor documentation.
- **RECOMMENDATIONS**
  Although it posted median-to-swift speeds, Number Nine Computer's #9GXiTC rates high for its easy hardware and software installation, excellent virtual screen utilities, and price. For inexpensive 24-bit Windows display at a resolution of 640 by 480 pixels, Diamond Computer Systems' SpeedStar 24X is a winner.

MultiView 24



Known for its 24-bit Macintosh products, Radius also offers the MultiView 24 adapter ($1999), a full-length board that's based on three 8514 chips and comes with 3 MB of VRAM. The 8514s are used as "drawing accelerator gate arrays," not coprocessors. Radius explains that using three 8514 chips on-board—one for each digital red, green, and blue signal—yields faster speeds by providing a 96-bit display data path. Brooktree's 473 24-bit RAMDAC supports Windows resolutions of from 640 by 480 pixels to 1024 by 768 pixels. The MultiView 24 uses VGA pass-through and includes cabling to connect your Super VGA adapter's feature-bus connection to the MultiView 24's feature bus. Only Windows 3.x drivers ship with the card (Super VGA card driver and chip-set functions are passed through the adapter for DOS applications).

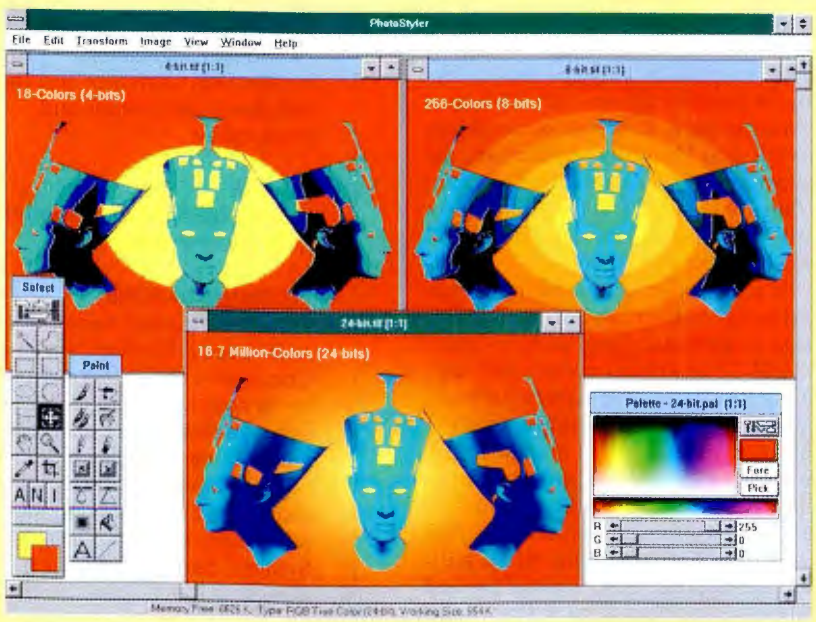
Radius's three-page quick-start manual makes hardware and driver installation a breeze. It swiftly details pass-through cabling, board-address selection, and monitor settings. From a 5¼-inch driver floppy disk, under Windows at a resolution of 640 by 480 pixels by 4 bits, you choose RUN from the FILE pull-down menu, type A:\INSTALL to select the 1024- by 768-pixel by 24-bit driver, and then reboot Windows.

At 1024 by 768 pixels by 24 bits, the Windows display is razor sharp, brilliant, and steady. PhotoStyler 24-bit images look excellent. Although the WinTach ratings were a little slow, there were noticeable performance boosts to pull-down and pop-up menus. Overall, I personally liked this adapter because of its screen clarity and genuinely easy and fast installation. It's a well-thought-out Windows imaging product and merits high marks.

WHAT IS 24-BIT COLOR?

On 8-bit display adapters, each screen pixel can display one color out of a maximum color palette of just 256 colors. The 24-bit display adapters have a palette of 16.7 million colors; that is, each individual screen pixel can display one color chosen from a palette of 16.7 million. Windows has a default VGA screen resolution and bit-plane pixel color depth of 640 horizontal pixels by 480 vertical lines, using 4 bits per pixel (just 16 colors allowed). Although screen resolution is an important factor affecting image quality, it is actually less important than color bit depth. The more colors you can display simultaneously, the easier it is to fool the human eye into perceiving a higher-quality image.

The 1024- by 768-pixel Windows screen shown in this text box was captured using Aldus's PhotoStyler with a 24-bit true-color display adapter. The top-left window shows the 24-bit image as it would look on a standard 4-bit (16-color) 256-KB VGA display adapter; the top-right window shows how the image would look on an 8-bit (256-color) 1-MB Super VGA adapter; the bottom image is displayed in full 24-bit digital color. Notice the image banding and dithering that occur in both the 4- and 8-bit images. (File-to-slide conversion courtesy of Image Center, Roanoke, VA.)



Volante AT2004

National Design, Inc.'s, Volante AT2004 adapter ($1995) is a full-length card based on TI's 40-MHz 34020 coprocessor. The test unit arrived with 4 MB of VRAM on-board. Other 2000-series adapters, like NDI's AT2084 ($3195), can be expanded to 8-MB DRAM/4-MB VRAM to further boost 24-bit Windows performance. TI's TLC-34076 24-bit RAMDAC and proprietary NDI acceleration ASICs (application-specific ICs) also speed throughput. The card's 24-bit noninterlaced Windows resolutions range from 640 by 480 pixels to 1024 by 768 pixels. The board also supports a resolution of 1280 by 1024 pixels in 16 or 256 colors.

The Volante AT2004 replaces your existing VGA or Super VGA adapter and uses Acumos's VGA chip set. The card is VBE BIOS–compliant and, like Truevision's adapter, is a 32-bit board using the extra 8 bits of alpha data for caching. Vibrant Graphics' DL-Xpress drivers for AutoCAD, AutoShade, and Autodesk 3D Studio ship with the Volante AT2004. Soft Engine/386 AutoCAD drivers are also available for an additional $200.

NDI's TIGA (Texas Instruments Graphics Architecture) installation is straightforward. A menu-driven installation program copies all TIGA communication files

WINTACH BENCHMARK TEST RESULTS

Table 1: *The adapters were tested using a Zeos 486/25 EISA system with 8 MB of RAM. For gauging display quality, Optiquest's 14-inch 3000 monitor was used—it has a Sony .24-mm-dot-pitch Trinitron CRT. Nanao's Flexscan 9500, a 20-inch multifrequency monitor, was used to test 24-bit resolutions greater than 1024 by 768 pixels. For image input, Microtek's MRS-600Z 24-bit color scanner was used with Windows 3.1 and two 24-bit image-editing programs, PhotoStyler and Image-In-Color. Pointing devices used were Wacom's 420 cordless digitizer tablet and a Microsoft Mouse. In VGA pass-through modes, an unaccelerated 1-MB Diamond SpeedStar Super VGA adapter was coupled with the unit being tested.*

Adapter	Word Processing	CAD/ Drawing	Spreadsheet	Paint	Overall RPM
GROUP 1 (640 by 480, 24 bits)					
Multimedia VGA 7900	5.94	13.08	4.26	7.68	7.74
SpeedStar 24X	6.54	11.58	9.48	6.96	8.64
GROUP 2 (1024 by 768, 24 bits)					
MultiView 24	26.41	21.65	17.66	12.74	19.62
Impression-S	18.12	26.57	19.50	35.17	24.84
Impression-1024	12.44	24.26	12.13	15.05	15.97
GROUP 3 (1024 by 768, 32 bits)					
Hercules Chrome Model C638	66.56	115.91	39.32	66.35	72.04
#9GXiTC	22.93	125.95	31.33	28.26	51.66
Volante AT2004	20.07	119.80	30.51	52.42	55.70
MonaLisa	22.11	108.74	24.98	43.92	49.91
Truevision 1024-32 (w/ 4MB)	37.47	25.60	18.43	14.54	24.01
Rapier 24	36.86	156.05	48.74	87.44	82.27
GROUP 4 (1280 by 1024, 24 bits)					
Impression-Ultra	42.24	50.94	43.26	41.21	44.41

Higher numbers = better performance for all tests. See the text box "Benchmarking the Benchmark: How Adapter Performance Speeds Were Evaluated" on page 89 for a full description of the WinTach performance rating indexes.

to your hard drive from one 5¼-inch floppy disk and then guides you through monitor, resolution, and board-address selection. There is one main DIP switch on-board to resolve IRQ/address conflicts.

I used default settings defined in NDI's sparse but accurate manual but found a conflict with my Mylex motherboard BIOSes that caused VRAM test failures. After some experimentation, I repositioned the board at address 0x0D400 via the diagnostic menu and then rebooted. With VRAM working and the TIGA link successfully established, I used Windows SETUP to choose Windows resolutions.

Under Windows at a resolution of 1024 by 768 pixels by 24 bits, the display is stable but a tad fuzzy compared to the Radius adapter, but I would still consider it sharp on its own merits. Also, 24-bit Targa image colors were absolutely brilliant in my PhotoStyler comparisons.

I was pleased that WinTach's RPM results confirmed my hunch: This board is fast. Inside every Windows application, you actually can feel performance boosts. NDI also warranties its adapters for life—a rarity for computer components. If you require swift 24-bit Windows speeds and use AutoCAD often, you may find the board to be an excellent value.

MonaLisa

Opta's full-length MonaLisa ($1995), a 4-MB VRAM adapter, has SIMM slots for adding 1 or 4 MB of on-board DRAM. The MonaLisa implements TI's 32-MHz 34020 coprocessor along with Brooktree's 473 24-bit RAMDAC. With Tseng's ET4000 Super VGA chip set on-board, it replaces your existing Super VGA adapter. Windows resolutions range from 640 by 480 pixels to 1024 by 768 pixels in either 8- or 24-bit color depths in 72-Hz noninterlaced modes.

The company ships only Windows 3.x drivers with the unit. After you purchase the board, you can also receive Vibrant's AutoCAD and Autodesk 3D Studio ADI drivers free of charge by calling Opta directly.

I found the installation of the TIGA link software somewhat complicated. From a 5¼-inch floppy disk, the installation menu prompts you for the board's eight-digit serial number. I missed this instruction in Opta's documentation, which is technically excellent but looks unprofessional. I had to quit the installation procedure and remove the board to find its serial number. After you enter the serial number, the installation program prompts you for monitor and board-address settings; then, you reboot the system to establish the TIGA link. Next, using TIGAMODE, you set board resolutions. Windows SETUP selects Windows display resolutions.

Under Windows at a resolution of 1024 by 768 pixels by 24 bits, the display is somewhat fuzzier than with the Volante AT2004. But like the Volante, the MonaLisa redeemed itself by displaying steady, vibrant 24-bit colors using Image-In-Color. In CorelDraw 3.0, where line-art drawing functions predominate, the lack of sharpness was more noticeable; but again, colors were brilliant.

The MonaLisa posted good speeds in the WinTach tests—overall, slightly slower than that of the Volante—and edged it out in the word processing comparisons. Installation and sharpness problems aside, the MonaLisa is well made and proved a fair value, especially at the speeds noted.

continued

#9GXiTC

Number Nine Computer's full-length #9GXiTC adapter ($2295) implements a 40-MHz 34020 coprocessor and ships with 4 MB of VRAM. Acumos's VGA chip set is on-board, and the #9GXiTC can replace your existing Super VGA card or you can configure it for use as a two-monitor system using VGA pass-through for CAD applications. The card is VBE BIOS–compliant and uses TI's 34076 24-bit RAMDAC. Three proprietary ASICs help speed Windows functions. Besides Windows 3.x, additional drivers support all Autodesk products and more than 15 other CAD and rendering applications.

Number Nine's menu-driven installation software makes TIGA's complex configuration a breeze, taking all of 2 minutes to install from one 5¼-inch floppy disk. Windows 3.1 installation is equally slick and painless. After rebooting to establish the TIGA communications link, you start Windows in 16-color 640- by 480-pixel mode; then, from the FILE pull-down menu, you RUN A:\GXISETUP.EXE from a second 5¼-inch floppy disk. Driver files are copied to your hard drive, simultaneously modifying Windows .INI files. A Number Nine Hawkeye Feature Set program group opens, containing three icons—Zoom, Resolution Exchange, and Chameleon Cursor. Using Resolution Exchange, you select a Windows display resolution and color bitdepth and then restart Windows.

The adapter supports noninterlaced 24-bit Windows resolutions of up to 1024 by 768 pixels, and the display is spectacularly clear, vibrant, and crystalline at all resolutions. Like many of the other boards I tested, the #9GXiTC is a 32-bit color adapter, using the extra 8 bits of alpha for caching. The board also supports 65,536 colors (16 bits plus) at resolutions of from 1280 by 1024 pixels to 1280 by 1600 pixels to 2048 by 1024 pixels using Number Nine's Virtual Screen functions.

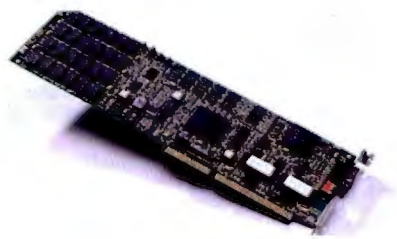
Virtual Screen is an amazing productivity enhancement feature, effectively providing an immense Windows desktop workspace. For instance, in a gigantic Microsoft Excel spreadsheet or tabloid-size PageMaker layout, simply dragging the mouse to the left or right smoothly autopans Windows screen data on- or off-screen.

In my PhotoStyler tests using HawkEye Zoom, by pressing F11 I was able to instantly zoom a scanned image in landscape mode to four times its size to perform minute touch-up work. The Chameleon Cursor icon substitutes cursor colors on the fly. If you've ever lost sight of the Windows white or gray cursor while performing image edits, this feature is great.

In 4- and 8-bit modes (16 and 256 colors, respectively), you can even achieve virtual screen resolutions of 2048 by 2048 pixels on a 14-inch monitor. Because Windows imaging applications manipulate image data at 24-bit color depths "behind the scenes," I found the 2048- by 2048-pixel 8-bit virtual mode fabulous for touch-up work in very large images. (After my 8-bit edits using this feature, I rechecked the images in a 24-bit display mode.) By the time you read this, Number Nine will be including a mouse motion-virtual-zoom function as well.

In the WinTach tests, the #9GXiTC posted median-to-swift speeds. Although it's just slightly slower than the Volante, this card moves right along. In the CAD results, it even outpaced the Volante. Everything about this board is thoroughly impressive. Its easy installation and excellent documentation are great. Its screen clarity, sharpness, vivid colors, and Virtual Screen utilities are superb. Because of these utilities, crystal-clear display, and extensive DOS application drivers, I rate the #9GXiTC adapter highly.

Impression-1024



Matrox Electronic Systems' Impression-1024 ($1295) sports 3 MB of VRAM and uses S3's 86C911 fixed-function accelerator chip. The full-length adapter supports noninterlaced 24-bit resolutions up to 1024 by 768 pixels using Brooktree's BT484 24-bit RAMDAC and is VBE BIOS–compliant. The board replaces your existing Super VGA adapter. By the time you read this, Matrox will be shipping a hardware pan and zoom utility that will provide zoom resolutions of from two to four times that of the original with just the click of a mouse button. It's bundled with Windows 3.x and over 20 DOS applications drivers, such as WordPerfect, Microsoft Word, and Lotus 1-2-3.

Board installation is a snap; no jumpers or DIP switches need to be configured. Likewise, Windows display resolution reconfiguration is easy. You use Windows SETUP to copy files from three driver floppy disks. Under Windows at a resolution of 1024 by 768 pixels by 24 bits, the cursor is slightly blurry. However, the screen is beautifully stable, pinpoint sharp, and clear. The adapter posted

TIGA VS. FIXED-FUNCTION ACCELERATION

All the cards reviewed, except Genoa's Multimedia VGA 7900 adapter, incorporate a graphics acceleration chip to help speed Windows throughput. Coprocessed adapters implement TIGA (Texas Instruments Graphics Architecture) 340x0 graphics processors.

Fixed-function cards implement chips such as S3's 86C911 and Western Digital's WD90C31. TIGA coprocessors use a software-to-hardware communications link established at system boot-up. TIGA drivers can be upgraded by the manufacturer. You simply upload any improvement updates to the coprocessed card.

Fixed-function acceleration chips have their graphics algorithms hard-coded in discrete logic. For both types of cards, an adapter manufacturer's software drivers determine which graphics functions—like BitBlts, font caches, and memory-to-screen writes—will be intercepted en route to the system's CPU and off-loaded to the graphics acceleration chip for processing. Off-loading these graphics duties accelerates Windows performance speeds and throughput.

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24-BIT DISPLAY ADAPTER FEATURE COMPARISON

Table 2: *If you can live with standard 640- by 480-pixel resolution, the SpeedStar 24X and Multimedia VGA 7900 offer 24-bit color at budget prices.*

Adapter name	Accelerator chip	VGA chip set	VRAM (MB)	DRAM (MB)	VBE BIOS	Maximum 24-bit resolution	24-bit RAMDAC	Retail price
Multimedia VGA 7900	N/A	ET4000	0	1	BIOS	640 × 480	ATT20C491	$199
SpeedStar 24X	WD90C31	WD90C31	0	1	BIOS	640 × 480	Diamond SS2410	$249
Truevision 1024-32	34020/32	ET4000	3	1	TSR	1024 × 768	Brooktree 473	$2295
MultiView 24	8514	N/A	3	0	N/A	1024 × 768	Brooktree 473	$1999
Volante AT2004	34020/40	Acumos	4	0	BIOS	1024 × 768	TI34076	$1995
MonaLisa	34020/32	ET4000	4	0	BIOS	1024 × 768	Brooktree 473	$1995
#9GXiTC	34020/40	Acumos	4	0	BIOS	1024 × 768	TI340767	$2295
Impression-1024	86C911	S3/VGA	0	3	BIOS	1024 × 768	Brooktree 486	$1295
Impression-S	34020/20	N/A	3	1	N/A	1152 × 882	Brooktree 463	$1995
Impression-Ultra	XG386	N/A	7	1	N/A	1600 × 1200*	Brooktree 463	$4495
Hercules Chrome C638	34020/40	N/A	3	8	N/A	1152 × 882	Brooktree 473	$2595
Rapier 24	34020/32	N/A	3.5	1	N/A	1152 × 882	Brooktree 463	$2995

* Only 1280- by 1024-pixel, 24-bit resolution was tested; see text.
N/A = not applicable; uses VGA pass-through.

slow WinTach results, but there was a noticeable increase in overall Windows speed compared to my 8-bit nonaccelerated SpeedStar.

The Impression-1024's Windows display output was one of the sharpest and clearest I observed. According to Matrox, there should be a sizable price reduction on the Impression-1024 and other Matrox boards by the time you read this. Slower speeds aside, I give the 1024 high marks for its super-low price and excellent Windows display output.

Impression-S

Based on the 32-MHz 34020 coprocessor, Matrox's full-length Impression-S adapter ($1995) uses VGA pass-through and comes with 3 MB of VRAM, 1 MB of DRAM, and Brooktree's 463 24-bit RAMDAC. It supports 24-bit Windows resolutions of from 1024 by 768 pixels to 1152 by 882 pixels noninterlaced. The Impression-S is a reengineered release of Matrox's first Impression adapter that uses extensive gate-array ASICs that, according to Matrox, provide a 30 percent increase in speed over its earlier Impression adapter.

For hardware installation, the configuration software programs the card's BIOS and locates the adapter in system memory. You must first remove Windows' HIMEM.SYS or any XMS (Extended Memory Specification) memory management software from CONFIG.SYS and reboot. Windows resolutions are then chosen via the configuration program; I positioned the adapter at address D8000-DBFFF for

BENCHMARKING THE BENCHMARK:

HOW ADAPTER PERFORMANCE SPEEDS WERE EVALUATED

I used Texas Instruments' WinTach 1.1, a Windows throughput rating utility, to gauge adapter performance speeds. WinTach emulates CAD, word processing, spreadsheet, and paint application functions in a Windows 3.1 environment. To "benchmark the benchmark" and verify WinTach's results, I used another benchmark utility, Winspeed, to test known speed differences between two adapters. Speed variances reported between the two adapters using both benchmark utilities proved identical in my percentile calculations.

WinTach does not perform chip-specific calls; it measures Windows 3.1 performance speeds of the emulated applications through calls made to Windows 3.1's API. The API speed results are evaluated and displayed in an RPM (relative performance measurement) index. The RPM index number rates how many times faster an adapter performed WinTach's emulated application functions compared to a 20-MHz 386DX system equipped with a standard 8-bit VGA adapter. When I spoke with TI representatives, they stressed that WinTach results should be compared among adapters only if the tests are performed at identical resolutions and color bit depths. The WinTach test data results in table 1 are grouped this way. Also, higher resolutions and/or bit depths mean more graphics data is being processed through the adapter and Windows API. Test results should not be compared between adapters in different groupings.

Some adapters implement 32-bit color depths in Windows and have been grouped accordingly. As explained in the main text, Windows 3.1 can display and manipulate only 24 bits of color information. The extra 8 bits of alpha data is often used for data caching, although the extra bits are not always used this way; this varies among manufacturers and driver implementation. WinTach 1.1 can be downloaded from BIX in the windows.utilities listings.

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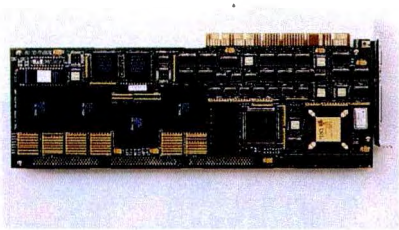
1024- by 768-pixel resolution tests. From the installation disk, Windows drivers are next copied into the WINDOWS\SYSTEM subdirectory. Manually, you reinvoke HIMEM.SYS in CONFIG.SYS and reboot the system.

As with the Impression-1024 adapter, the screen under Windows at all resolutions from the Impression-S is very clear and crisp, although the 24-bit 1152- by 882-pixel mode showed a slight moiré pattern. In both resolutions, the cursor was sharp, and both resolutions posted identical WinTach results. However, as pointed out in the text box "Benchmarking the Benchmark," higher Windows resolutions mean that there is more pixel data that must be manipulated. I was pleased to see that the higher 24-bit 1152- by 882-pixel resolution caused no degradation in board performance times.

For the price and the speeds posted, you might want to consider an alternative adapter. However, having used the first release of the Impression adapter for almost two years in a 24-bit Windows imaging environment, I must mention that I've experienced no problems with the unit and have found Matrox's support excellent. If vendor and board stability is a concern, then the Impression-S may just be the adapter you've been looking for.

Impression-Ultra



At $4495, Matrox's Impression-Ultra adapter was the most expensive 24-bit Windows display board I reviewed, but it should appeal to Windows users who work in high-end color prepress or photographic applications. This full-length adapter is a mother-daughter two-board combination; the first slot requires an EISA bus, and the second slot requires an ISA bus. The Ultra ships with 7 MB of VRAM and 1 MB of DRAM on-board, using Brooktree's 463 RAMDAC and proprietary Matrox XG386 ASICs for 24-bit color. According to Matrox, this combination provides 3 MB of data transfer per screen refresh using a 192-bit graphics data path. The board supports 24-bit Windows resolutions of from 1280 by 1024 pixels to 1600 by 1200 pixels. The board uses an external DB-15 port-to-port cable for VGA pass-through functions.

Board installation is comparatively easy for an EISA adapter; I copied the EISA configuration files to my hard drive from the installation floppy disk and then let my Zeos-Mylex EISA configuration software "auto-add" the adapter into my system setup. After rebooting, hardware-to-software links are established that upload communications code to the board's BIOSes. After communications link and monitor tests, your AUTOEXEC.BAT file is modified to automatically establish the link at boot-up. This sounds difficult, but it is quite easy and explained thoroughly in the documentation. You choose Windows resolutions from DOS by typing IMPUDL 1200 or 1600, which uploads Windows display settings to the adapter BIOS.

The Consistent Color manual is one of the best 24-bit documents I've seen.

Under Windows at a resolution of 1280 by 1024 pixels by 24 bits, the Ultra's display is sheer precision, crystal clear, and solidly stable. Windows functions glide smoothly and quickly, and the board supports real-time pan and zoom functions.

Unfortunately, I was unable to test the Ultra's higher 1600- by 1200-pixel resolution because of system configuration problems. Nanao confirmed that this resolution should function on its monitor, but the display vibrated and pulsed rapidly. After speaking with Matrox support and discussing several possible solutions, I was still unable to resolve the problem in time for inclusion in the review. However, using a computer system provided by Matrox, the company demonstrated to BYTE editors that the 1600- by 1200-pixel resolution works. Gauging just from the Ultra's superb 24-bit performance at 1280 by 1024 pixels, if you are an imaging professional who requires precision in the Windows environment, I'd rate this board high, even though it is expensive.

All Matrox true-color adapters ship with two impressive and professional Windows utilities. Consistent Color is a precision monitor-calibration program that fine-tunes color display output to any lighting environment using white balance, monitor, and white gamma color-correction algorithms. You can tune a monitor manually or use an external densitometer—Sequel Imaging's $1445 Four Channel System Calibrator (Sequel Imaging, 1 Palmer Dr., Londonderry, NH 03053, (603) 425-2170)—that connects from a communications port to the monitor's glass CRT screen. You then adjust and balance analog and digital color temperatures and workspace gamma using the densitometer readings or without it, visually. The Consistent Color manual is one of the best documents I've seen on 24-bit digital color.

Matrox's WinSqueeze JPEG compression utility let me compress a 339,318-byte 24-bit BMP file to 31,882 bytes using a WinSqueeze Q-Factor of 50 percent. Although JPEG is not lossless and induces image artifacts (e.g., reduction noise), the reduced image looked as good as the non-compressed BMP image. This utility is great for saving thumbnail representations of work in progress, but I would recommend against using it on master images.

Matrox boards are well made, and their support is excellent. Judging from them and the WinSqueeze and Consistent Color products, it's obvious that Matrox knows professional 24-bit color. Depending on your needs and budget, these boards should definitely be considered.

Hercules Chrome Model C638

The Hercules Chrome series of 24-bit adapters from Hercules Computer Technology are full-length 34020-based boards with 3 MB of VRAM and 1 MB of DRAM. They come in three basic configurations: a 32-MHz Model C531 ($1695), a 40-MHz Model C631 ($1895), and a 40-MHz Model C731 ($1995) that provides higher vertical refresh bandwidths to enhance display stability. My 40-MHz C638 test unit ($2595) arrived with an extra 8 MB of DRAM on-board. Hercules assured me that there were no speed differences in the performance times I observed using the 8-MB C638 and the 1-MB C631 unit.

Designed with an eye toward professional color prepress applications, the Chrome adapter can address up to 40 MB of on-board DRAM. According to Hercules,

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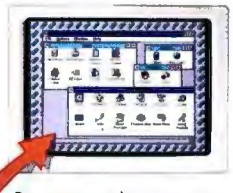

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this lets you manipulate large bit-map images directly using on-board DRAM as opposed to passing graphics data to system memory or paging it to your hard drive using virtual memory.

Further experimentation and research showed that, currently, Windows 3.1 cannot address the Chrome's extra on-board DRAM, and it is left to the imaging application in use to circumvent this problem; some DOS-oriented imaging software, like PixoArts' PixoFoto, addresses on-board DRAM directly. Many manufacturers and software developers are looking to Windows NT to rectify this obstacle.

The Chrome C638 supports a number of 24-bit Windows and 32-bit DOS resolutions: 1024 by 768, 1120 by 768, 1120 by 832, 1152 by 864, 1152 by 870, 1152 by 882, 1152 by 900, and 640 by 480 pixels. Drivers for all Autodesk products and a host of DOS applications ship with the unit. Board installation is a breeze; there are no jumpers or DIP switches to set, as the board's system address is set through software. After establishing the TIGA communications link, you choose board resolutions using Hercules' MoniTrac utility. Next, you copy Windows display drivers into the WINDOWS\SYSTEM subdirectory using SETUP.

At all resolutions, the Chrome's display is very sharp, stable, and clear. WinTach's results confirmed my suspicions: This adapter makes Windows' 24-bit environment hustle, and you can feel the results—in PhotoStyler, pans and zooms were almost in real time. It outpaced almost every board by a considerable margin in the overall RPM rating, although it did place lower in some CAD functions. At its $1895 base price, the Hercules Chrome Model C638 is definitely an excellent, top-notch 24-bit display adapter.

Rapier 24

VideoLogic's Rapier 24 ($2995) is a full-length adapter that ships with 3.5 MB of VRAM and 1 MB of DRAM. For acceleration, it uses a 32-MHz 34020 coprocessor and VGA pass-through. Using VideoLogic's timing-adjustment software, the Rapier 24 can also function with Macintosh monitors like the 20-inch Radius Precision Color or Rasterops's 2075. VideoLogic will also be releasing 4- and 8-MB DRAM expansion modules by the time you read this. At this writing, no pricing was available. Windows 3.x drivers ship with the unit and support 24-bit resolutions of up to 1152 by 882 pixels noninterlaced. After you mail in the warranty card, VideoLogic supplies Panacea's DLD386 Deluxe ADI/TIGA drivers for Autodesk products.

Of all the cards, the Rapier 24 proved the most difficult to install. After first connecting the supplied pass-through cabling, I spent several hours trying to comprehend the confusing documentation artwork that explained the positioning of the board's myriad I/O address and IRQ jumpers. About 10 seconds into the procedure for installing the TIGA software, the system would lock up with an address conflict no matter what jumper settings I used. After repeated attempts, I finally gave up and moved on to other adapters.

continued

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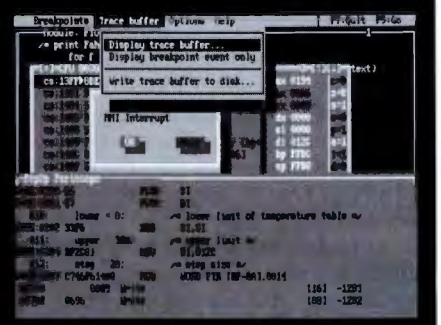

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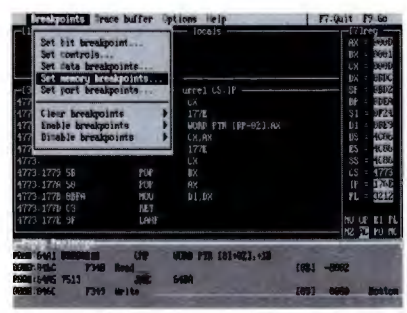

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Days later, I made one last attempt at installing the adapter and discovered that HIMEM.SYS must first be commented out of CONFIG.SYS—this was not mentioned in the manual. (Much later, I found this procedure mentioned in VideoLogic's addendum sheets.) After I rebooted the system, TIGA installation proceeded smoothly where I selected monitor and refresh-rate settings. After establishing the TIGA link and rebooting, I copied display resolution drivers from the 3½-inch installation floppy disk using Windows SETUP.

Under Windows, the display is stable and vibrant but fuzzy in comparison to other adapters. Running PhotoStyler with a 24-bit image opened and using the Alt-Shift and up- or down-arrow keys, I was able to instantly zoom in on the image at ×2, ×4, or ×8 magnifications. With just a small portion of the image filling the entire screen, moving the mouse smoothly pans off-screen image data into the display. I liked this feature very much, as it made pixel editing a snap.

Although the Rapier 24's TIGA installation was very frustrating, the end results proved worthy of my efforts. The adapter's WinTach speed ratings were impressive, outpacing those of every other card, including Hercules' Chrome adapter, by a substantial margin. You can easily feel the speed differences this board brings to Windows, but VideoLogic would do well to rework the installation documentation. This and the slight fuzziness of the display aside, I definitely would have to give this adapter a high rating for its impressive speed alone. If you want Windows acceleration, this adapter screams.

All Picks, No Pans

Of the two inexpensive lower-resolution adapters, Genoa's Multimedia VGA 7900 certainly wins for lowest-cost 24-bit display adapter. Its display output quality is identical to that of Diamond's SpeedStar 24X, but the 24X is faster. If your 24-bit display needs also mandate Windows swiftness, then you should definitely consider the SpeedStar 24X.

In the higher-resolution group, VideoLogic's Rapier 24 proved the fastest. Its price may exempt some users from choosing it, but—installation problems aside—this unit really moves. Because of the #9GXiTC's easy installation, virtual screen resolutions, and multiple utilities, it proved to be an impressive unit. Even though it posted comparative median-to-swift speeds, I personally loved this unit. As an animator, I also liked the Truevision 1024-32 adapter; if your needs include video or animation, you should take a look at this product.

Although it fared slowly in the test times, Matrox's Impression-1024 adapter gets the nod for best 24-bit display quality at the lowest price. Next in line for the least expensive/best performance thumbs up would be the Hercules Chrome Model C638 adapter. This card is a great value, and it's fast. Based on its excellent 24-bit display output observed at a resolution of 1280 by 1024 pixels, Matrox's Impression-Ultra should definitely be considered by users with critical imaging demands. It's expensive, but its impressiveness matches its cost.

Universally, all the boards performed as advertised, each meriting a commendation for speed, display quality, or price. There was not one board that I would recommend avoiding. Look over the adapters and choose one that fits your application and budget needs. Any one of them will make your 24-bit Windows display output look marvelous. ■

Greg Loveria is a computer graphics and desktop publishing consultant, animator, and writer in Binghamton, New York. He can be reached on BIX as "loveria."

COMPANY INFORMATION

Diamond Computer Systems, Inc.
(SpeedStar 24X)
532 Mercury Dr.
Sunnyvale, CA 94086
(408) 736-2000
fax: (408) 730-5750
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Genoa Systems Corp.
(Multimedia VGA 7900)
75 East Trimble Rd.
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(408) 432-9090
fax: (408) 434-0997
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Hercules Computer Technology, Inc.
(Hercules Chrome Model C638)
921 Parker St.
Berkeley, CA 94710
(800) 532-0600
(510) 540-6000
fax: (510) 540-6621
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Matrox Electronic Systems, Ltd.
(Impression-1024, Impression-S, Impression-Ultra)
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Dorval, Quebec,
Canada H9P 2T4
(514) 685-2630
fax: (514) 685-2853
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National Design, Inc.
(Volante AT2004)
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fax: (512) 329-6326
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Number Nine Computer Corp.
(#9GXiTC)
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fax: (617) 674-2919
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Opta Corp.
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(MultiView 24)
1710 Fortune Dr.
San Jose, CA 95131
(408) 434-1010
fax: (408) 434-6437
Circle 1143 on Inquiry Card.

Truevision, Inc.
(Truevision 1024-32)
7340 Shadeland Station
Indianapolis, IN 46256
(317) 841-0332
fax: (317) 576-7700
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VideoLogic, Inc.
(Rapier 24)
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Cambridge, MA 02142
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783	809	835	861	887	913	939
784	810	836	862	888	914	940
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954	979	1004	1029	1054	1079	1104
955	980	1005	1030	1055	1080	1105
956	981	1006	1031	1056	1081	1106
957	982	1007	1032	1057	1082	1107
958	983	1008	1033	1058	1083	1108
959	984	1009	1034	1059	1084	1109
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961	986	1011	1036	1061	1086	1111
962	987	1012	1037	1062	1087	1112
963	988	1013	1038	1063	1088	1113
964	989	1014	1039	1064	1089	1114
965	990	1015	1040	1065	1090	1115
966	991	1016	1041	1066	1091	1116
967	992	1017	1042	1067	1092	1117
968	993	1018	1043	1068	1093	1118
969	994	1019	1044	1069	1094	1119
970	995	1020	1045	1070	1095	1120
971	996	1021	1046	1071	1096	1121
972	997	1022	1047	1072	1097	1122

Inquiry Numbers 1123-1304

1123	1149	1175	1201	1227	1253	1279
1124	1150	1176	1202	1228	1254	1280
1125	1151	1177	1203	1229	1255	1281
1126	1152	1178	1204	1230	1256	1282
1127	1153	1179	1205	1231	1257	1283
1128	1154	1180	1206	1232	1258	1284
1129	1155	1181	1207	1233	1259	1285
1130	1156	1182	1208	1234	1260	1286
1131	1157	1183	1209	1235	1261	1287
1132	1158	1184	1210	1236	1262	1288
1133	1159	1185	1211	1237	1263	1289
1134	1160	1186	1212	1238	1264	1290
1135	1161	1187	1213	1239	1265	1291
1136	1162	1188	1214	1240	1266	1292
1137	1163	1189	1215	1241	1267	1293
1138	1164	1190	1216	1242	1268	1294
1139	1165	1191	1217	1243	1269	1295
1140	1166	1192	1218	1244	1270	1296
1141	1167	1193	1219	1245	1271	1297
1142	1168	1194	1220	1246	1272	1298
1143	1169	1195	1221	1247	1273	1299
1144	1170	1196	1222	1248	1274	1300
1145	1171	1197	1223	1249	1275	1301
1146	1172	1198	1224	1250	1276	1302
1147	1173	1199	1225	1251	1277	1303
1148	1174	1200	1226	1252	1278	1304

Inquiry Numbers 1305-1479

1305	1330	1355	1380	1405	1430	1455
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1307	1332	1357	1382	1407	1432	1457
1308	1333	1358	1383	1408	1433	1458
1309	1334	1359	1384	1409	1434	1459
1310	1335	1360	1385	1410	1435	1460
1311	1336	1361	1386	1411	1436	1461
1312	1337	1362	1387	1412	1437	1462
1313	1338	1363	1388	1413	1438	1463
1314	1339	1364	1389	1414	1439	1464
1315	1340	1365	1390	1415	1440	1465
1316	1341	1366	1391	1416	1441	1466
1317	1342	1367	1392	1417	1442	1467
1318	1343	1368	1393	1418	1443	1468
1319	1344	1369	1394	1419	1444	1469
1320	1345	1370	1395	1420	1445	1470
1321	1346	1371	1396	1421	1446	1471
1322	1347	1372	1397	1422	1447	1472
1323	1348	1373	1398	1423	1448	1473
1324	1349	1374	1399	1424	1449	1474
1325	1350	1375	1400	1425	1450	1475
1326	1351	1376	1401	1426	1451	1476
1327	1352	1377	1402	1427	1452	1477
1328	1353	1378	1403	1428	1453	1478
1329	1354	1379	1404	1429	1454	1479

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IMAGE DOCTORS

Four programs for enhancing the quality of digital images

D. BARKER

You've got an image problem: The scanned photograph of the company's new president is much too dark, and if you print it in the annual report, it'll look like she was photographed during a solar eclipse. Or the only photo of the company's new programming whiz shows him holding up a competitor's product, and you don't want to feature that in the corporate newsletter. Or you've got a scanned image that needs spiffing up or altering for either commercial or artistic purposes.

Used to be you'd solve these problems by getting a different photo, hiring a professional photo doctor, or buying a Macintosh or graphics workstation. But now there's a good collection of image-editing programs that run under Microsoft Windows. BYTE looked at three of these applications in a recent Windows special report (see "Image Magic," June BYTE). This time around, we're looking at packages that offer a range of capabilities, from basic tools for adjusting the quality of a scanned image to hefty toolboxes loaded with filters and enhancers, pencils and paintbrushes, and color-control capabilities.

Micrografx's Picture Publisher is by far the most sophisticated and well-equipped program in this bunch. Along with Aldus PhotoStyler and Adobe Photoshop, it's in the major leagues of personal computer–based image editing. ZSoft's PhotoFinish is a less ambitious variation on the Picture Publisher theme. Computer Associates' CA-Cricket Image and Media Cybernetics' Halo Desktop Imager dispense with drawing and painting tools to focus on sharpening up scanned pictures.

All these programs let you take a digital image and enhance its quality for use in a printed publication, an electronic document, slides, or a presentation. They all work with the most common graphics formats, and they all can handle 24-bit color pictures. Which package is right for you depends on the type of image problems you have to solve.

Ideally, you'd have a fast 486-based PC to run these programs, but I've used them all on my Dell 33-MHz 386 (8 MB of RAM) and not cursed too often. And as you can see from the features table, or as you know if you've worked with image-editing software, the fully stocked programs have some heavy memory requirements. I'd suggest at least 8 MB of RAM. As for storage, it doesn't take long before a 100-MB hard drive seems tiny.

Picture Publisher 3.1

Picture Publisher is a darkroom on disk, complete with photo-retouching tools, special effects, image-sharpening filters, and the type of graphics functions found in painting programs. Think of it as a combined digital darkroom and art studio. On the one hand, this is a package for working with images at a nuts-and-bolts level: adjusting basic components like brightness and contrast, correcting colors the scanner didn't handle so well, and turning images into four-color separations for printing. On the other hand, this is a package for working at a creative level: turning a staid photo into a snazzy graphic, blending elements into a composite image, or preparing a picture for incorporating into a desktop-published document (as shown in screen 1). Picture Publisher will not overwhelm the mechanic, nor will it leave the artist under-equipped.

Picture Publisher's straightforward interface displays the tool icons in a single vertical stack on the side of the screen. Most of the icons, when clicked on, spill out a horizontal row of related tools. Click on the painter's-palette icon, for example, and it shows you all the related tools; you can then pick the paintbrush, the airbrush, the smearing finger, the cloner, or the texture tool. The interface doesn't blitz you with a screenful of arcane icons.

The toolkit is extensive. Besides painting tools, there are freehand drawing tools; a tool for adding text to a picture (up to 80 characters, using any Windows-compatible fonts); tools for filling an area with colors, textures, or gradients; an eraser; a color-probe tool, which basically samples any color you point to in the image and then loads up the current painting tool with that color; and a tool for zooming in on an image. Picture Publisher also has tools for sharpening or softening the edges in an image; you essentially brush over the edges you want to sharpen or smooth. You can use any of these tools to paint or draw on an image or create a new design.

Screen 1 shows a simple example of what can be done with Picture Publisher. Using the program's masking tools, I cut the girl with the glasses out of a scanned color photograph, copied her to the Clipboard, and then pasted her into a different background. The edges of the pasted image were a bit rough in spots, like a picture clipped from a magazine, so I used the paintbrush and smear tools to soften the edges and blend them into the background. With the color probe tool, I could easily paint pasted areas so they matched the color of surrounding areas. Using the zoom function, you can do some pretty up-close pixel editing; this is particularly helpful in spots where separate images merge. Picture Publisher excels at this sort of image doctoring.

The masking tools are one of the most

BYTE ACTION SUMMARY

- **WHAT IMAGE EDITORS DO**
  They let you enhance the quality of digital images, in gray-scale or various color modes; the more sophisticated ones have graphics tools for retouching pictures and adding creative elements.
- **LIKES**
  The ability to manipulate colors and other components of an image; relative ease of learning and use; tools that are productive but also fun to use.
- **DISLIKES**
  The more powerful programs gobble up memory; some operations are very slow.
- **RECOMMENDATIONS**
  For professional-level color control and a good set of artist tools, Picture Publisher is excellent; however, depending on your needs, PhotoFinish, CA-Cricket Image, or Halo Desktop Imager might be more appropriate.

IMAGE-EDITING PROGRAM FEATURE COMPARISON

All these packages can enhance a scanned image, but PhotoFinish and Picture Publisher offer painting and drawing tools.

	CA-Cricket Image 1.0	Halo Desktop Imager 1.0	PhotoFinish 1.0	Picture Publisher 3.1
Price	$295	$139	$199	$495
Filters	Sharpen, smooth, remove noise, user-definable, special effects	Sharpen, smooth, blur, despeckle, special effects	Sharpen, equalize, diffuse, blend, remove spots, brightness, contrast, edge detection, special effects	Sharpen, smooth, lighten, darken, brightness, contrast, edge detection, special effects
Graphics tools	None	None	Paintbrush, airbrush, spray can, color picker, geometric drawing, patterns, lines and curves, clone tool, blend, smear, smudge, text	Paintbrush, airbrush, freehand drawing, textures, gradients, color picker, clone tool, text
Area-selection tools	Rectangular	Rectangular	Freehand, rectangular, polygonal, magic wand	Freehand, elliptical, rectangular, magic wand
Gamma control	Yes	Yes	Yes	Yes
Scanning functions	None	Prescan, calibration	Prescan, brightness and contrast adjustment, scaling, auto-stitching	Prescan, speed control, brightness and contrast adjustment, calibration, scaling, auto-stitching
Adjust color map	Yes	Yes	Yes	Yes
Image conversion	Yes	Yes	Yes	Yes
Color separations	Yes	No	No	Yes
Halftones	Yes	Yes	Yes	Yes
File formats supported	TIFF, Targa, BMP, PCX, GIF, PIX, WIN, BPX, CVP, JPEG	TIFF, Targa, BMP, PCX, GIF, MSP, IMG, CUT	TIFF, Targa, BMP, PCX, GIF, MSP	TIFF, Targa, BMP, PCX, GIF, JPEG, Photo CD

impressive facets of Picture Publisher. A mask lets you select part of an image when you want to make changes to just that part or to everything *but* that part. For example, say you have a photo of someone standing against a busy background and you want to change that background. With the freehand mask tool (the icon looks like an X-Acto knife), you can cut around the edges of the person and then either remove that person from the image or change everything outside the masked area. (You click on a button to make editing changes take place either within the masked area or outside it.) Screen 2 shows a masking operation.

In some ways, masking tools are like the marquee and lasso tools found in many graphics packages: They allow you to select an area to operate on. But Picture Publisher's masking functions are more intelligent than that. Besides the freehand and geometric mask-drawing tools with which you have to do the razor work yourself, the program has an AutoMask and a SmartMask. AutoMask will draw the mask for you, tracing along the edge lines of an object. SmartMask, akin to the magic wand in some paint programs, knows about colors. It can sense changes in color and draw the mask accordingly; for example, if you want to mask a blue section surrounded by red, SmartMask will detect the color differences and select just the blue region.

SmartMask, akin to the magic wand in some programs, knows about colors.

The SmartMask works really well if the breaks in color are sharp and well defined. A big yellow sun in a deep blue sky is something SmartMask can handle nicely. But in many images, things aren't so black and white, so to speak. One color often blends into a variation of itself or is darkened by shadow or brightened by light. In this sort of situation, SmartMask could be a little smarter. It won't always mask an area as precisely as you'd like. Fortunately, you can adjust the mask's range of color tolerance, based on the RGB color model, so it will recognize a wider range of blues, for example. As you raise the value (by percentages), the mask includes more colors. These adjustments will usually do the trick, but some dinking around is needed to set the range just right.

Picture Publisher's Color Shield is similar to the SmartMask but knows only about colors, not lines and shapes. It lets you select and mask part of an image based on color values. You can adjust the color range the shield will protect by opening a dialog box and typing in percentages. With a setting of 0 percent, for example, the

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Software Publishing Corporation	Harvard Draw	Harvard Graphics: (Windows)	Not Available	62	1600	$1190
Aldus	Freehand	Persuasion	PhotoStyler	12	305	$1885
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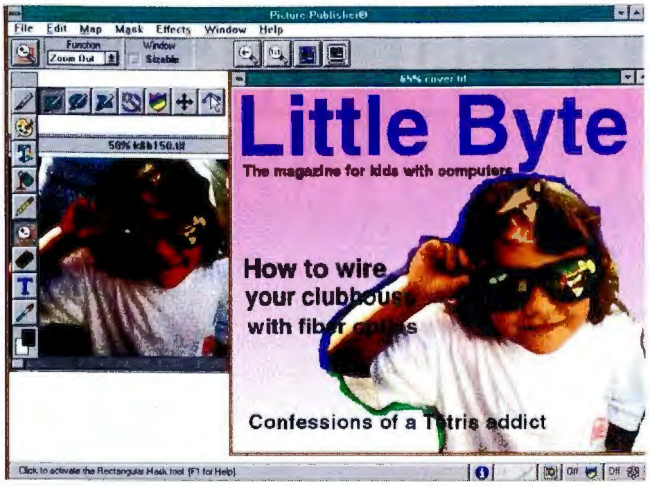

Screen 1: *With Picture Publisher's hefty set of sophisticated color controls and graphics tools, it's relatively easy to assemble something like a prototype of a magazine cover, shown here, or a montage. (Photo of girl by John Olson; used with permission.)*

Screen 2: *Picture Publisher's SmartMask (magic wand) at work. The dotted green-and-red line defines the masked area. Here, the mask has gone beyond what the user wanted (the black sunglasses frames), selecting other regions it interpreted as black.*

shield will select only colors that match exactly; at 10 percent, it will select areas that are within 10 percent of that color's value, and so on.

Color control is one of Picture Publisher's main components. There's a whole set of tools for changing the RGB or CMY channels. You can modify the color map (or what some folks call a color lookup table), which changes the way the program displays a color. This can be done interactively, so you can preview the effects of your changes on the image you're working on. Its extensive set of controls for manipulating color channels, brightness and contrast, and hue and saturation makes Picture Publisher a professional-level image-editing program.

Picture Publisher also has a menu of special effects. These will let you do things like change the size of an image, rotate it, and reduce the number of colors. But it will also let you do some far-out things, like make the image look embossed, engraved, crystallized, windblown, rippled, textured with stucco, or like it's wrapped around a cylinder. I ran into some problems with these filters in 3.1, however; some effects would not work properly.

The Image Browser shows you miniaturized versions of graphics files instead of just listing their names. This is very handy if you can't remember the name of a file but know what it looks like. The drawback with this browser is that it has to build the thumbnail sketch the first time you bring a file into Picture Publisher. This can sometimes take minutes. You can turn off this function if you want.

Version 3.1 has auto-stitch capabilities. It will take different parts of a large image and sew them together seamlessly. This is especially useful if you've got a big picture that won't fit on your scanner bed or if you're using a hand scanner to bring in a wide image.

Picture Publisher tends to slow down when it comes to certain operations. With version 3.0, it can take as long as a minute and a half to open up a 150-dot-per-inch TIFF file (on a 33-MHz 386). Version 3.1 pulls in that same file in a minute. The newest version is also a bit faster at manipulating pixels. It can fill an area with a pattern in 10 seconds, whereas 3.0 can take about 16 seconds.

While 16 or 90 seconds aren't significant lengths of time, they can add up to what feels like an eternity when you spend your day working with images. A minute here, a minute there—it all accumulates. With 3.1, you spend less time watching the little clock on the screen.

Picture Publisher isn't alone in its need for more speed. The kinds of compute-intensive jobs it's performing tend to take time. Even the excellent Adobe Photoshop, on a zippy Mac Quadra 950, can chew up the minutes when reading in a file or running an image through a filter. This is more of a plea to Micrografx: In the next version, please torque up the processing speed instead of adding features.

Like its rival, PhotoStyler, Picture Publisher is geared toward artistic types and graphics professionals, but you don't have to be an artist to use it effectively. In fact, the tools are so good that they can compensate for lack of artistic skill; a good eye, imagination, and the ability to work at the pixel level are just as important. This is an excellent package for anyone who has to scan or import images and then use them in either printed publications or electronic presentations. Picture Publisher provides everything you need except creativity. At its new price of $495—a drop of $300—Picture Publisher is a Texas-size deal.

PhotoFinish 1.0

From the company that brought us PC Paintbrush, this program is heavy on the graphics tools. One way to think of PhotoFinish is as Paintbrush with photo-processing tools. It doesn't have all the sophisticated color-manipulating capabilities of Picture Publisher, and it doesn't have as many filters and effects, but it's by no means a lightweight package.

PhotoFinish gives you an extensive set of tools. There's a paintbrush, a paint roller, an airbrush, a spray can, a pen for drawing freehand, a pencil for drawing lines and Bezier curves, a text generator, an "eyedropper" that will pick up a color you point at in an image and set that as the operative color, tools for smearing and smudging paints, tools for drawing geometric shapes, and an eraser that can delete something in the foreground without erasing the background. Special-effects filters can make an image appear embossed, blurred by motion, or made up of mosaic-like pixels.

Not all the tools will work with gray-scale or 256-color images, however. This is an unfortunate set of limitations. All the tools work with 24-bit color images, so if you've got the right graphics card, you can

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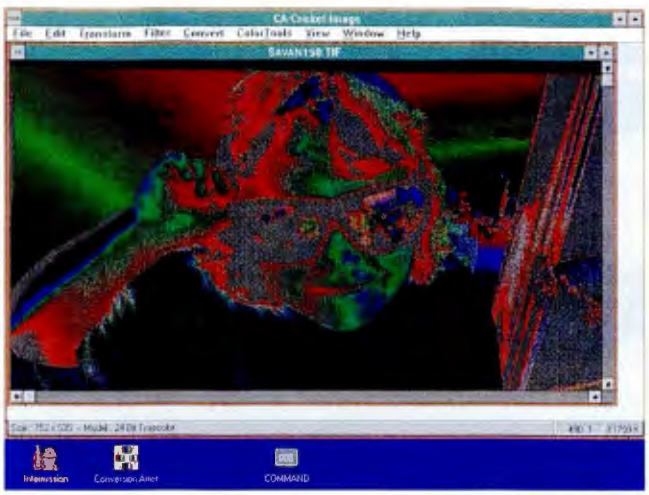
Screen 3: *PhotoFinish has a well-stocked collection of painting and drawing tools. The woman was clipped out of a sample file that comes with the program and pasted against the sky. The other elements were done with the various paint tools.*



Screen 4: *CA-Cricket Image doesn't have the "creative" tools of Picture Publisher and PhotoFinish, but it does have some special-effects filters. The scanned photo here has been solarized.*

convert a file to 24-bit color. If you don't have the stuff to display 16.7 million colors, the program tries to simulate that by reducing the number of colors shown on the screen.

Screen 3 shows the PhotoFinish workspace and an example of the type of picture you can put together. The woman was cut out of a scanned image, pasted against the sky, and altered using the paint tools. Clouds and lightning were painted on top of the new image.

You can select areas within a rectangular frame (a marquee) or within irregular lines (a lasso). But there's also a magic wand; like Picture Publisher's SmartMask, it will highlight an area on the basis of color, and you can adjust the range of colors it will select. I find that PhotoFinish's magic wand usually requires more tinkering with the color range than Picture Publisher's SmartMask does.

PhotoFinish has a set of image-processing features that will let you change brightness and contrast, remove noise, soften colors, and sharpen edges. To my eyes, PhotoFinish doesn't reproduce scanned colors as well as Picture Publisher does; they appear darker. Flesh tones, a good test of color accuracy, have an orange cast to them. You can fix this by adjusting color levels using RGB, CMY, or HLS (hue-luminance-saturation) color models.

You can scan from within PhotoFinish, using either a flatbed scanner, a hand scanner, or a video frame grabber. PhotoFinish, too, has a solution for pictures that are too big: It will stitch them together. From the scanner setup dialog box, you can adjust brightness and contrast, scale the size of the image, set the resolution, and change the levels of color. Although it lacks the calibration functions of Picture Publisher, this is a good scanning application.

One bad thing about this program is its Undo function. It erases everything you did since you last picked up the most recently used tool. This is okay if you want to clear all the paint you've put down, but what if you want to get rid of just the last brushstroke? You have to grab the eraser for that and then carefully cover your mistake. A multistep Undo—as found in Halo Desktop Imager—would be much better.

PhotoFinish is a very capable, easy-to-learn program for altering and enhancing digital images. It's not running neck-and-neck with Picture Publisher, but for people who don't need such a high-powered program, PhotoFinish is a winner.

CA-Cricket Image 1.0

Cricket Image lacks the painting and retouching tools of Picture Publisher and PhotoFinish, but it's strong in image-processing functions. The program, derived from a DOS package called PHIPS, has a set of filters for sharpening or smoothing edges, eliminating noise, and applying special effects that will do things like melt or solarize an image (see screen 4) or make it look like an oil painting, a pencil drawing, or a mosaic.

You can also define your own filters. Unless you know something about image-transformation algorithms, you'll be experimenting, but you don't need to understand theory to concoct these filters. Just by randomly entering coefficient values, you can produce some unique effects (which can be stored in a library of filters).

Cricket Image gives you good control over color. You can edit the colors in the palette and alter color values by changing the color response curve. RGB is the default color model, but the program can also use the CMYK, HLS, or HSV (hue-saturation-value) models. It can separate an image into either RGB or CMYK layers.

Conversion is one of Cricket Image's features. It will convert files to 1-bit black-and-white, 256-gray-scale, 16- or 256-color, or 24-bit-color. It will do color reduction to show a true-color image on a 16-bit color display.

The program's method for selecting a part of an image is limited: The only choice you have is a rectangular frame. You cannot scan from within Cricket Image, which is too bad.

Cricket Image loses points for its lack of speed. Changes can sometimes take minutes to process—special effects are the worst—while the program rattles the hard drive almost constantly. It's little compensation, but a red status line at the bottom of the screen lets you see how close to completion an operation is.

Cricket Image is not intimidating, but it's not as easily approachable as the other packages I reviewed. The command interface is almost entirely reliant on menus and dialog boxes. When you want to pick a color-reduction process, for example, you get a list of choices like Biased Median Cut and Uniform Quantization. The manual explains the differences.

This is more of a graphics or production professional's tool than an artist's or

Screen 5: *Halo Desktop Imager's spartan interface belies the capability of this utility. The slider bars let you adjust brightness and contrast and make gamma corrections.*

designer's tool. With its considerable color-control capabilities, Cricket Image is a good tool for anybody who has to take scanned or otherwise acquired images and fine-tune them until they look sharp.

Halo Desktop Imager 1.0

This is a different class of software from Picture Publisher and PhotoFinish, but Halo Desktop Imager is a crafty utility for working with scanned graphics. As screen 5 shows, this program presents a Spartan interface: a work area; three sliding bars for controlling brightness and contrast and making gamma corrections (as you move the bars, the effects are quickly reflected in the loaded image); two buttons for making rectangular frames around parts of an image; and a strip where you can set thumbnail sketches of images you're working with.

Besides these basic controls, Halo Desktop Imager has a few special effects. You can make an object look embossed, sculpted in metal, or reversed like a negative. There are filters that soften edges, sharpen edges, and remove noise.

One unusual feature lets you print out test strips to see what variations in contrast and other settings look like when you print the image. This is a handy way to find out which settings are best for a particular output device.

The program can stitch together the parts of an image scanned in in strips. Media Cybernetics says the software can print an image as big as 50 by 50 letter-size pages (I didn't test this). Halo Desktop Imager has its own screen-capture utility, which is a handy idea, but when I used it to grab a screen for this article, the program could not open the file after snapping the picture. Fortunately, North Coast Software's amazing Conversion Artist program *could* (see "A Few of Our Favorite Things," June BYTE, page 200). Halo will use the company's proprietary technology for displaying 24-bit images on an EGA or VGA monitor, but to my eyes the result is not great.

There's one weird thing about the design of this program. It can recognize and save files in most common image formats, but with the Open command, you can bring in only TIFF files. To bring in files in other formats, including Windows mainstays like BMP and PCX, you have to use the Import command.

At $139, Halo Desktop Imager is a good buy. It's a decent fit for someone who's doing desktop publishing under Windows and needs to clean up scanned images before putting them into a document. This package is a good choice for people who don't need graphics and retouching tools and who just need to sharpen images for use in documents and presentations. Version 2.0, slated for an October release, will be more capable and will include, Media Cybernetics said, the ability to produce color separations.

Finding the Right Doctor

While similar in nature, these four packages represent different aspects of the image-editing picture. Picture Publisher is a professional application. At a mechanical level, it will let you manipulate and refine every component of a digital image. At an artistic level, it will let you use a scanned image as the basis of a creative work. Although complex, it's not hard to get the hang of; plus, it's fun to use.

PhotoFinish isn't trying to match Picture Publisher, but it comes pretty close anyway. It's very capable and has a good set of painting tools. One of its most obvious differences is in the treatment of colors. If you look at the same scanned image with both programs, the Picture Publisher rendition will be more faithful, in terms of colors and highlights, to the original.

Cricket Image is a good workhorse application for refining brightness, contrast, color, and other graphics components. It has a fine set of filters and effects but lacks any artist tools. If you need fairly sophisticated image-processing functions but no graphics tools, this is one to consider.

Halo Desktop Imager is a functional little program with some nice touches, particularly the ability to print out test strips. For the person who isn't a graphics hacker but needs to capture screens or convert files and clean them up for other applications, it's a useful utility. At $139, it costs about the same as some screen-capture packages that aren't nearly as capable.

As these four packages testify, there's a good range of image-editing applications for PC users running Windows. ■

D. Barker is a BYTE technical editor covering applications software. You can contact him on BIX as "dbarker."

COMPANY INFORMATION

Computer Associates International, Inc.
(CA-Cricket Image 1.0)
1 Computer Associates Plaza
Islandia, NY 11788
(800) 342-5224
(516) 342-6000
fax: (516) 342-5329
Circle 1221 on Inquiry Card.

Media Cybernetics
(Halo Desktop Imager 1.0)
8484 Georgia Ave.
Silver Spring, MD 20910
(800) 992-4256
(301) 495-3305
fax: (301) 495-5964
Circle 1222 on Inquiry Card.

Micrografx
(Picture Publisher 3.1)
1303 Arapaho Rd.
Richardson, TX 75081
(800) 733-3729
(214) 234-1769
fax: (214) 234-2410
Circle 1223 on Inquiry Card.

ZSoft
(PhotoFinish 1.0)
450 Franklin Rd., Suite 100
Marietta, GA 30067
(800) 444-4780
(404) 428-0008
fax: (404) 427-1150
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LOOKING GOOD FOR LESS

Five full-featured Windows word processors that cost less than $250

MARK SCAPICCHIO

Why would you want to buy a low-cost Windows word processor instead of one of the better-known higher-end alternatives such as Word for Windows, WordPerfect for Windows, and Ami Pro? What a low-cost alternative provides is a relatively fast path to solidly designed mainstay business documents—letters, memos, and reports combining eye-catching text and layout effects with a few simple graphics.

Because a low-cost program includes only the most important features, it's easier to find and learn the features you need most. With the best of these programs, a first-time user can—in about two or three hours—install the program, click through a quick tutorial, and crank out a professionally designed report that will definitely get a reader's attention.

This review looks at four popular Windows word processors in the $199-to-$250 price range: Lotus Write for Windows, a trimmed-down version of Lotus's Ami Pro 2.0; Software Publishing's Professional Write Plus, a trimmed-down sped-up version of Ami Pro 1.2; Symantec's JustWrite 2.0; and Computer Associates' CA-Textor. I also took a peek at a bargain alternative, Spinnaker's Easy Working Word Processor, that lists for $49.95. Easy Working provides a surprising range, but limited depth, of features (see the text box "Easy Working Word Processor: Easy on Your Wallet" on page 106).

When might none of the low-end word processors reviewed here be right for you? See the text box "Reasons to Step Up" on page 110 to see what the high-end packages provide that these don't. If your tasks require regular activity in one or more of the features listed in the text box, you should look at the higher-end word processing software or learn to live with reduced capabilities and/or more labor-intensive word processing.

BYTE ACTION SUMMARY

- **WHAT LOW-COST WINDOWS WORD PROCESSORS DO**
  Because of their smaller feature set, they let you create high-style documents quickly—sometimes within an hour or two after you install the program.
- **LIKES**
  Styles for formatting paragraphs and documents quickly; frames for positioning text and graphics anywhere on a page.
- **DISLIKES**
  No in-document tables; no significant drive-space savings; slow performance on lower-end PCs and laptops.
- **RECOMMENDATIONS**
  You can create professional-looking documents more quickly and easily with Lotus Write than with any other program reviewed. For long documents, use JustWrite. Its formatting and layout capabilities are a step behind Lotus Write's, but its complete selection of power features and proofing tools is better suited to big text-crunching jobs.

Criteria and Testing

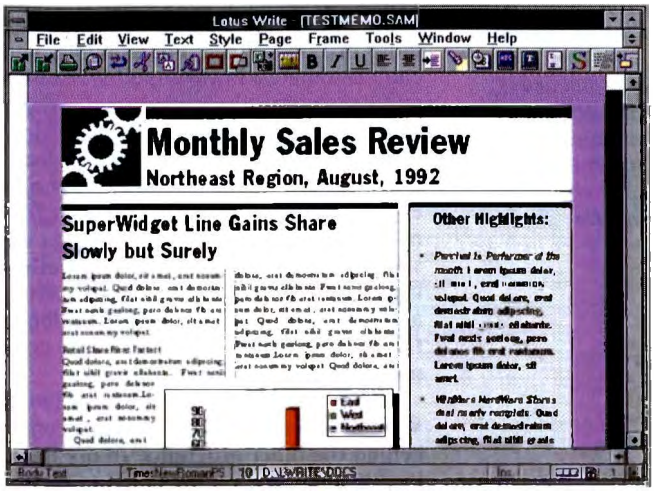
To help you create the best-looking document in the shortest period of time, a Windows word processor must provide sound implementations of the following three features:

- *Styles.* A style (also called *paragraph style*) is a named collection of instructions for formatting a particular type of paragraph. For example, you might have a style named Headline that specifies bold, centered, 18-point Helvetica; a Normal style that specifies justified 10-point Times Roman with a first-line indent; and so on. With styles, reformatting a paragraph is as easy as selecting another style; reformatting all paragraphs of a particular type is as easy as modifying the appropriate style.
- *Frames.* Frames are boxes you can use to position text, graphics, and tables on a page. You might use a frame to position a graphic as part of a page header, to create a headline that spans across several columns in a multicolumn layout, or to create a sidebar around which you can wrap your main document text. The more options you have for positioning and formatting frames, the more quick layout effects you have at your disposal.
- *WYSIWYG display.* In an ideal WYSIWYG display, your document looks exactly the same on-screen as it will look when you print it. In reality, few Windows word processors—no matter what their cost—can achieve this ideal without a font management program such as Adobe Type Manager. WYSIWYG is especially important to users of portables, who usually don't have the luxury of test-printing a document several times until they get it right.

To test each program's command of these basics, I used it to create a "better" departmental memo—one that combines provocative headlines, a three-column layout, and a table of contents to create a document that was easier to read, easier to reference, and, ultimately, more effective. You may never need to create such a fancy document, but if your word processor can handle such heavy-duty formatting, it can knock off your day-to-day documents with ease. The table provides a quick features-comparison reference for the programs reviewed here.

Lotus Write for Windows

Lotus Write does the basics better than any word processor in this roundup. Its styles let you control virtually everything



Screen 1: *Lotus Write, a slimmed-down Ami Pro 2.0, includes ATM, 13 additional fonts, automatic numbering and bulleting, and the best layout tools in this roundup.*

about a paragraph's formatting: fonts, attributes, alignment, indents, hyphenation, tabs, spacing, lines, and more (see screen 1). You can assign function keys to 10 of the styles so you can select them quickly as you type. You can even program a style to switch to another style whenever you finish typing a paragraph, so that, for example, when you finish typing a subhead with the Subhead style, you're automatically switched to the Body Text style.

But if you're like most first-time users, what will impress you most are the ready-made Bullet and Number List styles that come with many of Lotus Write's templates (called *style sheets*). The Bullet style automatically inserts a bullet at the beginning of each paragraph (you can choose from several bullet characters) and creates a nifty hanging indent. The Number List style automatically numbers your paragraphs in succession and will renumber them if you add or delete paragraphs from the list.

Lotus Write's frames let you place text and graphics anywhere on a page. A Lotus Write text frame is virtually a page within a page: You can format it with margins, newspaper-style columns, and tabs. You can import, size, and crop any of 12 graphics file types in a graphics frame. You can wrap text around the frame, overlay frames to create special effects, and format frames with borders, colors, shadows, and even rounded corners.

Like its forerunner, Ami Pro 2.0, Lotus Write sets a standard of WYSIWYG that most other Windows word processors are still shooting for. Much of this is due to ATM (bundled with the program), which adds 13 new fonts to all your Windows programs and sharpens the display of all fonts on-screen. But Lotus Write is also free of the display woes that plague other Windows word processors, such as lines of text that extend beyond the margins of the page if you change the view level. You always get an accurate representation on-screen of your printed page, no matter what view level you choose.

Given the features it might have borrowed from Ami Pro 2.0, Lotus Write's power features are a bit disappointing. There's one really sore point: Ami Pro's excellent table feature was omitted from Lotus Write.

JustWrite

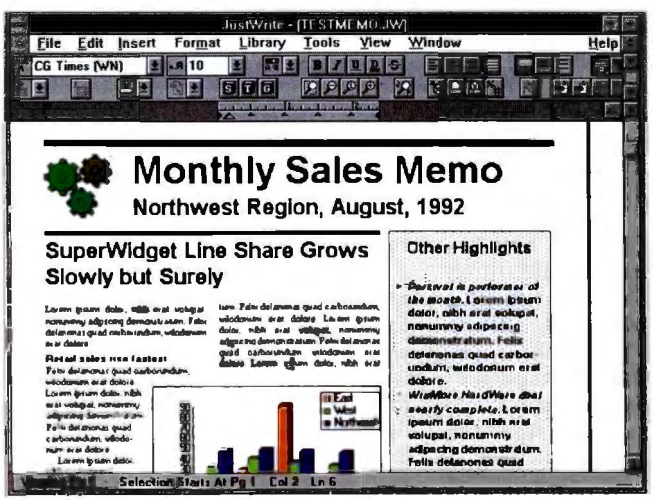
On the basis of features alone, JustWrite 2.0 is nearly a high-end word processor for a low-end price. Compared to top-flight word processors like Word for Windows and Ami Pro, JustWrite lacks little more than document automation (via macros and fields), drawing, and charting (see screen 2).

JustWrite's tables are easy to work with because you can size rows and columns by hand. You get quick math functions for totaling and averaging data in tables. For long documents, you get an outliner, table of contents and index generators, bookmarks, and footnotes and endnotes. For proofing, JustRight includes a thesaurus, a spelling checker, and a grammar checker. Of the programs tested, this one adapts most readily to big word processing jobs.

Unfortunately, JustWrite's styles are not very easy to create, modify, or use—especially when you compare them to the styles in Lotus Write and Professional Write Plus. The documentation is partly to blame; it doesn't mention that you must create a style based on an existing formatted paragraph. The style dialog boxes rely on confusing icons to convey your formatting choices; graphical examples like those in Lotus Write and Professional Write Plus's dialog boxes would work much better. You can't automate switching from one style to another, and you can't assign shortcut keys to styles for quick selection.

JustWrite's frames provide all the functionality and flexibility you could want. You can place them anywhere on a page; fill them with text, tables, or graphics; span them over columns; and wrap text around them. You can even rotate graphics within a frame. But to edit the contents of a frame, you must work in a separate document window. Usually, you have to go back and forth a few times between the frame and the document window until you're certain that things look the way you want them to look.

But thanks to its combination of layout capability and power features, JustWrite is the only program in this group that could be your first and last word processor. Like many users, you might find the extra learning time and occasional inconvenience



Screen 2: *JustWrite's many perks include a Microsoft Word–like interface, complete reference and proofing features, and more-than-adequate layout capability.*

Screen 3: *Professional Write Plus, an optimized Ami Pro 1.2, excels at layout and includes automatic numbering and bulleting styles but has some trouble with font display.*

a small price to pay for a word processor that can grow with you.

Professional Write Plus

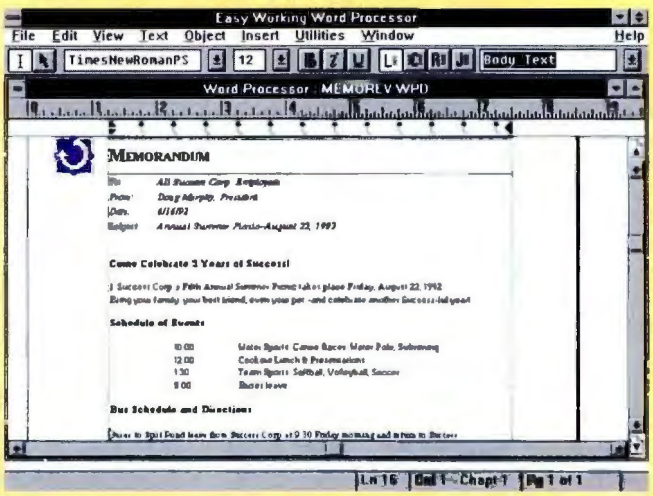
Professional Write Plus is a streamlined, faster version of Ami Pro 1.2. It carries forward much of its progenitor's easy-to-use interface—intuitive menus and icon shortcuts, clean dialog boxes with graphical examples, and 24 ready-to-use style sheets (see screen 3). But it remains unchanged since its release in March 1991, making it by far the oldest release I reviewed.

The styles and frames in Professional Write Plus are just a step or two behind those of Lotus Write. For example, you can't automate a Professional Write Plus style to switch to another style, draw frames with rounded corners or shadow effects, or specify a frame's exact location on a page via the keyboard. But other than that, you get plenty of fast formatting power. In particular, you get the same automatic numbering and bulleting styles that are found in Lotus Write, and you can also rotate a graphic within a frame—something that Lotus Write does not allow.

Unfortunately, Professional Write Plus's WYSIWYG capability lags significantly behind the other programs. In my tests, Professional Write Plus failed to recognize scalable TrueType fonts on the system; instead, it selected the closest printer font size available and then compensated with character and line spacing. As a result, characters often appeared too close or too

EASY WORKING WORD PROCESSOR: EASY ON YOUR WALLET

At first glance, Easy Working Word Processor from Spinnaker Software looks like a lot of software for the money. It includes Publisher's Powerpak, which adds 30 fonts, hollow and condensed text effects, and a sharper font display to all your Windows programs. It also packs an outliner, a spelling checker, a thesaurus, footnoting, and table of contents generation. Easy Working helps you through mail merge with support for printing labels and envelopes and with a card-file interface for creating and managing data files. It's pretty heady stuff for $49.95 (see screen A).



Screen A: *For a list price of $49.95, Easy Working Word Processor can zip off some surprisingly impressive documents.*

Another pleasant surprise is that Easy Working's styles are quite capable—a bit less powerful than Professional Write Plus's, a bit more powerful and easier to use than JustWrite's. You can not assign function or shortcut keys to the styles or program one style to automatically follow another, but you get all the text formatting power that you need.

Easy Working falls short in the layout department, however. Its frames are as good as any for sizing graphics, but you can't wrap text around a frame, and you can import only PCX, PCC, BMP, and TIFF graphics files—none of which is known for particularly sharp output on desktop printers. You also can't create tables or multiple newspaper-style columns with the program.

A closer look at some of its power features may disappoint you. The outliner is fine for creating a document that looks like an outline, but because you cannot move headings and associated underlings together, it's not useful for reorganizing your thoughts.

You cannot create more than one master name and address list with the mail-merge card-file interface, and you can't change its preset field names. To mail to a portion of the list, you have to select records by hand. If you want to merge data outside the card file, you're limited to DBF- or comma-delimited files.

But if you just want to dash off a few better-than-average-looking memos from your laptop, Easy Working could be the answer. At a street price of $30, it's a word processor you can afford to outgrow.

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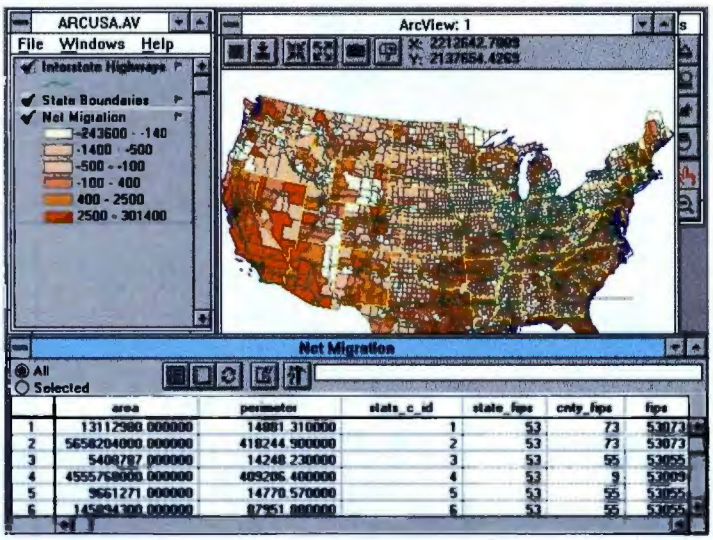

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far apart, although the line breaks were always accurate. Without an outliner, table of contents and index generators, conditional mail merge, tables, bookmarks, and glossaries, Professional Write Plus also loses in the breadth-of-features battle with JustRight and CA-Textor.

CA-Textor

CA-Textor attempts to be too many things at once. On the one hand, it is small and efficient: It takes up just 2.3 MB of hard drive space—less than any of the other programs reviewed except Easy Working. On the other hand, it provides high-

COMPARING LOW-COST WORD PROCESSOR FEATURES

Fundamental word processing, layout, and proofing features. Of the packages reviewed, Lotus Write and JustWrite offered the most features.
(● = yes; ○ = no.)

Product	Lotus Write for Windows	Just-Write	Professional Write Plus	CA-Textor	Easy Working Word Processor
Company	Lotus Development	Symantec	Software Publishing	Computer Associates International	Spinnaker Software
Price	$199	$249	$249	$225	$49.95
Drive space required	4.8 MB (without ATM)	5 MB	3.4 MB	2.3 MB	2 MB (without Publisher's Powerpak)
Formatting and layout features					
Styles	●	●	●	●	●
Text frames	●	●	●	○	○
Tables	○	●	○	●	○
Graphics frames	●	●	●	○	●
Graphics scaling	●	●	●	●	●
Graphics rotation	○	●	●	○	○
Font management	● (ATM)	○	○	○	● (Publisher's Powerpak)
Simple bullets	●	○	●	○	○
Simple numbering	●	○	●	○	○
Clip art	●	○	○	○	○
Templates	●	●	●	●	●
Graph types imported	12	12	11	6	4
Columns	8	8	8	6	0
Dialog box examples	●	○	●	○	○
Power editing					
Outliner	●	●	○	○	●
Footnotes/endnotes	●	●	●	○	●
Glossaries	○	●	○	●	○
Index	○	●	○	○	●
Table of contents	○	●	○	●	●
Spelling checker	●	●	●	●	●
Thesaurus	●	●	●	●	●
Grammar checker	○	●	●	○	○
Mail merge	●	●	●	●	○
Macros/fields	●*/○	○	○	○/●	○
Bookmarks	●	●	○	●	○
Windows capabilities					
DDE	●	●	●	●	○
OLE	●	●	○	○	○
MDI	●	●	○	○	○

ATM = Adobe Type Manager
MDI = multiple document interface—the ability to have more than one document open at a time
* Can only run Ami Pro macros; cannot create macros.

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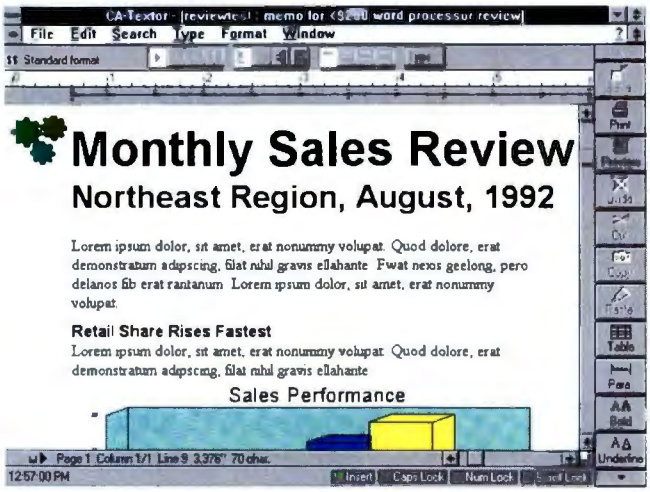

Screen 4: *CA-Textor's scrolling, labeled icons are the best yet, but the program is hard to learn and its layout capabilities are nothing special.*

powered word processing features like programmable fields and conditional mail merge. But the result is a weak implementation of the basics, little layout capability, and a semiselection of power features that most users will quickly outgrow (see screen 4).

To be sure, you'll find a few things in CA-Textor that you won't find in the other programs. The Library File Management system virtually eliminates the need to create subdirectories. With it, you can organize your documents into folders that can have names up to 12 characters long; what's more, you can use 40-character filenames within these folders. When you open the file, CA-Textor displays both the folder name and the filename in the title bar.

CA-Textor's icon shortcuts are the best of the bunch for two reasons. First, they're all labeled (e.g., Bold or Undo), so you'll never forget what an icon stands for. Second, they scroll along the icon bar so you have access to any icon in the program without having to resort to the menu.

But perhaps the most unique features in CA-Textor are the built-in British- and French-language spelling checkers and thesauri. These and the ability to import U.K.-only CA-SuperDB files make CA-Textor a product of choice for international applications.

For writing snappy memos here on the homefront, however, CA-Textor can prove frustrating. The style menu's commands are not intuitive: You'll never learn to use them without studying the manual. You get no on-screen or keyboard shortcuts for selecting styles. You're instructed to assign cryptic IDs to each style for no apparent reason. And when you switch styles for another paragraph, CA-Textor automatically inserts a carriage return—a convention that you may never get used to.

CA-Textor has no frames; you can insert graphics into a line of text only. You can create tables with some effort, but you can't wrap text around them or edit them in the document display. And you cannot stretch text over several columns. As a result, CA-Textor can produce layouts no fancier than those you can create in a DOS-based word processor. It was unable to produce a satisfactory three-column sales memo in my tests.

CA-Textor's power features provide only half of what you need for a particular application. For in-document calculations, you get over 60 fields for calculating numbers, performing math and trigonometric functions, returning dates, and more. However, you can't use any of them within a table. For long documents, you get a table of contents generator and bookmarks but no outlining, indexing, or footnoting.

It's also worth noting that although each of the other programs I reviewed looks and feels like a high-priced alternative, CA-Textor looks and feels like no other word processor on the market. When you outgrow CA-Textor (and you almost certainly will), you may have no place to go to upgrade your inordinately hard-earned skills.

continued

REASONS TO STEP UP

If you need some of the features listed below, you'd probably be better off with a high-end word processor than with one of the low-end alternatives reviewed here.

In-text tables—Perhaps the most underrated feature in word processing, in-text tables allow you to create side-by-side columns—perfect for creating scripts, instructions, forms, sideheads, and other documents where text must remain associated with the text next to it. Tables are also useful for importing spreadsheet and database data or for creating impromptu spreadsheets within your document. At the low end, JustWrite's and CA-Textor's table editors are suitable for creating only the most basic kinds of tables; no other reviewed program offers tables.

Table math—For calculating numerical data within tables. JustWrite features column and row summing and averaging. None of the other programs offers table math.

Macros—For everything from automating common tasks to creating custom word processing applications. High-end word processors feature facilities for recording, writing, and running macros; some include graphical dialog box editors. Lotus Write can run Ami Pro macros. No other low-end program can run or create macros.

Programmable fields—Useful for calculating math, referencing pages, numbering figures, and triggering macros. At the low end, only CA-Textor includes a wealth of math fields; no other program has fields of any type.

More mail-merge control—High-end word processors let you set merge conditions and preview merged documents one by one; some include menu-driven merge assistants for creating envelopes and labels. At the low end, JustWrite and Easy Working Word Processor include comparatively limited label and envelope support.

Drawing—Tools, usually more sophisticated than those of Windows Paintbrush, for creating in-document illustrations. At the low end, only Easy Working Word Processor features some drawing capability.

Charting—Quick tools for creating a graph within your document. Nothing like it at the low end.

Equation editor—A graphical, icon-driven editor for creating scientific equations; indispensable for engineering and scientific applications. Again, you'll find nothing like this at the low end.

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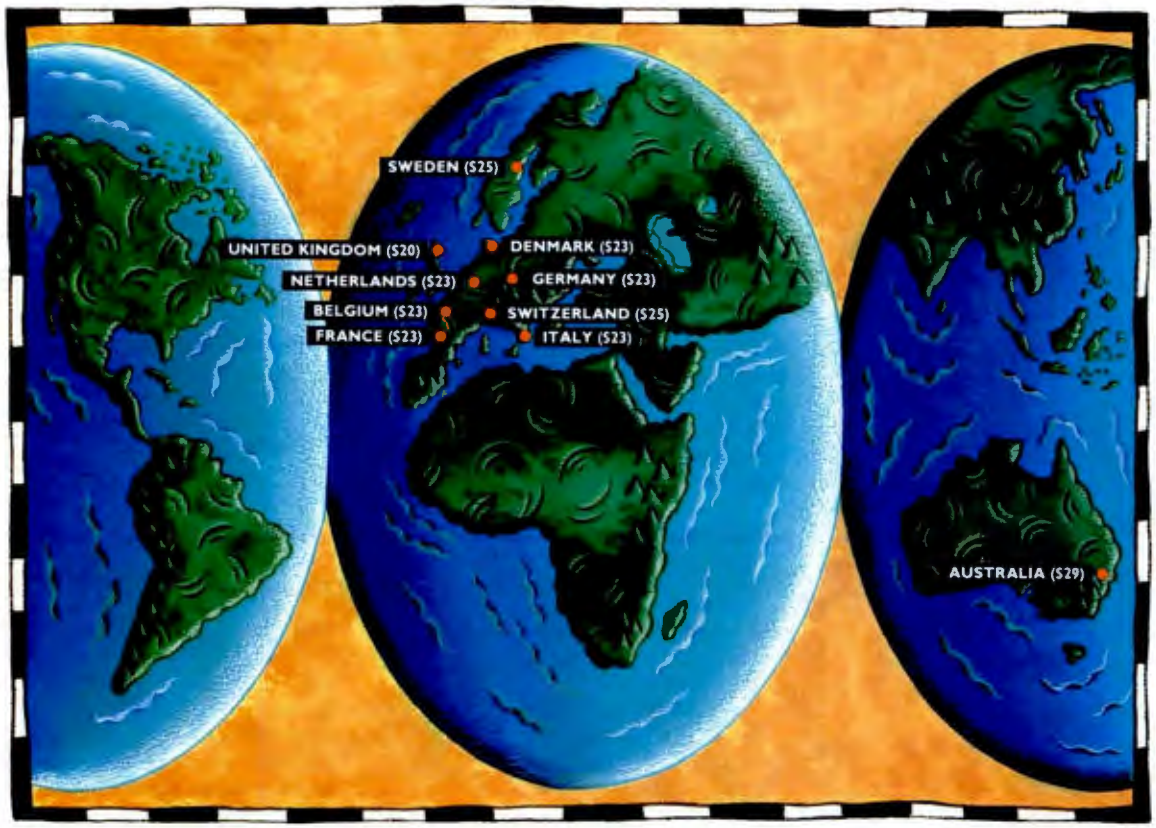

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Mark Scapicchio is a freelance writer and consultant based in Reading, Massachusetts, and the author of two books on word processing. You can contact him on BIX c/o "editors."

PROS AND CONS

CA-Textor
Best icon shortcuts; file management makes files easy to organize and find. Hard to learn; styles difficult to select and use; no frames; does not allow sophisticated layouts.

Easy Working Word Processor
Inexpensive; includes Publisher's Powerpak and 30 fonts; good range of features. Limited layout capabilities; features are easy to outgrow.

JustWrite 2.0
Tables; widest range of well-implemented power features. Poor documentation fails to explain use of styles; all frames must be edited in separate window.

Lotus Write for Windows
Styles are easiest to use; most capable frames; most reliable WYSIWYG of the products tested. No tables; no graphics rotation; icon overload.

Professional Write Plus
Very easy to learn and use; rotates graphics. Slow performance with graphics; some font display problems; needs a revision.

COMPANY INFORMATION

Computer Associates International, Inc.
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Software Publishing Corp.
(Professional Write Plus)
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Spinnaker Software Corp.
(Easy Working Word Processor)
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FOUR WINDOWS DESKTOPS

If you're not happy with Windows out of the box, try one of these desktop enhancers

DICK POUNTAIN

Windows may now be the best-selling GUI for personal computers, but up to version 3.0 it lacked many of the convenience features that users expect, especially those who have experienced the Macintosh interface. The weak File Manager came in for most criticism, followed by the lack of truly hierarchical file folders (i.e., beyond one level) and the inability to place frequently used applications directly onto the desktop. These deficiencies spawned a slew of Windows enhanced desktops, including shareware products like BackMenu and commercial ones like Norton Desktop.

But Windows 3.1 corrects the worst of the flaws. The File Manager is now very usable, and you can drag and drop files and directories within it. This has not eliminated the market for enhanced desktops, but it has raised the stakes. To add value to Windows now means offering fully object-oriented features (e.g., data-driven applications), larger-than-screen virtual desktops, and more powerful job automation via macro and scheduler facilities. I recently examined four of the strongest contenders: Tool Technology Publishing's WinTools 1.0, Hewlett-Packard's NewWave 4.0, the improved Norton Desktop 2.0 from Symantec, and hDC Computer's Power Launcher 2.0. (See the table for a comparison of their features.)

Installation and Resources

Getting Windows 3.1 properly set up (and keeping it that way) is no trivial matter. I've thus become very sensitive about applications that mess around with your system configuration and leave potentially dangerous dross behind when they have gone. A demonstration program that I'll not name locked me out of Windows recently when I deleted its DLLs! All four programs reviewed here were quite proper in this respect.

Both WinTools and Norton Desktop have proper Uninstall routines, and they both ask you before they install themselves as the Windows shell (WinTools can also replace the Task Manager if you wish). Norton Desktop modifies both CONFIG.SYS and AUTOEXEC.BAT, but it keeps backups of both. Power Launcher replaces the Control Menu of every application with its own icon, but it has a Remove command that reverses this takeover; you must manually add SHELL=POWER.EXE to SYSTEM.INI to make it a shell. NewWave is a completely standalone system, and you must manually add a line to your AUTOEXEC.BAT file if you want it to run from boot-up.

Norton Desktop and NewWave are disk-eaters, requiring 8 and 10 MB, respectively, for a full installation, although Norton lets you choose which parts you need. By contrast, WinTools and Power Launcher are lightweights, needing only some 1.5 MB of disk space each.

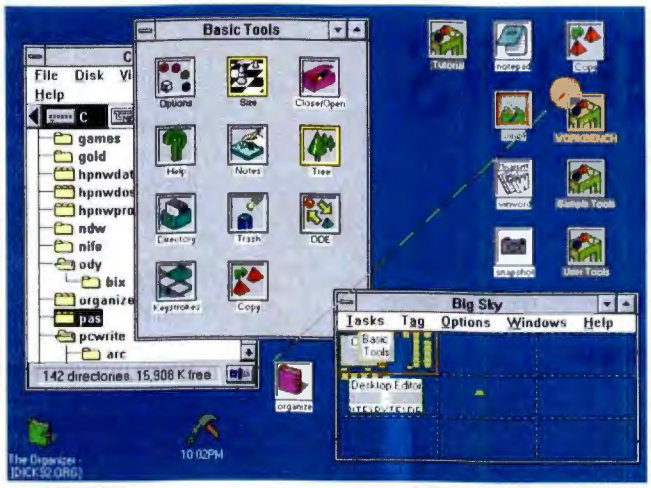
WinTools 1.0

WinTools describes itself as a "Windows customization system," but it is much more; it transforms the look and feel of Windows in a radically object-oriented way. The three key concepts in WinTools are *tools*, *desks*, and *desk sets*. A tool is any application or data file; a desk is a folder that can hold tools or other desks, hence providing fully hierarchical storage; and a desk set is a top-level desk that can be saved and loaded from disk. All these object types look the same, with large square icons surrounded by what I think are rather unattractive "picture frames." A special desk set called Basic Tools is automatically loaded with WinTools.

Almost everything you do in WinTools is a drag-and-drop operation, and no menu bar is visible on the screen (although you can click on the WinTools icon for a system menu). To change the name, font, or

BYTE ACTION SUMMARY

- **WHAT WINDOWS DESKTOP ENHANCERS DO**
  These add-on products for Microsoft Windows enhance its desktop metaphor by adding features like hierarchical folders, virtual desktops, toolboxes, and object-oriented drag-and-drop mechanisms for creating data files.
- **LIKES**
  Both WinTools and NewWave are more deeply object-oriented than Windows; you focus on data, not applications. Norton Desktop has powerful, good-looking utilities and now features drag-and-drop. Power Launcher is excellent for automating tasks, and it assists power users who prefer the keyboard to a mouse.
- **DISLIKES**
  The frames around WinTools icons look plain ugly. NewWave restricts your choice of filename extensions. Norton Desktop doesn't support subdirectory tools on the desktop. Power Launcher's huge menus can get confusing. Virtual desktops may give trouble with some older DOS applications; check that your favorites work.
- **RECOMMENDATIONS**
  WinTools is a peek into the future, a wholly drag-and-drop interface, and I love it. If you don't want to change your ways so drastically, Norton Desktop may be more to your taste.
- **PRICE**
  WinTools 1.0, $149
  NewWave 4.0, $195
  Norton Desktop 2.0, $149
  Power Launcher 2.0, $99



Screen 1: *This WinTools desktop contains desk sets and tools and an open desk set called Basic Tools. The yellow borders of the Size and Tree tools show that they are running. I asked the Organize tool about its membership, so it points to its parent desk set called Workbench.*

Screen 2: *The NewWave desktop contains objects, data files that invoke their applications when clicked on. Applications themselves live in the window called "Create a New...," where you use them as templates from which to create new objects.*

colors of any object, you drag it onto the Options tool in Basic Tools. There's no need for a separate scheduler for automating tasks, because timing is a property of every object, which you set from Options. Similarly, dragging any object onto the Copy tool makes a copy of it, although of only its WinTools representation, not the physical file. You make new desks by copying old ones; only the container is copied, not the contents.

To make any DOS file into a tool, drag it into an open desk window. You can even make subdirectories into tools in this way. When double-clicked on, they display the WinTools directory manager, which is similar to the Windows 3.1 File Manager but separates tree and directory views into different tools. You can create a desk that contains your word processor tool and a directory tool for your documents and then drag files onto the editor.

I particularly liked the Close/Open tool. If you drop any desk icon onto this tool, all that desk's contents will be unpacked onto the main desktop; repeat the drop, and they are all put away again in one swoop. If you have lots of tools out on the desktop, clicking the right mouse button on one identifies which desk it belongs in by drawing a "string" that connects their icons (see screen 1).

Big Sky is WinTools' virtual desktop manager, which creates a virtual screen 16 times the size of the real one. At installation time, you can choose to have this replace the Windows Task Manager. You activate it by double-clicking anywhere on the desktop. The Big Sky tool displays a reduced map of the virtual screen, in which you can move an application by dragging its tiny icon to another sector. Double-clicking on a sector in the map moves you to that screen. You can tag any tool or desk so that it follows you around from screen to screen. If you design your desks thoughtfully, Big Sky will give you many of the benefits of Xerox's advanced Rooms environment.

Other powerful features in WinTools include the Keystrokes tools, which are macros that pass keystrokes into an application, and DDE tools, which pass DDE messages to other applications.

I underestimated WinTools at first sight, perhaps because its crude icons give it a slightly toy-like appearance (however, you can change them). Nothing could be further from the truth. This is a fast, rich, and innovative environment. Remarkably, it occupies only half as much memory as the Windows Program Manager. Now I feel claustrophobic when I have to reluctantly return to a cluttered Windows screen.

NewWave 4.0

As with WinTools, Hewlett-Packard's NewWave 4.0 takes a more strongly object-oriented approach than Windows itself. While installing all your applications, NewWave divides them into *tools*, which are ordinary applications that you run from the NewWave desktop by clicking on them, and *objects*, which behave as templates and do not appear on the desktop. Only the data files for objects appear on the desktop, and they call their associated applications when clicked on. You must link objects to their applications by a unique file extension.

To create a new document, you select "Create a New..." from the menu bar. This opens a dialog-box window containing all the template applications. Clicking on the Word icon in this box creates a new named document instantly on the desktop. NewWave comes with several object types already built in, such as Folder, Task, Text Note, and Object Storage. The latter type is a shared data repository for workgroups using a network (see screen 2).

NewWave searches your hard disk for applications to convert into object types and old data files to convert into objects. You don't even have to specify the file extension in advance. The first time you try to create an object from an unknown application type, NewWave asks you to save an empty file from that application, which it uses as a template for future objects. You can also save documents with content (e.g., a form or a letterhead) as different masters for the same type; the type's icon changes into a stack, and in the future you will be shown a list of masters whenever you create a new object.

NewWave has its own desktop, on which icons have an elegant, chiseled appearance. You can organize files hierarchically by nesting folders inside folders, as on the Mac, and then stowing them all away under the File Drawer icon. NewWave doesn't have a separate file manager (although you can still use Windows'), but listing nested folders in the Title directory, rather than Icon view, achieves the same effect. NewWave has an object finder that lets you search for objects by type or title (although, regrettably, not by

content) and presents a list of all the matches from which you can open objects by clicking on them.

Tasks are NewWave's macros, which you can create either by recording or by compiling from a powerful object-oriented macro language. There are two types: Agent tasks, which are stand-alone programs, and Menu tasks, which can be called from inside an object's menus and can be inherited by whole classes of objects. You can schedule tasks to automate chores (e.g., backing up disks) or trigger them on events like the opening of a certain file. NewWave supports shared views of objects, so the same object might be visible in many different folders and changing any one updates all the others. You can also form DDE or OLE links from objects to other Windows applications (even ones not installed into NewWave) and share data that way.

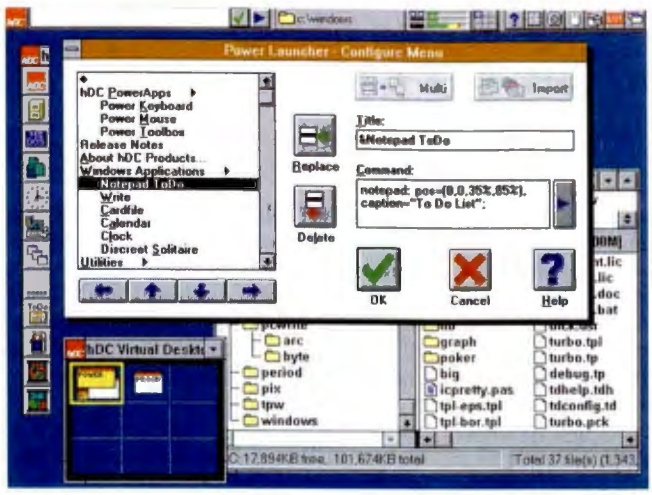
I found NewWave to be robust, but slow, with lots of disk activity even on my 8-MB system. It ran all my applications, including DOS ones, without a hitch. I couldn't get NewWave to associate different file extensions with the same application, even though it allows multiple file formats for file conversions. Similarly, you can't create objects that load multiple files (even with the same extension) into the same application, as you can with WinTools and Power Launcher.

Norton Desktop 2.0

Norton Desktop (see screen 3) is less radical than WinTools or NewWave and more of a straight add-on product. It originally provided an enhanced file manager, hierarchical program groups, desktop tool icons, and more than 20 powerful utility programs that you could use as stand-alone programs without installing the desktop. However, version 2.0 offers some significant improvements, which keep Norton Desktop in strong competition as a complete environment.

Norton's new file manager has the ability to let you expand and collapse directory trees by double-clicking, like Windows 3.1, while retaining the user-definable button bar (now expanded to 14 buttons), from which you can view, edit, and otherwise manipulate selected files directly. If you'd rather use the Windows File Manager, you'll find a Norton Tools option added to its menu bar. Drag-and-drop operations pervade the whole system now, not just the directory windows, so you can drop data files onto any desktop tool icon or onto an icon in a group window. When you do this, the cursor changes into a rocket to signify that you're "launching" an application.

Screen 3: *This Norton Desktop screen shows examples of drive icons, desktop icons for commonly used tools like SmartErase, and a toolbox view of the Quick Access window that I have named Workbench.*



Screen 4: *At the far left is a vertical toolbox. Below it is the virtual desktop map. In the Configure Menu dialog box, you can see an example of Power Launcher's enhanced command syntax, which launches the Notepad at a fixed screen position.*

The new Desktop Editor is an excellent ASCII text editor that leaves the Windows Notepad for dead. It has a multidocument interface like WinEdit, can open big files, and offers reassignable command keys, macros, regular expression search and replace, file compare, and document preferences you can save.

Other Norton utilities have been upgraded. Norton Backup can now handle tape drives as well as floppy disks. A proper macro recorder supplements the Batch Builder. You can save custom menu and default sets to disk. The Sleeper supports third-party screen savers (including After Dark) and comes with some nice new ones of its own.

Best of all, Norton Desktop 2.0 uses the Windows file-association dialog box, and it doesn't churn the disk for ages, as it used to. In fact, the program is much faster all around, particularly in saving the configuration and loading as a shell; I found it to be around four times faster here. Norton AntiVirus is now bundled with the Desktop; it installs itself as a TSR program. On my system, it takes less than 5 seconds to scan my 100-MB hard drive during bootup, which is an acceptable price for whatever security it provides.

A small but pleasing improvement is that desktop tool icons now snap to a grid, so they don't slide all over the place when you click on them. I also like the optional Toolbox view for program groups; all the icons appear packed together into a horizontal toolbar, without labels. There's now a network installation routine, and you can choose to have the NCD tree files for remote drives stored locally for speed.

In short, Norton Desktop 2.0 has added just about everything on my wish list, with the exception of the ability to drag subdirectories into a group.

Power Launcher 2.0

Power Launcher from hDC Computer is different from the other three products in that it doesn't replace the Windows desktop; it enhances it. When you load Power Launcher, the Control Menu at the top left of every application window turns into a red hDC logo. Click on this and you get two cascaded menus, the original controls

WINDOWS DESKTOP FEATURE COMPARISON

Subtle differences of emphasis make each product more attractive for a particular type of user. (● = yes; ○ = no.)

	WinTools	NewWave	Norton Desktop	Power Launcher
Disk space (MB)	1.5	8–10	2–8	1.5
Uninstall	●	○	●	●
Hierarchical folders	●	●	●	○
Drag-and-drop	●	Only when printing	●	●
Icons on desktop	●	●	●	○
Virtual desktop	●	○	○	●
Macro recorder	○	●	●	●
Macro language	○	●	●	○
Scheduled events	●	●	●	●
Triggered events	○	●	○	● (on idle)
Pass keystrokes to application	●	●	●	●
Pass DDE messages	●	●	○	●
Toolboxes	●	○	●	●

plus the Power Launcher extras.

At the top of the screen is a snazzy-looking Toolbar from which you can issue DOS commands, see a bar chart of system resources, and launch Power Launcher's "microapplications." Power Launcher is elegant looking throughout, employing Borland-style customized OK and Cancel buttons. However, I found that its huge menus became irritating after a while.

Power Launcher adds five main features to Windows: enhanced command launching and menus, toolboxes, macros, scheduling, and a virtual desktop (see screen 4). Enhanced command launching solves the worst problem users have with Windows: its sheer indeterminacy. You never know what size a window is, where a window will appear, or what directory an application is looking at. With Power Launcher you know, because it lets you specify window size, position, and default directory in the launch command line. You can build your own cascading menus using enhanced commands, so you can launch your favorite utilities from any window.

You don't even have to remember the complicated new syntax, because there's a neat interactive tool called the Command Builder. It creates commands for you by pointing, dragging, and picking. If you do learn the full command syntax, you'll find that it enables you to do advanced things like passing DDE messages, running functions from DLLs, and passing keystrokes into a launched application.

Power Launcher's microapplications, which you access from the Toolbar, are called Power Keyboard, Power Mouse, and Power Toolbox. They let you assign enhanced commands to keyboard combinations, mouse-clicks (with all three buttons), and floating toolboxes made from attractive 3-D buttons. You can associate all three of these features with applications so that a special toolbox appears every time you launch, for example, Microsoft Word. Drag-and-drop is now a feature of Power Launcher, either onto toolbox buttons or the Toolbar itself.

A macro facility can record mouse-clicks as well as keystrokes, and it lets you schedule a macro to run either at regular time-and-date intervals or whenever the computer is idling. This last option is extremely useful. I use it to run an incremental backup routine whenever I stop typing for more than 5 minutes.

The virtual desktop is much like the one in WinTools, except that it can hold up to 64 screens. The virtual screen map is nicer to use because, unlike with WinTools, you can pan smoothly over the virtual screen with the right-hand mouse button, as well as hopping a screen at a time. I did find that some DOS applications (PC-Write, a U.K. communications program called Odyssey, and List, a shareware directory) were not happy running full screen under the virtual desktop, though.

Power Launcher is the most powerful of the environments I tried. But it's also the most complicated.It's definitely a power user's tool.

Four Winners

All four of these Windows enhancers are rich enough to deserve long reviews to themselves, and they all make Windows much nicer to work with. There are subtle differences of emphasis that make each product more suited to a particular type of user.

Both WinTools and NewWave are ideal for MIS managers to use in building turnkey interfaces for beginners on large corporate networks. Power Launcher is attractive for power users and developers, fast typists, and mouse-haters. Norton Desktop is perhaps more suitable for the average solo Windows user. You can even use some of these products in combination (e.g., I successfully ran Norton Desktop under WinTools' Big Sky), but I can't guarantee that unwanted interactions will not show up.

As one of nature's rebels, what thrills me about all these products is that they free you from the tyranny of the standard user interface we're all supposed to want and let you get back to some serious tweaking. ■

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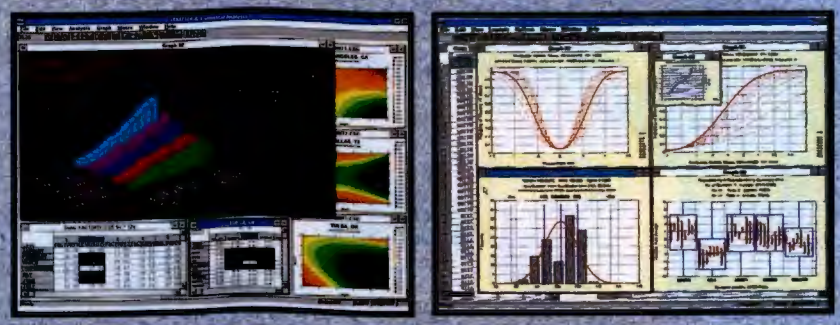

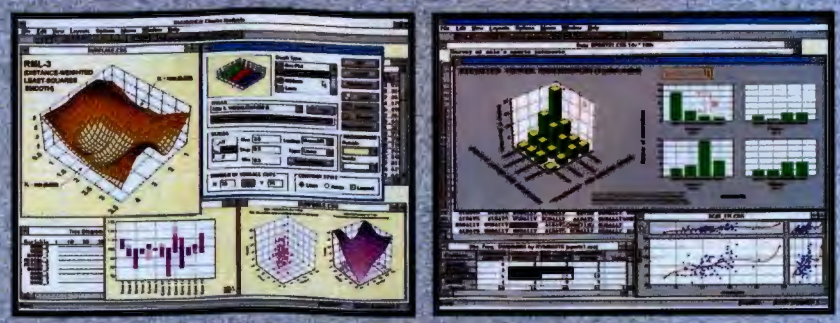

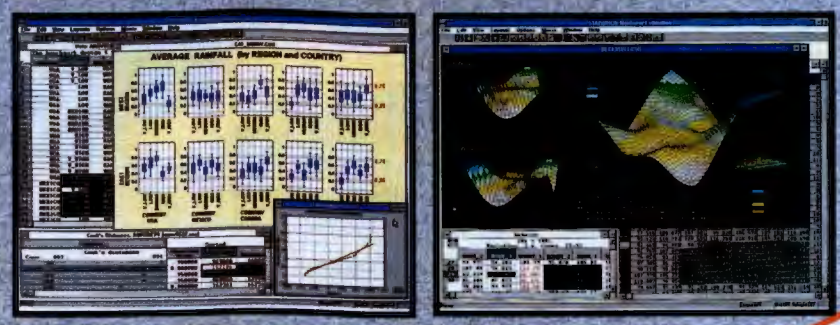

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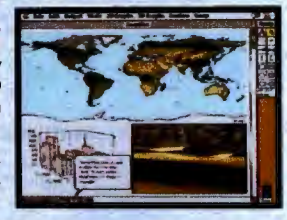

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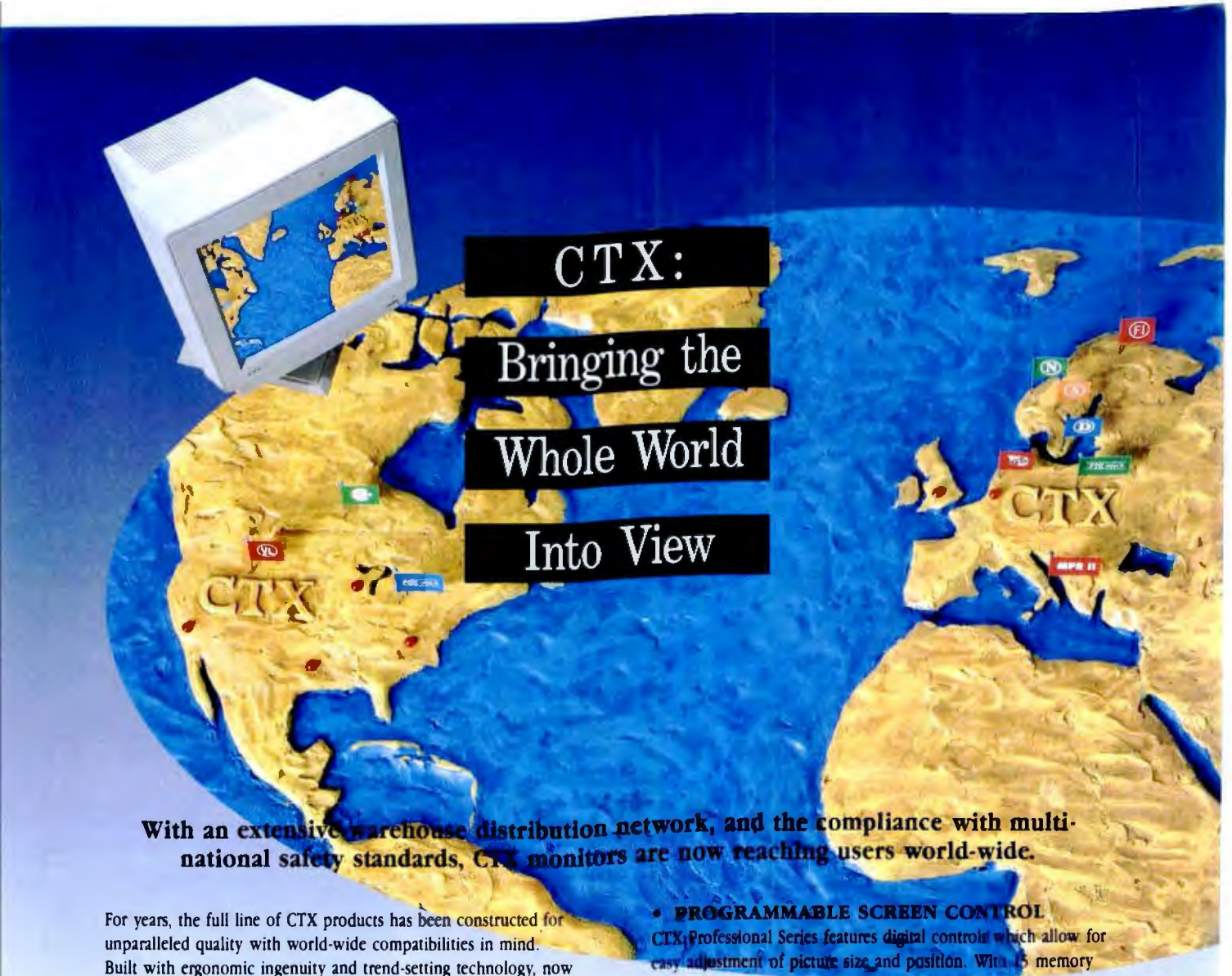

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TRACKING THE ELUSIVE PROJECT

Four project management packages that can help you be on time and on budget

DANIEL YAHDAV

Imagine knowing before even starting a project whether it will meet its deadline, how to eliminate many of your resource-allocation hassles, and how to perhaps save your company a great deal of money. PM (project management) software programs attempt to do just that.

PM software also lets you detect and correct even the slightest deviations from your plan long before they become troublesome. You can easily plan and clearly communicate your schedules with charts. An outliner facilitates managing large projects, and an earned-value analysis clarifies the status of your projects by comparing actual and planned work costs at any given time.

But not all PM programs provide the same benefits. Different packages model real life with varying levels of flexibility, and there are fundamental differences in the way each program achieves this flexibility. The art of PM software selection is to find the right mix of features and flexibility for your particular projects.

For this review, I looked at four Windows-based products that list for under $1000: Computer Associates International's CA-SuperProject for Windows 2.0a, Microsoft Project for Windows 3.0, and Symantec's On Target 1.0 and Time Line for Windows 1.0. These products cover a wide range of user needs, but each has an emphasis for different types of users. (See table 1 for a comparison of package features.) Together they are generally easier to use than DOS-based programs and, with a few exceptions, also share many common features.

I evaluated the programs using Microsoft Windows 3.1 on a 33-MHz 486 with 8 MB of RAM and a 16-millisecond 213-MB hard drive. To take full advantage of graphics under Windows, I used a 17-inch NEC MultiSync 5FG monitor with a resolution of 1280 by 1024 pixels and a refresh rate of 72 Hz provided by a Number Nine GXi video card. While speed and resolution are important, you can get along OK with a 16-MHz 386, 4 MB of RAM, and a 14-inch VGA monitor. For benchmark testing, I used a medium-size project containing 200 tasks (see table 2).

Most projects consist of a set of tasks and the resources required to perform them. To begin such projects, you place tasks on a time table called a Gantt chart. Then you assign resource amounts (e.g., worker-hours) to each of the tasks that are represented by column bars; this is called a *resource histogram*. The program multiplies resource usage by cost rates and draws a cost-distribution chart based on the resulting dollar amounts for each time period. Task relationships are best illustrated by a network of nodes (i.e., tasks) and arrows (i.e., dependencies), which is known as a PERT chart.

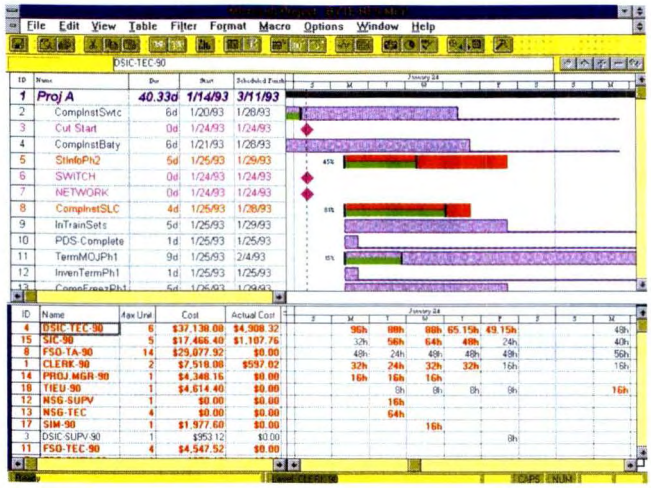
To schedule tasks, you define their dependencies and estimated durations. For example, a five-day task may depend on the completion of a nine-day task. Thus, the first task finishes on the ninth day, and the second one starts on the tenth day. Applying this scheduling technique to all tasks in a project reflects the concept of the CPM (Critical Path Method). In CPM, there is always at least one path of consecutive tasks with the longest duration that will determine the length of the project. This path is the most critical to perform on time.

Common Features

All the programs that I reviewed for this article offer Gantt, PERT, resource, and cost-distribution charts; CA-SuperProject also offers a Work Breakdown Structure chart. You can use a program's built-in chart presentations, or *views*, or design your own. You can create, edit, and update

BYTE ACTION SUMMARY

- **WHAT PM SOFTWARE DOES**
  It can help you plan and control your projects better by considering task dependencies, resources, project priorities, required dates, and budgets.
- **LIKES**
  Windows-based PM software brings scheduling and control to a wide audience. The number of keystrokes or commands required is declining, thanks to new standards of ease of use.
- **DISLIKES**
  Setting up projects and updating them is still a tedious and complex chore. Vendors must concentrate more on simplifying PM processes rather than just the required keystrokes. Microsoft Project's Planning Wizards and Time Line's Co-Pilot may be the beginning of this kind of assistance.
- **RECOMMENDATIONS**
  For extensive flexibility and analysis, consider CA-SuperProject. It can manage your project to the last detail. For high-quality presentations, Microsoft Project does the best job.
- **PRICE**
  CA-SuperProject for Windows 2.0a, $895; LAN node, $695
  Microsoft Project for Windows 3.0, $695; LAN node license, $556
  On Target 1.0, $399; LAN node, $349
  Time Line for Windows 1.0, $699; LAN node, $599



Screen 1: *The appearance of Microsoft Project's bars, text, and layouts is entirely your choice, thanks to the program's near-perfect customization capabilities.*

tasks on all charts and interactively manipulate them. Projects can contain thousands of tasks if you have enough RAM. All the programs support project and resource calendars that allow you to define the days of the year during which all or certain resources do not work. A task ID is the row number, except with CA-SuperProject; with this program, the task ID is used to uniquely identify every task.

Multiproject scheduling is conceptually different from one program to another. Resource management varies greatly in capabilities, options, and results, although all the programs support automatic resource leveling, which considers real-life resource constraints (see the text box "Resource Leveling" on page 121). With resource leveling, costs are based on resource rates and, usually, task-overhead amounts.

While all four programs allow you to track a project's progress and analyze its performance against a baseline plan, the amount of user control differs from package to package. Symantec's programs let you post progress only in terms of percentage completed, and actual dates become target dates. Microsoft Project offers more control over progress reporting. CA-SuperProject has a comprehensive tracking facility.

All charts can be customized for look and content and then saved and printed as they appear on-screen. Except for CA-SuperProject, all the programs offer font selections and user-defined field names. They also support different ways of assigning resources to summary tasks and linking them. All the programs have a useful print-preview function.

All the programs can import and export standard file formats. Alternatively, you can use the Windows Clipboard to instantly cut, copy, and paste any highlighted subset. All four programs are installable on a LAN. File locking is turned on when you load a project.

All the programs offer on-screen tutorials, but these differ in depth and coverage. Generally, on-line help is sophisticated and illustrative and offers instant answers to problems. The information is context-sensitive or indexed, using hypertext. Information differs in its depth and sensitivity to your problems.

Data entry is done on a spreadsheet, a form, or a chart. By simply clicking and dragging, you can change the field width of a tabular view or the length of a bar in a Gantt chart; you can move bars in a similar fashion. Only CA-SuperProject does not offer such control. An outline can be expanded or collapsed with a toolbar icon or a double-click.

Microsoft Project 3.0

If you need your presentations to look good, you can't go wrong with Microsoft Project for Windows 3.0. For $695, you get all the essential functions in a versatile, flexible, and highly customizable package. Project is available in both Windows and Mac versions and allows data transfer between these two platforms.

Project offers what may be the best array of customization functions available. Its PM functionality is good, although not very flexible. The main views are the best of the four packages; the underlying concept of synchronized yet fully customized top and bottom views is what makes it special. And if you don't like what you see, you can easily customize the views to fit your needs (see screen 1). You also can choose what type of chart goes into the top or bottom part of a window, what information each includes and how they look, and where the window is split.

You can change the height of any row or the name of any field and even add as many as 10 text fields and 10 yes/no flag fields to your project tasks. You also can separately customize the bars and columns of any task. The only shortcoming of Project's Gantt chart feature is that it does not draw task relationships (i.e., a logic bar chart). The bottom part of a split screen is best for viewing resource utilization. The usage spreadsheet, which shows load amounts per period for multiple resources, is an alternative view to the typical histogram of a single resource.

When your schedules must look good, your words must be spelled correctly. Project helps you achieve that with its spelling-checker function. If there is a special form, view, table, filter, or macro you want that is not available in Project, you can easily design it. You can make tools appear in the program's menu or as toolbar icons.

In addition to the included task macros, you can automate your most difficult tasks by selecting from the program's powerful menu-driven macro facility or by writing your own. The program lacks only a keystroke recorder module. Your custom macros will work on different sets of fields, tables, or views.

Multiple task editing is the most powerful and unique feature of Microsoft Project. With it, linking, adding, changing, or posting progress for multiple tasks is as easy as with a single task.

Project's multiproject scheduling feature is one of the best. It lets you link and resource-level up to 20 independent projects that share a resource pool. Linking tasks across projects is simple; it's done by establishing a DDE link using the Windows Clipboard. You can visually merge multiple projects into a single window to view, edit, or print tasks of all projects from one spot.

Although the resource leveling is much improved over that of the previous version of Project, there are cases in which it does not resolve resource conflicts or calculates inefficient projects. Another problem is that you have to turn on the Automatic Calculations feature to detect circular links during the process of setting dependencies. But if an error is detected, further explanations of the problem and instructions to remedy it are available.

If Project's charting capabilities are not sufficient for you, you can use the bundled Microsoft Graph software, which includes capabilities beyond the typical PM chart functions. With Graph's numerous features and options, you can produce a sophisticated and powerful array of charts never before seen in PM software. Also, Project supports a powerful print-preview function with a zoom option, multipage preview, and a handy page-setup feature. It also lets you insert page breaks, so the

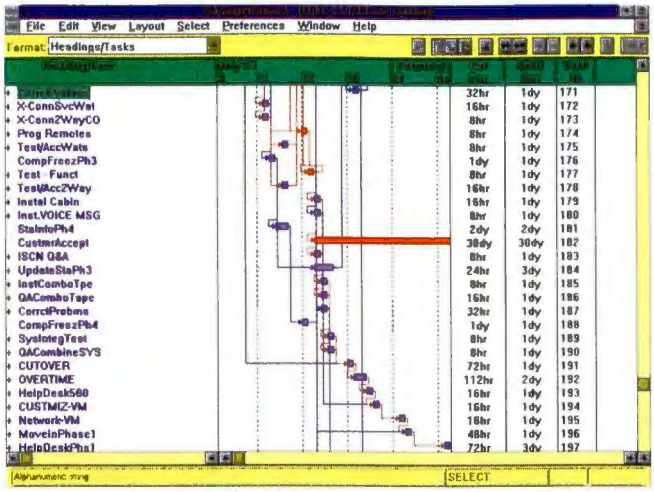
next phase in an outline begins printing on a new page.

Project's excellent Planning Wizards feature offers an on-screen guide and a tutor that performs for you the tedious—and sometimes difficult—set of keystrokes needed to accomplish some repetitive routines. But unlike macros, Planning Wizards offers help along the way and gives you much more control over the operation. Planning Wizards actually teaches you while showing you how to do things, something that more software should do.

CA-SuperProject 2.0a

If your primary concern is project information quality, you should consider CA-SuperProject for Windows 2.0a. Although specifically rewritten for Windows, this $895 package looks and feels like the older, proprietary graphical DOS version. CA-SuperProject accommodates a nearly complete array of modeling options and the widest range of PM functionality of the four packages. Also, its ability to communicate across different platforms while retaining a similar user interface and functionality can be a major advantage for organizations that combine DOS, Windows, and VAX/VMS operating environments.

CA-SuperProject lets you define virtually every task type, relationship, and date constraint, as well as use an outline for tasks, resources, and even account codes. You can combine them with a powerful on-screen cross-tabulation view of resource and cost amounts. You also can include probability fields that determine your chances of finishing the project within a certain time frame.



Screen 2: *CA-SuperProject's logic bar chart offers the clearest picture of your project logic and even tries to optimize the way dependencies are drawn.*

The program supports comprehensive multiple-project and resource management facilities. You can assign consumable material resources, define variable resource loads and cost rates, and use overtime cost and availability factors. You can load and view more than one project at once, each in a separate window. You can also link projects, view their combined resource conflicts with a common resource pool, and automatically level them. The only limitation is that you cannot link tasks across projects.

CA-SuperProject offers a comprehensive import/export facility that includes many formats, options, and file types. The program also lets you add imported data to existing values, such as costs, or replace them.

While CA-SuperProject looks like any other Windows product, it lacks some of the feel and sophistication that Windows users are accustomed to. For instance, it

RESOURCE LEVELING

Resource leveling is the function by which PM (project management) software resolves resource conflicts—namely, resource overloads. The decision about which tasks will be delayed is the core of the leveling process, and it's based on heuristic methods devised by each program's software developers.

The end result of the leveling process is usually a longer project. But because of the different heuristic methods used by each program, they each calculate a different schedule and project length. The ramifications of these differences may mean a great deal to users who need to plan and control their own resources. They could mean the difference between the success or failure of a project or between winning or losing a proposal.

There may be more than one way to measure the success of this function, but the simplest and most important way is to look at the resulting length of a project under the same resource availabilities with different programs. Furthermore, more than one leveling strategy affects the results. The most effective ones are resource constraining, leveling by priorities, and, the most revolutionary, resource contouring.

The problem of ranking PM software in order of efficiency of leveling is that a diversity of projects calls for different leveling methods, and each user may prefer a different leveling strategy. While the time it takes to level may vary by as little as seconds or as much as hours, project durations may reflect differences that vary by days or even years. And leveling may not always give a clear advantage to one product; conclusive results are not as simple to achieve as you might think.

However, a recent independent study of this issue, the 1992 Resource Leveling Study, concluded that leveling results are not random after all. Conclusive results were obtained by repeating the leveling tests on each of several projects dozens of times under each of the tested strategies.

The study, which involved seven popular packages, concluded that two programs clearly do a better job than the rest: CA-SuperProject for Windows and the DOS version of Time Line 5.0. Each does a great leveling job under different strategies. The program with the worst results in the test was Microsoft Project 1.0.

For additional information about the 1992 Resource Leveling Study, contact 1 Soft Decision, Inc., P.O. Box 6123, San Rafael, CA 94903, (415) 491-1616; fax (415) 491-0151.

PROJECT MANAGEMENT SOFTWARE COMPARED

Table 1: *A comparison of the four reviewed packages' features. (ALAP = as late as possible; effort-driven tasks are based on input in worker-hours; ● = yes; ○ = no.)*

Product	Disk space required (MB)	Tasks per project	ALAP task type	Effort-driven tasks	OLE	DDE	Logic bar chart	Toolbar icons	Macro language
CA-SuperProject 2.0a	2.80	10,000	●	●	○	○	●	17	○
Microsoft Project 3.0	6.80	9999	●	●	●	●	○	27	●
On Target 1.0	1.60	1000	○	○	○	○	●	12	○
Time Line 1.0	4.00	8000	●	●	●	○	●	35	○

does not support DDE or OLE for linking data and objects dynamically among projects or applications. You can select different character sizes for a printed report, but there is only one screen font. Pop-up forms are not actual Windows information boxes: They pop up exactly where you don't want them, and you cannot move them. Changed preferences are not automatically saved, and the Save command is *outside* the form—not where you would expect it to be.

Usually a double-click is equivalent to making a selection and pressing Enter, but with CA-SuperProject, a double-click generates a task. CA-SuperProject offers a limited print-preview function and spreadsheet-layout customization. In addition, the software does not use the usual click-and-drag layout manipulations or let you control the width of a field in a table. The toolbar offers a limited number of options, and they cannot be customized. Also, the program lacks a macro facility.

The logic bar chart (see screen 2) optimizes the drawing of links after every change, but the optimization process is so long that you have to abort it to bypass it most of the time. You have the option, of course, to turn off the dependency drawing, but then you do not get to use this powerful version of the bar chart.

While the other packages come with unlimited free technical support, CA-SuperProject's lasts for only 90 days. Further help costs $2 per minute (with a minimum charge of $20 per call), or you can purchase Computer Associates' Support Plus, which includes complete technical support and software updates, for a fee of $195 a year.

Although the free technical support is minimal, you'll find the program's manuals complete, along with a comprehensive on-line context-sensitive help facility. In addition to the on-screen tutorial and table of contents, which most programs support, there are three layers of help, each designed for a different sensitivity. There is a continually available one-line help feature and a useful optional four-line ("Assist mode") help feature as well.

CA-SuperProject has about everything you can think of in terms of PM functionality and flexibility. But for the program to lure a wider range of users, Computer Associates needs to adhere to the common Windows interface.

Time Line 1.0

When PM software usability is your primary concern, you might want to turn to the offerings from Symantec. This software developer currently offers two look-and-feel-alike programs intended for two distinct groups of users. Unlike its low-end sister program On Target (described below), the $699 Time Line for Windows 1.0 (see screen 3) is for those who are already familiar with PM software techniques.

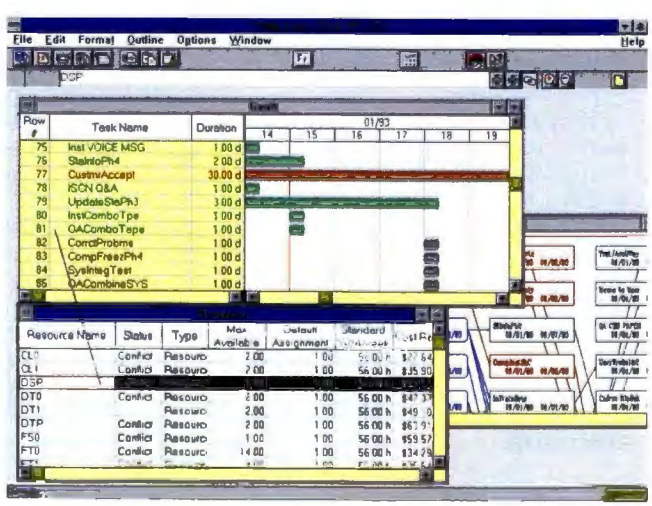
Time Line is built on its sister product and uses a great deal of its code, so the programs share some strengths and weaknesses. Both programs support remarkably powerful zooming capabilities, a task-outline structure that is graphically shown on a PERT chart, a Controlling Factors box that clarifies why a task is scheduled for completion by a certain date, use of phrases such as "this week" and "this month" rather than requiring you to set date ranges repeatedly, a useful calendar report that prints a monthly wall calendar of the schedule, and a versatile print-preview function that shows the colors of the working views.

Yet the $300 price difference between Time Line and On Target needs some justification. Perhaps it can be attributed to Time Line's added flexibility, better modeling of real-life projects, additional library views offering more analysis, improved system interface, and enhanced intelligence.

Time Line can handle larger projects—up to 8000 tasks—than On Target. You can set ALAP (as late as possible) tasks and fixed start and end dates, and you can set effort-driven (based on worker-hours input) tasks and link tasks in four ways (see table 1). You can view and print more than 180 fields, not just 50, as with On Target.

Time Line offers a set of cross-tabulation views and reports, breaking down every task into periodic cost or resource amounts. The program's toolbar is composed of more than 30 commonly used functions.

The program supports OLE, and Time Line makes it a simple matter to establish an OLE link with other programs and



Screen 3: *Assigning resources to a task has never been easier and more intuitive: With Time Line, you just point to a resource and drag it to the appropriate task.*

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PROJECT MANAGEMENT SOFTWARE PERFORMANCE

Table 2: *Benchmark results. All tests were conducted on a 200-task project. The Program Load test measures the time required to bring up a program; the File Load test measures the time needed to load the project; the Scheduling test measures the time it takes for a package to perform a complete recalculation of the project after a task duration has changed; and the Gantt Print test measures the time needed to print a Gantt chart of the entire project with a one-page-wide time scale. All times are in seconds except for the Gantt Print results, which are in minutes:seconds.*

Product	Program Load	File Load	Scheduling	Gantt Print
CA-SuperProject 2.0a	5	4	2	2:11
Microsoft Project 3.0	5	1	1	2:32
On Target 1.0	1	3	3	2:11
Time Line 1.0	3	16	1	2:04

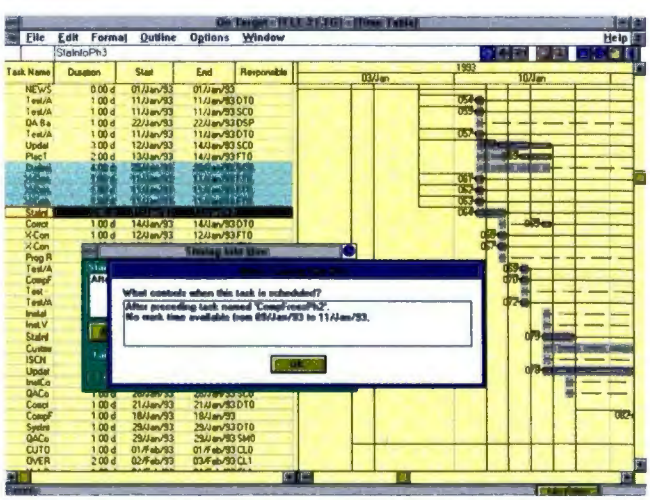
access the attached document. But this function froze my screen in several cases. A separate program is bundled with Time Line that enables you to quickly transfer your schedules from Microsoft Project. However, you will have to review the assumptions made by the vendor to overcome data-translation incompatibilities between the two programs.

Time Line's Co-Pilot facility is an extension of On Target's Schedule Assistant facility. It offers intelligent guesses based on user actions that may have more than one possible intent. It prompts you for all possibilities and gives you the opportunity to make an informed choice.

Multiproject scheduling is supported under one project file. Alternatively, you can establish task or summary task links across projects based on WBS (work breakdown structure) codes. But to find the right WBS code of a task in a different project, you have to launch an additional copy of Time Line and use it to view the other project. Furthermore, the nature of the cross-file Consolidate function, which does not use the Windows DDE technique, does not permit links to automatically reflect changes made to the source projects (i.e., predecessor tasks). However, this multiproject scheduling may be handy where related projects are scheduled by different users who level their resources separately.

There are a few areas in which Time Line could be improved. The program supports hourly time units, but not time of day. You can embed objects from other applications in Time Line, but not vice versa. Multitask manipulations are good only for enhanced views or when you are posting tasks as being completed. The addition of a macro facility and the ability to customize the toolbar could improve the program's ease of use.

On the plus side, Time Line is based on a simple design and takes advantage of Windows 3.1's capabilities and interface. It delivers the most essential PM needs and requires little time to master.



Screen 4: *If you need to know what controls a task when it is scheduled, On Target's More Timing Info box makes it easy to find out.*

On Target 1.0

Have you ever read about or tried to use PM software and thought it was too technical, full of jargon, and hard to understand? Then you might want to give Symantec's On Target 1.0 (see screen 4) a try. This program is in a category of its own, not just because of its low $399 price tag, but because it is aimed at those who want to begin managing projects on a PC but are not sure if they can.

On Target is simple to learn and easy to understand. It does not offer the flexibility or the number of toolbar functions of its higher-priced counterpart, but you can start with On Target and smoothly upgrade to Time Line whenever you want.

On Target looks and feels just like a genuine Windows application. In addition to providing the normal Windows-based PM software features, the program allows you to manually move any task in a list to another location by just dragging it. As you move or stretch a bar on a Gantt chart, a small box appears along with two vertical lines that represent the chart's duration.

The core of the program contains three main windows: Gantt chart, PERT chart, and resource list. You can open them simultaneously to build projects in an unusual and effective way: You can use a predefined Starter Schedule or design one with the help of the Schedule Assistant. If On Target senses a task that could be the predecessor of another task, it notifies you of this possibility. You also can establish links on an outline or a Gantt chart to a successor by pointing to a predecessor's name or bar and dragging the mouse to it. To add an assignment to a task, you simply draw a line between the task and the assignment.

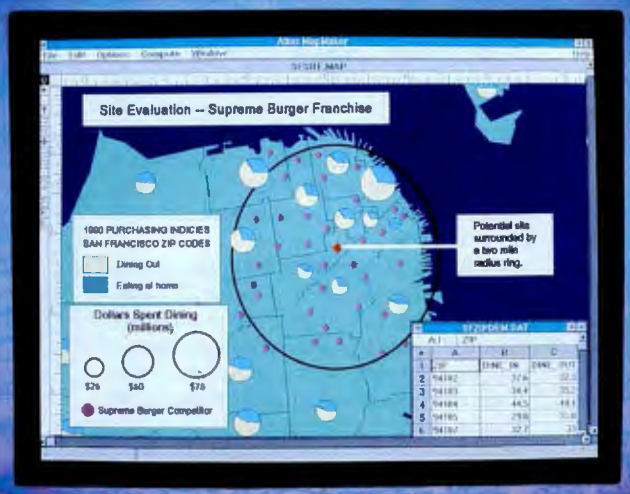
On Target is fully WYSIWYG: You can't print anything that you cannot view on the screen. Instead of a standard report list, it offers a set of standard screen-view libraries that you can load to screen, review, and print. Or you can save any of the views you design to your own libraries for later use. To verify that your report will print the way you want, you can preview it on-screen. You can also preview the report or chart with one page zoomed at a time and then go back to the entire report view. You can review and edit headers, footers, and margins before getting a printout.

If you need to follow formalized PM techniques but feel intimidated by them or cannot afford to learn them, you might find On Target to be just the PM software package you need to manage your projects better and to communicate them more clearly.

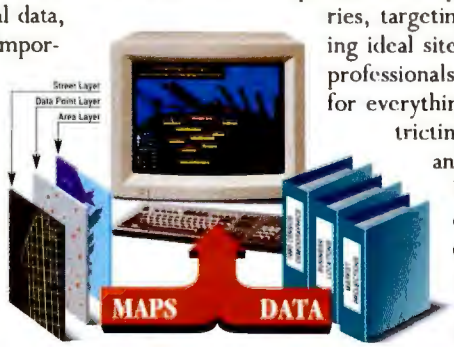
continued

ATLAS SOFTWARE

A NEW DIMENSION IN DATA MANAGEMENT



Most business and government professionals view and analyze data with spreadsheets, databases and occasionally in business graphics packages. While these types of software work well when displaying statistical data, they are blind to important geographical information such as market potential by sales territory, distribution coverage by product, or customer locations by ZIP code or street address.



Atlas Software™ is changing that. By linking data from spreadsheets, databases and even other applications – on your PC or Macintosh® you can now add the important geographical dimension to your information system.

And when we say important, we mean mission critical. For example, *Atlas Software* can help business professionals answer "what if" and "show me where" questions for optimizing sales territories, targeting customers, and selecting ideal site locations. Government professionals can use *Atlas Software* for everything from political redistricting to land-use planning and public safety analysis. Without *Atlas Software* decision makers often overlook important geographic information and allocate resources ineffectively.

Atlas Software programs come equipped with built-in data management capabilities, map file importing and a generous base map and data sampler from our comprehensive library containing over 75 gigabytes of geographic files, business statistics and demographic data.

Atlas Software comes in a variety of "flavors" to suit your specific needs and supports MS DOS®, MS Windows® and Macintosh operating systems.

So if you're ready to add a dynamic new dimension to the way you use information, like 25,000 other Strategic Mapping customers, call us for a free *Desktop Mapping Guidebook* and demo disk. We'd be happy to map out a plan for you.

Phone: (408) 970-9600
FAX: (408) 970-9999

STRATEGIC MAPPING INC.

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In the UK, call 44 81 994 2780
In Germany, call 49-228-62-73-82
In Australia, call 61 3-866 1766
In Belgium/LUX, call 32 2 771 25 75
In the Netherlands, call 34 340-266 336
In France, call 33 1-45-27-20 61
In Denmark, call 45-42-25-17 77
In Spain, call 34 1 564-1356
In Brazil, call 5521 262-9459

Circle 125 on Inquiry Card.

Which One for You?

Significant benefits never come without some investment. To get the most from a PM software package, you first need to invest in an up-front effort to plan your projects correctly. Second, while your project is in progress, you have to be consistent in reporting back to your program how things are actually turning out. Your success will depend as much on how persistent you are with these two tasks as on how well the software tool you choose meets your expectations.

Even though they all run under Windows, these four programs feel and act different. Each has something special to offer. On Target does only simple planning, but it simplifies PM concepts and learning and costs almost half as much as the others. And if you purchase On Target and then need to handle larger projects or model them more accurately, you can upgrade to Time Line with ease. With Time Line, you must be more experienced and learn a little bit more, but you will get a better program with additional planning flexibility and more tools to make your work easier.

More demanding users can choose between CA-SuperProject and Microsoft Project. CA-SuperProject has some rough interface edges and costs more than the other packages, but it delivers extensive modeling options and the highest PM power of the group.

If you can get along with somewhat less power, you may prefer Microsoft Project. It offers more sophistication because it uses Windows so effectively. It is the most customizable package of the group and accommodates tremendous presentation flexibility. An added bonus is that Project is also available on the Mac, so you may not need to make a choice between two environments.

Picking a clear winner from this group is a difficult task. The two programs that stand out are CA-SuperProject and Microsoft Project. If you need power, choose CA-SuperProject. If you must have ease of use and customization, choose Microsoft Project. ■

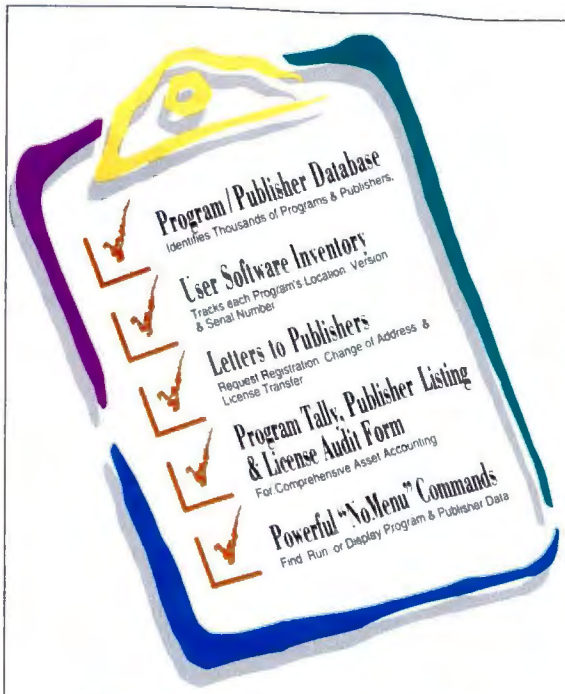
Daniel Yahdav is a consultant based in San Rafael, California. His firm, I Soft Decision, Inc., specializes in corporate PM software selections and publishes several related studies. You can reach him on BIX c/o "editors."

COMPANY INFORMATION

Computer Associates International, Inc.
(CA-SuperProject for Windows 2.0a)
1 Computer Associates Plaza
Islandia, NY 11788
(800) 342-5224
(516) 342-6000
fax: (516) 342-5329
Circle 1060 on Inquiry Card.

Microsoft Corp.
(Microsoft Project for Windows 3.0)
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1061 on Inquiry Card.

Symantec Corp.
(On Target 1.0, Time Line for Windows 1.0)
10201 Torre Ave.
Cupertino, CA 95014
(408) 253-9600
fax: (408) 253-4092
Circle 1062 on Inquiry Card.



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TouchStone
Software Corporation
2130 Main Street, Suite 250
Huntington Beach, CA 92648

(800) 531-0450 or (714) 969-7746

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BYTE

BYTE's Guide to Top Windows Products

COMPILED BY JAN FIDERIO

If you're considering buying Windows software, you'll find over 3000 products on the market, and that number is growing every day. One way to decide on your needs is to look at what other people are buying. To help you in your search, BYTE has compiled a list of 128 of the hottest Windows products. We started with our own surveys of what BYTE readers are buying and with a list of Windows best-sellers from software distributor Ingram Micro. Finally, we added a few new products that we anticipate will be big sellers, such as Quattro Pro for Windows 1.0 and AutoCAD release 11 Extension for Windows.

You'll find products listed alphabetically by category, as well as listings ranging from programming tools to entertainment, and word processors to CAD. Each product listing includes a short description, company information, pricing, and (when available) a reference to the most recent BYTE review. We've also flagged those products that support OLE or DDE for sharing data with other programs. And so you know what to ask for, we've included each product's introduction and latest release date.

This list certainly isn't comprehensive, but it's a good place to start if you're in the market for Windows software. Before making a purchase, be sure to refer back to BYTE reviews for evaluations of similar products not included here.

KnowledgePro Windows 2.11, Knowledge Garden

APPLICATIONS GENERATORS

Actor 4.1, $249

Introduced: Feb. 1987
Latest release: Sept. 1992
Supports DDE and OLE

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(800) 999-8846
(415) 968-4892
fax: (415) 968-4622
Circle 976 on Inquiry Card.

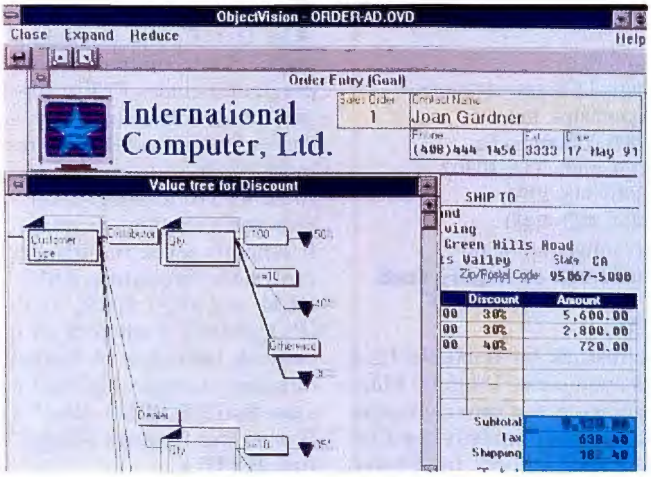
Actor 4.1 is an object-oriented visual-programming environment, with which you can use graphics, windows, and data management tools for rapid development of custom Windows applications. The software features a reusable toolkit of objects that includes edit windows, graphics, and dialog boxes.

KnowledgePro Windows 2.11, $549

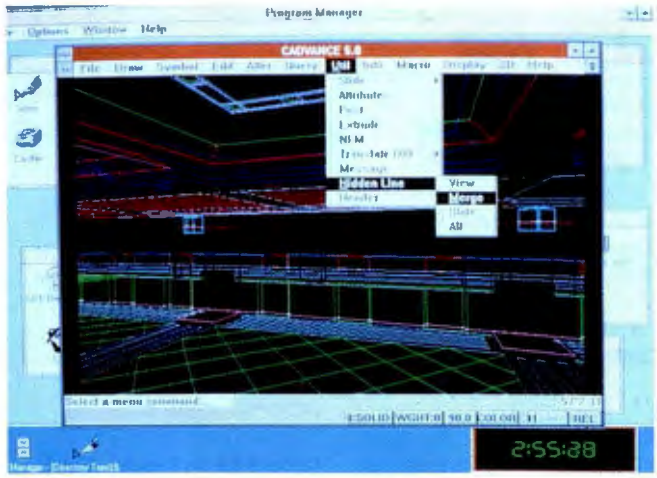
Introduced: May 1990
Latest release: April 1992
Supports DDE

Knowledge Garden, Inc.
12-8 Technology Dr.
Setauket, NY 11733
(516) 246-5400
fax: (516) 246-5452
Circle 977 on Inquiry Card.

KnowledgePro Windows 2.11 combines visual-programming tools with an object-oriented environment for developing Windows applications. The software provides more than 300 commands, interactive design tools, simplified access to DDLs, and enhanced bit-map performance. KnowledgePro Windows lets you select fonts, colors, and styles, as well as drag, size, and drop screen objects, text, and graphics images, and link them to other objects.



ObjectVision 2.0, Borland International



CADvance 5.0 for Windows, IsiCAD

Multimedia Resource Kit, $300

Introduced: March 1991
Supports DDE

Asymetrix Corp.
110 110th Ave. NE, Suite 700
Bellevue, WA 98004
(206) 462-0501
fax: (206) 455-3071
Circle 978 on Inquiry Card.

When you combine the Multimedia Resource Kit with ToolBook 1.5, you get a complete authoring system for Windows multimedia applications. The kit lets ToolBook users link to and control hardware and software that uses Windows DLLs, such as CD-ROM drives, laserdisc players, waveform audiocards, overlay video boards, MIDI sequencers, and animation software. (See "The Multimedia PC: High-Powered Sight and Sound on Your Desk," February BYTE.)

Multimedia ToolBook 1.5, $695

Introduced: Sept. 1991
Supports DDE

Asymetrix Corp.
110 110th Ave. NE, Suite 700
Bellevue, WA 98004
(206) 462-0501
fax: (206) 455-3071
Circle 979 on Inquiry Card.

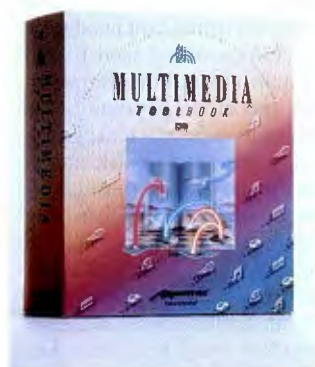
The Multimedia ToolBook 1.5 includes the Multimedia Resource Kit and ToolBook 1.5. The package lets you link to and control multimedia hardware and software that has a Windows DLL or a driver that is compatible with the Windows Multimedia Extensions.

ObjectVision 2.0, $149.95

Introduced: Feb. 1991
Latest release: Nov. 1991
Supports DDE and OLE

Borland International, Inc.
1800 Green Hills Rd.
Scotts Valley, CA 95067
(800) 331-0877
(408) 438-8400
fax: (408) 439-9119
Circle 980 on Inquiry Card.

A visual applications development tool, ObjectVision 2.0 lets you create Windows applications by pointing and clicking. You simply draw the interface, add logic, and then make the connections to your data. The software includes graphical decision-tree logic; DLL, DDE, and OLE support; direct access to Paradox, dBase, Btrieve, and ASCII data; and Borland's Menus-on-Demand menu builder.



Multimedia ToolBook 1.5, Asymetrix

ToolBook 1.5, $395

Introduced: May 1990
Latest release: April 1991
Supports DDE

Asymetrix Corp.
110 110th Ave. NE, Suite 700
Bellevue, WA 98004
(206) 462-0501
fax: (206) 455-3071
Circle 981 on Inquiry Card.

ToolBook 1.5 lets you create custom Windows applications without using traditional programming methods. The object-oriented, visual applications development package supports large bit maps, DLL, DDE, and file locking. Toolbook also provides application examples, sample scripts, and graphics filters that let you import DRW, EPS, TIFF, BMP, DIB, CGM, and WMF files. (See "Script Languages: The BASIC of the 1990s?" April 1991 BYTE.)

CAD

AutoCAD release 11 Extension for Windows, $99
AutoCAD release 11, $3500

Introduced: March 1992
Supports DDE

Autodesk, Inc.
2320 Marinship Way
Sausalito, CA 94965
(800) 445-5415
(415) 332-2344
fax: (707) 794-1325
Circle 982 on Inquiry Card.

The Windows Extension for AutoCAD release 11 adds a toolbar, dialog boxes, and support for bidirectional DDE links. You use the Clipboard to copy AutoCAD drawings into Windows-based applications, such as word processing and desktop publishing programs.

CADvance 5.0 for Windows, $1995

Introduced: Jan. 1992
Latest release: Aug. 1992
Supports DDE and OLE

IsiCAD, Inc.
1920 West Corporate Way
Anaheim, CA 92803
(800) 634-1223
(714) 533-8910
fax: (714) 533-8642
Circle 983 on Inquiry Card.

CADvance 5.0 for Windows lets you exchange drawing data bidirectionally via the Clipboard or by setting up DDE or OLE links. The package supports the Multiple Document Interface protocol for multiple views of drawings and raster and vector data in the same drawing. The Visual Programming Tool records activities like drawing functions and generates compilable code for customizing CADvance. The software complies with IBM's SAA/CUA (Systems Application Architecture/Common User Access) specifications.

Drafix Windows CAD 2.0, $695

Introduced: Oct. 1989
Latest release: Feb. 1992
Supports DDE

Foresight Resources Corp.
10725 Ambassador Dr.
Kansas City, MO 64153
(800) 231-8574
(816) 891-1040
fax: (816) 891-8018
Circle 984 on Inquiry Card.

Drafix Windows CAD 2.0 features icons, user-definable buttons, a CAD edit bar, cascading menus, about 50 new shortcut keys, associative dimensioning, and a macro programming language. The Multiple Viewport feature lets you work in up to four views concurrently. Foresight Resources offers optional symbol libraries, a report generator, an extended memory manager, and overlays.

COMMUNICATIONS

cc:Mail for Windows 1.1, $345 (10-user pack)

Introduced: May 1991
Latest release: May 1992
Supports DDE

cc:Mail, Inc.
A Division of Lotus Development Corp.
2141 Landings Dr.
Mountain View, CA 94043
(800) 343-5414
(415) 961-8800
fax: (415) 960-0840
Circle 985 on Inquiry Card.

Cc:Mail for Windows 1.1 offers everything you need to set up a Windows-based E-mail system, including administrator and client software. The package supports text, graphics, binary, and fax file attachments and runs on most LANs, including NetWare LAN Manager, AppleTalk, OS/2 Lan Server, and Vines. Other features include a spelling checker, an applications launcher, and keyword text searches. (See "Please, Mister Postman," March 1991 BYTE.)

Crosstalk for Windows 1.2.2, $195

Introduced: July 1989
Latest release: May 1992
Supports DDE

Digital Communications Associates, Inc.
1000 Alderman Dr.
Alpharetta, GA 30202
(800) 348-3221
(404) 442-4000
fax: (404) 442-4366
Circle 986 on Inquiry Card.

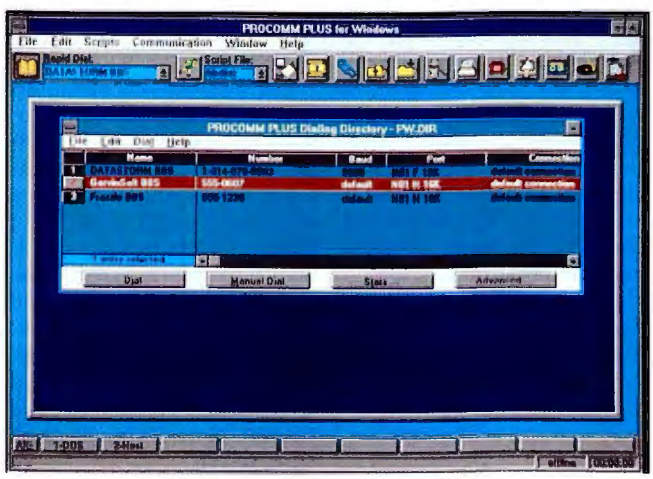
Crosstalk for Windows 1.2.2 lets you create Program Manager icons that provide instant access to commonly used information services. In addition, the telecommunications software includes a script language, cut-and-paste capabilities from the Windows notepad into a communications session, and support for COM1 through COM4. Crosstalk for Windows supports eight file-transfer protocols, including ZMODEM, and seven terminal-emulation modes.

DynaComm Asynchronous 3.1, $249

Introduced: May 1990
Latest release: July 1992
Supports DDE

FutureSoft, Inc.
1001 South Dairy Ashford,
Suite 101
Houston, TX 77077
(713) 496-9400
fax: (713) 496-1090
Circle 987 on Inquiry Card.

Procomm Plus for Windows 1.0, Datastorm Technologies



The DynaComm Asynchronous 3.1 telecommunications program includes INT14 support for network connectivity, a viewer for GIF and REGIS (remote graphics instruction set) files, VT340 terminal emulation, and a scripting language. It supports seven file-transfer protocols, including ZMODEM, and NCSI, NASI, TCP/IP, and DEC Pathworks 4.0 network interfaces. A dialing directory includes log-ins for more than 200 BBSes. (See "A Few of Our Favorite Things," June BYTE.)

FaxGrabber 1.0, $149

Introduced: Oct. 1991
Supports DDE

Calera Recognition Systems, Inc.
475 Potrero Ave.
Sunnyvale, CA 94086
(800) 544-7051
(408) 720-8300
fax: (408) 720-1330
Circle 988 on Inquiry Card.

A background fax-conversion utility, FaxGrabber 1.0 translates incoming fax images into ASCII text. FaxGrabber lets you preview files and cut portions for conversion, or it can translate them automatically. You can save translated files in more than 50 word processing, spreadsheet, and desktop publishing formats. FaxGrabber supports most CAS (Communications Applications Specification)–compatible fax boards.

Irma Workstation 2.0, $495

Introduced: May 1990
Latest release: May 1992
Supports DDE

Digital Communications Associates, Inc.
1000 Alderman Dr.
Alpharetta, GA 30202
(800) 348-3221
(404) 442-4000
fax: (404) 442-4361
Circle 989 on Inquiry Card.

With the Irma Workstation 2.0, you can communicate as an IBM 3270 terminal with mainframe systems via CUT (Control Unit Terminal), DFT (discrete Fourier transform), SDLC (synchronous data-link control), or Token Ring, or as a NetBIOS client to an IrmaLAN gateway. The IBM 3270 communications software package supports all-points-addressable graphics and works with Digital Communications Associates and IBM 3270 communications adapters.

Procomm Plus for Windows 1.0, $149

Introduced: May 1992
Supports DDE

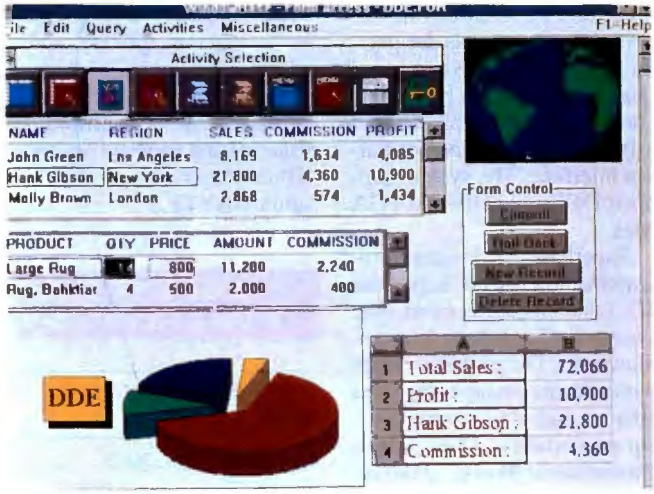
Datastorm Technologies, Inc.
P.O. Box 1471
Columbia, MO 65205
(800) 326-4999
(314) 443-3282
fax: (314) 875-0595
Circle 990 on Inquiry Card.

The Windows version 1.0 of Procomm Plus supports 34 terminal emulations; 11 file-transfer protocols, including ZMODEM; and INT14 for network use. A customizable action bar provides quick access to most features, which include an automated dialing directory, the Aspect scripting language, a graphical dialog-box editor, keyboard remapping, and a utility for dynamically viewing GIF files as you download them. (See "Buttoning Up Procomm Plus," June BYTE.)

Relay Gold 5.0 for Windows, $399

Introduced: July 1991
Latest release: April 1992
Supports DDE

Microcom, Inc.
500 River Ridge Dr.
Norwood, MA 02062
(800) 822-8224
(617) 551-1000
fax: (617) 551-1968
Circle 991 on Inquiry Card.



WindowBase 1.5, Software Products International

Relay Gold 5.0 for Windows supports up to 15 simultaneous sessions and lets you cut and paste from the Windows Clipboard to a session. The package features 10 programmable Quick Buttons; the Hot Spots mouse interface; automated scripting; NASI and INT14 interfaces; 12 file-transfer protocols, including ZMODEM; and support for microcomputer-to-mainframe communications.

WinFax Pro 2.0, $119

Introduced: July 1991
Supports DDE

Delrina Technology, Inc.
6830 Via Del Oro, Suite 240
San Jose, CA 95119
(800) 268-6082
(408) 363-2345
fax: (408) 363-2340
Circle 992 on Inquiry Card.

WinFax Pro 2.0 lets you send and receive faxes from within Windows applications by selecting the print function. Incoming faxes arrive in the background and beep when they are done. You can automatically print incoming faxes, as well as view, rotate, cut and paste, and zoom in on an image. Other features are broadcast, Group 3 fax support, conversion to PCX or TIFF, and an automated scheduler that lets you send faxes when phone rates are low.

DATABASES

Approach 1.0 for Windows, $399

Introduced: March 1992
Supports OLE

Approach Software Corp.
311 Penobscot Dr.
Redwood City, CA 94063
(800) 277-7622
(415) 306-7890
fax: (415) 368-5182
Circle 993 on Inquiry Card.

Approach 1.0 for Windows is an easy-to-use, stand-alone relational database program with a point-and-click interface that lets you quickly build your database. The package includes a forms generator, a report writer, a mailing-label generator, and PowerKeys, a set of Windows DLLs that let you open and update files in dBase, Oracle SQL, and Paradox format. Approach can also function as an SQL (Structured Query Language) front end. (See "A Fresh Approach to Databases," August BYTE.)

CA-dBFast 1.7, $550

Introduced: July 1988
Latest release: March 1992
Supports DDE

Computer Associates International, Inc.
1 Computer Associates Plaza
Islandia, NY 11788
(800) 342-5224
(516) 342-6000
fax: (516) 342-5329
Circle 994 on Inquiry Card.

A stand-alone system, CA-dBFast 1.7 lets you use your knowledge of dBase-compatible languages (e.g., dBase and Clipper) and run dBase III Plus applications concurrently with dBFast applications. The package includes an applications development language, a debugger that traps errors at source-code level, and support for modal and nonmodal paradigms and Windows DLLs.

Paradox for Windows, $795

Introduced: November 1992
Supports DDE and OLE

Borland International, Inc.
1800 Green Hills Rd.
Scotts Valley, CA 95067
(800) 331-0877
(408) 438-8400
fax: (408) 439-9100
Circle 995 on Inquiry Card.

Paradox for Windows combines a relational database, applications development tools, and the InterBase local engine, which supports a variety of data formats and new data types with enhanced data security. Among the features are an object-oriented user interface, a Speedbar with object icons and action accelerators, Menus-on-Demand, layout and drawing tools, a graphical Query By Example function, and visual data modeling.

SQLWindows 3.1, $1595

Introduced: Aug. 1988
Latest release: April 1992
Supports DDE
Add-on: Quest advanced querying and reporting tool, $595

Gupta Technologies, Inc.
1060 Marsh Rd.
Menlo Park, CA 94025
(800) 876-3267
(415) 321-9500

fax: (415) 321-5471
Circle 996 on Inquiry Card.

With SQLWindows 3.1, you can create Windows database applications without resorting to C or the Microsoft Windows Software Development Kit. This object-oriented database applications development system features the SQL Windows applications language; the Express Windows applications generator; the Report Windows report writer; the single-user version of SQLBase Server; SQLTalk interactive data management, character mode, the SQL API, and a C API.

Superbase 4 1.3, $695

Introduced: Nov. 1989
Latest release: Sept. 1991

Superbase 2 1.3, $345

Introduced: May 1989
Latest release: Sept. 1991
Supports DDE
Add-on: The Superbase SQL Library

Software Publishing Corp.
3165 Kifer Rd.
Santa Clara, CA 95051
(408) 986-8000
Circle 997 on Inquiry Card.

A relational DBMS, Superbase 4 1.3 includes image-handling and applications development tools, a forms designer, embedded SQL (Structured Query Language), macros, a communications program, and a Browser with a control-button interface. The system supports DDLs and GIF and TGA files.

Superbase 2 1.3 is a nonprogrammable subset of Superbase 4 1.3 that can act as a run-time system for Superbase 4 1.3 applications. The package comes with a forms design tool, a text editor, and a telecommunications utility. (See "DOS Databases at Work," January BYTE.)

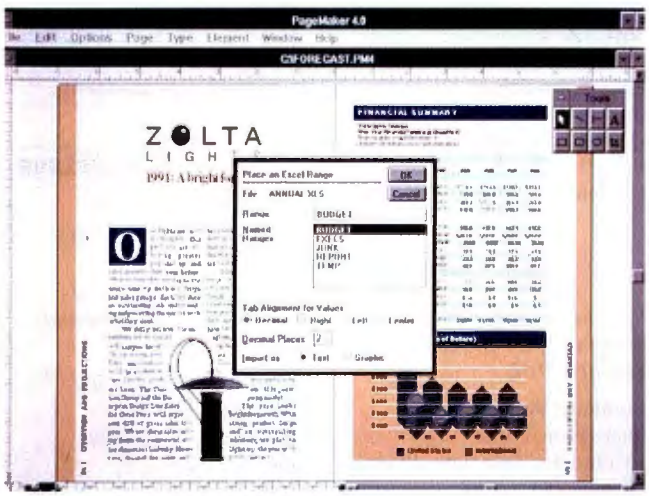
WindowBase 1.5, $495

Introduced: Aug. 1991
Latest release: March 1992
Supports DDE

Software Products International, Inc.
9920 Pacific Heights Blvd.
San Diego, CA 92121
(800) 937-4774
(619) 450-1526
fax: (619) 450-1921
Circle 998 on Inquiry Card.

WindowBase 1.5 lets you input, view, and update data through forms, reports, or tables. The relational DBMS supports SQL (Structured Query Language) and includes features such as default forms and reports for fast design work, a Data Viewer function for finding data quickly, and a point-and-select query system for making ad hoc reports. The package can accommodate dBase III and Btrieve files. (See "DOS Databases at Work," January BYTE.)

PageMaker 4.0, Aldus



DESKTOP PUBLISHING

Aldus PageMaker 4.0, $795

Introduced: Jan. 1987
Latest release: April 1991
Supports DDE

Aldus Corp.
411 First Ave. S
Seattle, WA 98104
(800) 685-3540
(206) 622-5500
fax: (206) 343-3360
Circle 999 on Inquiry Card.

A standard in high-end desktop publishing, Aldus PageMaker 4.0 integrates text and graphics that let you produce sophisticated, professional-quality publications. The software includes professional typographic controls, style sheets, more than 35 predesigned templates, over 40 import and export filters, graphics and color controls, a table editor, long document capability, and a built-in word processor with a spelling checker. (See "FrameMaker: Power Publishing for Windows," October BYTE.)

Express Publisher for Windows, $149.95

Introduced: March 1992
Supports DDE

Power Up Software Corp.
2929 Campus Dr.
San Mateo, CA 94403
(800) 851-2917
(415) 345-5900
fax: (415) 349-1356
Circle 1111 on Inquiry Card.

Designed for business users, Express Publisher for Windows is an easy-to-use document design and layout program that comes with 100 graphics images, Adobe Type Manager, 15 predesigned document templates and styles, and support for editable thumbnail views. You can rotate text and graphics, use automatic alignment and resizing tools, and zoom in on any part of the page. Express Publisher includes TextAppeal text-effects software. (See "FrameMaker: Power Publishing for Windows," October BYTE.)

FrameMaker 3.0 for Windows, $795

Introduced: Jan. 1992
Supports OLE
Add-on: FrameReader

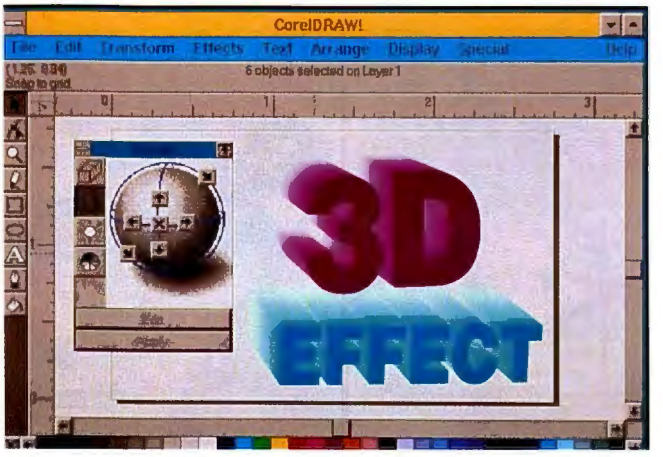
Frame Technology Corp.
1010 Rincon Cir.
San Jose, CA 95131
(408) 433-3311
fax: (408) 433-1928
Circle 1112 on Inquiry Card.

Previously available for Unix and Mac systems, the Windows version 3.0 of FrameMaker combines WYSIWYG word processing, page layout, and structured document building into one application. The publishing package features conditional text, intelligent tables, long document capability, a wide selection of fonts, and electronic distribution and pagination capabilities. FrameMaker for Windows supports the Multiple Document Interface and lets you launch other applications from within the FrameMaker program.

Publisher for Windows 1.0, $199

Introduced: Sept. 1991
Supports DDE and OLE

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1113 on Inquiry Card.



CorelDraw 3.0, Corel Systems

An entry-level desktop publishing program, Publisher for Windows 1.0 includes The Page Wizard, which walks you through the creation of 12 types of publications, building the publication as you respond to questions. Key features include a word processor, a 120,000-word spelling checker, 100 clip-art images, border art, font effects, a search-and-replace command, and options for creating, placing, moving, and formatting text. (See "FrameMaker: Power Publishing for Windows," October BYTE.)

Ventura Publisher 4.0 for Windows, $795

Introduced: Nov. 1991
Latest release: Jan. 1992
Supports DDE and OLE
Add-ons: Ventura Separator, Ventura Color Pro, Ventura Scan, and Ventura DataBase Publisher

Ventura Software, Inc.
15175 Innovation Dr.
San Diego, CA 92128
(800) 822-8221
(619) 673-0172
fax: (619) 673-7672
Circle 1114 on Inquiry Card.

Ventura Publisher 4.0 for Windows is a high-end publishing package that features a spelling checker, undo/redo, and search and replace on text, attributes, and tags. The software supports 24-bit true color and CMYK, CMY, RGB, HLS, and Pantone solid- and process-color models. Ventura Publisher can define 65,000 colors, of which 255 can be spot colors, and it supports TIFF, DCS, PCX, and EPS formats in 24-bit mode.

DEVELOPMENT TOOLS

Microsoft Windows SDK for Windows 3.1, $349

Introduced: March 1988
Latest release: April 1992
Supports DDE and OLE

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1115 on Inquiry Card.

The Microsoft Windows SDK (Software Development Kit) provides OLE and DDE management libraries for adding DDE and OLE client and server support to your Windows applications. Three new features include Stress, a stress-testing tool; Dr. Watson for troubleshooting; and a Windows debugger. The SDK also has the tools that let you take advantage of Windows' multimedia and pen-computing extensions.

DRAWING/PAINTING/IMAGING

Adobe Illustrator 4.0, $695

Introduced: Jan. 1992
Add-ons: Adobe Type Manager, Adobe Streamline, Adobe TypeAlign, and Adobe Type Library

Adobe Systems, Inc.
1585 Charleston Rd.
Mountain View, CA 94043
(800) 833-6687
(415) 961-4400
fax: (415) 961-3769
Circle 1116 on Inquiry Card.

A long-time standard for Mac users, Adobe Illustrator 4.0 offers Windows users its combination of illustration and single-page design capabilities. The professional design-tool package supports 16- and 24-bit color and includes Adobe Type Manager, 40 Adobe Type 1 scalable fonts, Adobe TypeAlign, Adobe Separator, a toolbox, and a library of predrawn artwork. You can edit and refine color or black-and-white images on-screen in preview mode. (See "A New Illustrator for Windows," September BYTE.)

Aldus FreeHand 3.1, $595

Introduced: Dec. 1991
Latest release: March 1992

Aldus Corp.
411 First Ave. S
Seattle, WA 98104
(800) 685-3540
(206) 622-5500
fax: (206) 343-4240
Circle 1117 on Inquiry Card.

Aldus FreeHand 3.1 lets you create black-and-white and true-color graphics. The package combines pressure-sensitive drawing tools, editing in full-screen color preview mode, color blending and separation capabilities, and a range of import formats. Text-handling features include editable font outlines, kerning, and text wrapping around objects. (See "Art for Business's Sake," April BYTE.)

Arts & Letters Graphics Editor 3.11, $695

Introduced: Nov. 1988
Latest release: Jan. 1992

Computer Support Corp.
15926 Midway Rd.
Dallas, TX 75244
(214) 661-8960
fax: (214) 661-5429
Circle 1118 on Inquiry Card.

Arts & Letters Graphics Editor 3.11 is a high-end drawing and editing program that lets you specify size, position, length, angle, slant, and rotation of technical illustrations. Editing features include shape blending, hole cutting, clipping masks, EPS (Encapsulated PostScript) import conversion, autotrace, text along a path, and automatic four-color separations. The package includes more than 7000 clip-art images and 90 outline typefaces.

CorelDraw 3.0, $595

Introduced: Jan. 1989
Latest release: June 1992
Supports DDE and OLE
Add-on: FontMonger

Corel Systems Corp.
The Corel Building
1600 Carling Ave.
Ottawa, Ontario,
Canada K1Z 8R7
(800) 836-3729
(613) 728-8200
fax: (613) 728-9790
Circle 1119 on Inquiry Card.

A vector-based drawing tool, CorelDraw 3.0 lets you construct an image as a wireframe. The package includes drawing, charting, image editing, tracing, painting, and presentation graphics modules, as well as 14,000 clip-art images, 250

Circle 140 on Inquiry Card.

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Division of Information Dimensions, Inc.
100 Lexington Drive • Buffalo Grove, IL 60089
Phone: (708) 459-8000 • Fax (708) 459-8054

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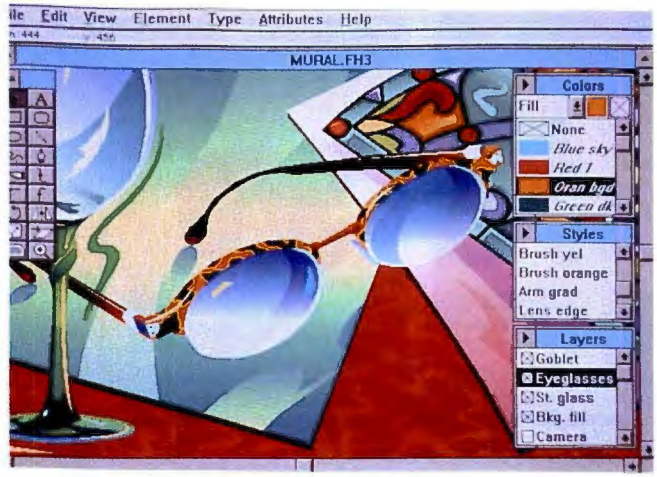

FreeHand 3.1, Aldus

TrueType and Adobe Type 1 fonts, a visual file manager, and a tracing utility. Special effects include object extrusion and blending. (See "A Few of Our Favorite Things," June BYTE, and "CorelDraw 3.0: A Swiss Army Knife for Illustrators," October BYTE.)

Fractal Design Painter 1.2 for Windows, $399

Introduced: March 1992

Fractal Design Corp.
335 Spreckels Dr., Suite F
Aptos, CA 95003
(408) 688-8800
fax: (408) 688-8836
Circle 1120 on Inquiry Card.

You can use Fractal Design Painter 1.2 for Windows, a 24-bit color paint program, to create original art or to add natural effects to other artwork and scanned images. The software simulates the tools and textures of natural media with features such as friskets, more than 50 variable paper textures, cloning, digital tracing paper, and multiple bristled brushes. You create with Fractal Design Painter's colored pencils, crayons, calligraphy pens, and charcoal. (See "A Few of Our Favorite Things, June BYTE, and "Art for Business's Sake," April BYTE.)

Micrografx Designer 3.1, $695

Introduced: Jan. 1988
Latest release: April 1992
Supports OLE

Micrografx, Inc.
1303 Arapaho Rd.
Richardson, TX 75081
(800) 733-3729
(214) 234-1769
fax: (214) 234-2410
Circle 1121 on Inquiry Card.

Using Micrografx Designer 3.1, you can create presentations, illustrations, and brochures with 15 drawing tools, 64 layers, automatic dimensioning, object snap, and 2200 clip-art images. The illustration package supports TrueType fonts and includes Adobe Type Manager, Adobe Type Align, 30 import and export filters, and more than 175 Adobe Type 1 fonts. Designer lets you customize the toolbox, perform gradient fills, and select from the color palette. (See "Art for Business's Sake," April BYTE.)

PhotoFinish 1.0, $199

Introduced: Dec. 1991

ZSoft Corp.
450 Franklin Rd., Suite 100
Marietta, GA 30067
(800) 444-4780
(404) 428-0008
fax: (404) 427-1150
Circle 1122 on Inquiry Card.

Publisher's Paintbrush 2.02, ZSoft

Casual business users can use PhotoFinish 1.0 to edit and enhance scanned photos, drawings, or clip art for importing into drawing, presentation, page layout, and word processing packages. Among the features are automatic retouching, special-effects filters and tools, a stitching feature for joining multiple scans, and a poster capability for banners and signs. (See "Image Doctors" in this issue, and "A Few of Our Favorite Things," June BYTE.)

PhotoStyler 1.1a, $795

Introduced: Oct. 1991
Latest release: April 1992

Aldus Corp.
411 First Ave. S
Seattle, WA 98104
(800) 685-3540
(206) 628-2320
fax: (206) 343-4240
Circle 1123 on Inquiry Card.

PhotoStyler 1.1a lets you scan, enhance, modify, compose, retouch, and print true-color, black-and-white, and gray-scale images. You can input images from scanners and video and produce color separations. PhotoStyler's gamma correction feature lets you calibrate RGB display colors. (See "Image Magic," June BYTE.)

Picture Publisher 3.1, $495

Introduced: Jan. 1989
Latest release: June 1992
Supports OLE

Micrografx, Inc.
1303 Arapaho Rd.
Richardson, TX 75081
(800) 733-3729
(214) 234-1769
fax: (214) 234-2410
Circle 1124 on Inquiry Card.

Picture Publisher 3.1 is a 24-bit, color image editor for retouching and enhancing scanned or photographic images. The package features an image browser, 50 textures and images, color-separation controls, editing tools, JPEG (Joint Photographic Experts Group) compression, image stitching, and more than 30 special effects and filters. Picture Publisher supports the TWAIN and Kodak Photo CD standards. (See "Image Doctors.")

Circle 120 on Inquiry Card (RESELLERS: 121).

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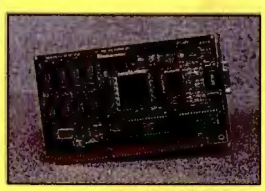

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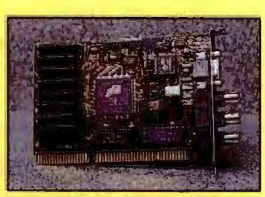

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Simply The Best

STB Systems, Inc.

Publisher's Paintbrush 2.02, $495

Introduced: May 1991
Latest release: May 1992

ZSoft Corp.
450 Franklin Rd., Suite 100
Marietta, GA 30067
(800) 444-4780
(404) 428-0008
fax: (404) 427-1150
Circle 1125 on Inquiry Card.

Publisher's Paintbrush 2.02 works with gray-scale or color images and a long list of scanners. You can create original artwork, retouch or apply special effects to scanned images, add high-quality type to images, and reduce images to icons. The painting and image-editing software package provides 42 drawing tools, 24-bit photo-realistic image processing with 256 shades of gray and up to 16.8 million colors, and support for the Multiple Document Interface. (See "Art for Business's Sake," April BYTE.)

Windows Draw 3.0 Plus OLE, $149.95

Introduced: Oct. 1991
Latest release: May 1992
Supports OLE

Micrografx, Inc.
1303 Arapaho Rd.
Richardson, TX 75081
(800) 733-3729
(214) 234-1769
fax: (214) 234-2410
Circle 1126 on Inquiry Card.

Windows Draw 3.0 Plus OLE features nine drawing tools, 2600 clip-art images, and special-effect tools for blending, gradient fills, rotating objects, and placing text on a curve. In addition, the package provides more than 30 import and export filters and 32 TrueType fonts. You can stretch, slant, and flip drawings; add patterns; mix colors; and zoom in or out on an image. (See "Art for Business's Sake," April BYTE.)

ENTERTAINMENT

After Dark 2.0, $49.95

Introduced: March 1991
Latest release: March 1992

Berkeley Systems, Inc.
2095 Rose St.
Berkeley CA 94709
(800) 877-5535
(510 540-5535
fax: (510) 540-5115
Circle 1127 on Inquiry Card.

In addition to more than 40 screen displays, the After Dark 2.0 screen saver includes digitized sound, network password support, the WallZapper wallpaper option, and Multimode, which lets you combine displays on-screen. Screen-saver displays include Swan Lake, Hall of Mirrors, Nocturnes, Marbles, Aquatic Realm, and the famous Flying Toasters.

Entertainment Pack Volumes 1–3, $39.95 each

Introduced: May 1990
Latest release: Sept. 1991

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1128 on Inquiry Card.

The Microsoft Entertainment Pack Volume 1 features seven games, including Tetris, Taipei, MineSweeper, TicTactics, Golf, Gruel solitaire, Pegged, and four screen savers. Volumes 2 and 3 each add seven more games to the collection. Titles include Pipe Dream, Free Cell solitaire, Rodent's Revenge, Tut's Tomb, JigSawed, Klotski, Fuji Golf, and several screen savers.

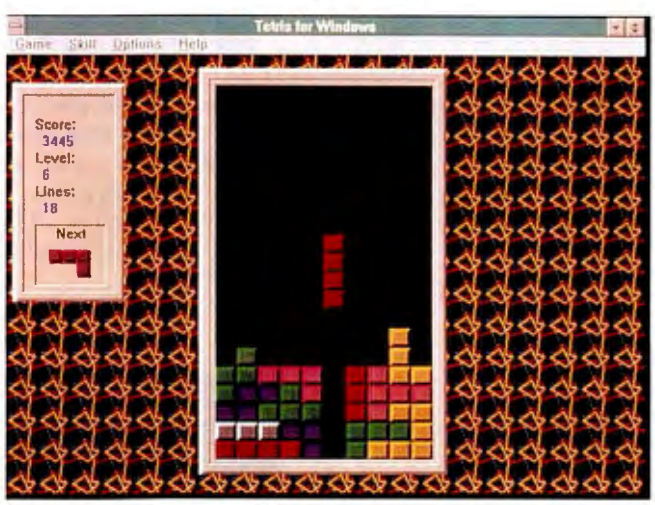
The Far Side Computer Calendar 1.0, $69.95

Introduced: Sept. 1991

Amaze, Inc.
11810 115th Ave. NE
Kirkland, WA 98034
(800) 367-4802
(206) 820-7007
fax: (206) 823-0568
Circle 1129 on Inquiry Card.

The Far Side Computer Calendar 1.0 features a new Gary Larson cartoon each day and a few surprise animations. The calendar includes a daily planner with appointment alarm that presents day, week, month, or year views. The software can also handle recurring events. (See "A Few of Our Favorite Things," June BYTE.)

Entertainment Pack Volume 1, Microsoft



Symantec Game Pack for Windows, $39

Introduced: Oct. 1991

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(800) 441-7234
(408) 253-9600
fax: (408) 253-4092
Circle 1130 on Inquiry Card.

The six games in the Symantec Game Pack include Smart Dots, Pick Up Sticks, a version of the childhood game of Jacks, a Hangman word game, Memory Blocks, and Codebreaker.

EXECUTIVE INFORMATION SYSTEMS

Forest and Trees 2.0d, $495

Introduced: Dec. 1990
Latest release: May 1992
Supports DDE

Channel Computing, Inc.
53 Main St.
Newmarket, NH 03857
(800) 289-0053
(603) 659-2832
fax: (603) 659-7590
Circle 1271 on Inquiry Card.

Forest and Trees 2.0d is a group of data-access and reporting tools that let you collect, combine, and monitor business information. You start by creating a library of "vital signs" that keep tabs on your projects or those of your department or enterprise. Forest and Trees can access data in most spreadsheets, databases, database servers, and host databases. (See "EIS Moves to the Desktop," June BYTE.)

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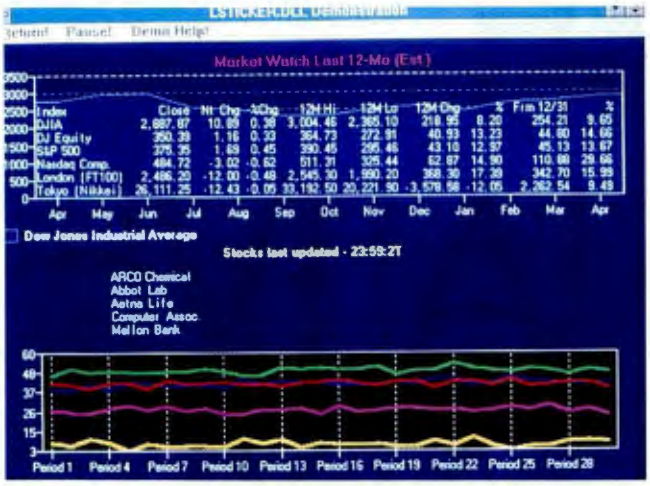


Lightship 3.01, Pilot Software

FormWorx 2.01, Power Up Software

FORMS SOFTWARE

Lightship 3.01, $795

Introduced: Sept. 1990
Latest release: July 1991
Supports DDE

Pilot Software, Inc.
40 Broad St.
Boston, MA 02109
(800) 944-0094
(617) 350-7035
fax: (617) 695-1265
Circle 1272 on Inquiry Card.

The Lightship 3.01 graphical development environment helps you build applications that can access and analyze data in your company's database. The software includes logic and math functions, charting capabilities, group mode, and Lightship Lens, which incorporates DLLs for creating live links to data across a network. Lightship 3.01 also lets you create multidimensional views of data. (See "EIS Moves to the Desktop," June BYTE.)

FormWorx 2.01, $299.95

Introduced: April 1991
Latest release: Jan. 1992

Power Up Software Corp.
2929 Campus Dr.
San Mateo, CA 94403
(800) 851-2917
(415) 345-5900
fax: (415) 349-1356
Circle 1273 on Inquiry Card.

FormWorx 2.01 provides over 500 ready-to-print forms and lets you design and fill in customized forms by pointing and clicking on design objects. Using desktop publishing tools, you design the form and then fill in form data on-screen. You can minimize typing by importing dBase files for automatic fill-in and validation.

JetForm Design 3.0, $495

Introduced: Oct. 1988
Latest release: Dec. 1991
Supports DDE
Add-ons: JetForm Filler/G, JetForm for E-mail

JetForm Corp.
163 Pioneer Dr.
Leominster, MA 01453
(800) 267-7793
(508) 840-8181
fax: (508) 534-6023
Circle 1274 on Inquiry Card.

JetForm Design 3.0 lets you design and generate multipage forms. The software provides graphics, drawing, and text-handling tools with user-defined grids and an AutoTrace feature that can trace over scanned objects. You can zoom, pan, scale, rotate, and stretch objects, and JetForm Design includes the JetForm Filler data-entry program. (See "The Next Best Thing to the Paperless Office," November 1991 BYTE.)

PerForm Pro 1.0, $293

Introduced: Sept. 1990
Supports DDE

Delrina Technology, Inc.
6830 Via Del Oro, Suite 240
San Jose, CA 95119
(800) 268-6082
(408) 363-2345
fax: (408) 363-2340
Circle 1275 on Inquiry Card.

PerForm Pro 1.0 includes forms design tools and more than 65 calculation functions that help you automate form filling. Features include a Fast Fill option, Form Folders to cut down on repetitive entry, direct links to databases including dBase, over 100 ready-to-use forms, and electronic signatures for security. PerForm Pro comes with the Agfa Type Director font-manager software. (See "The Next Best Thing to the Paperless Office," November 1991 BYTE.)

INTEGRATED SOFTWARE

Microsoft Works 2.0 for Windows, $199

Introduced: Sept. 1991
Supports DDE and OLE

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1276 on Inquiry Card.

The WorksWizards interactive templates in Microsoft Works 2.0 for Windows provide step-by-step guidance and prompt you for information as you create custom documents. The integrated software package also offers a WYSIWYG word processor, a spreadsheet, charting capabilities, a database, and drawing programs. Additional features include a toolbar, electronic "sticky tags" that you can attach to documents, and context-sensitive on-line help. (See "A Few of Our Favorite Things," June BYTE.)

PFS:WindowWorks 1.3, $149

Introduced: May 1991

Spinnaker Software Corp.
201 Broadway
Cambridge, MA 02139
(800) 323-8088
(617) 494-1200
fax: (617) 494-1219
Circle 1277 on Inquiry Card.

PFS:WindowWorks 1.3 integrates WYSIWYG word processing, page layout, spreadsheet, and database applications with features such as telecommunications, an address book, a label maker, and charting and business graphics software. The package supports multiple open windows; hot links between the word processor, spreadsheet, and chart modules; and on-line help.

LANGUAGES

BASIC

CA-Realizer 1.0, $247

Introduced: May 1991
Supports DDE

Computer Associates International, Inc.
1 Computer Associates Plaza
Islandia, NY 11788
(800) 342-5224
(516) 342-6000
fax: (516) 342-5329
Circle 1278 on Inquiry Card.

CA-Realizer 1.0 is a visual programming language that lets you create Windows applications without resorting to the Windows SDK (Software Development Kit). A structured superset of BASIC, CA-Realizer includes the FormDev visual forms tool. The package supports interface, spreadsheet, and table objects and includes an integrated debugger, direct Windows calls capability, and DLL support. (See "Two Ways to Program BASIC for Windows," October 1991 BYTE.)

Visual Basic 1.0, $199

Introduced: May 1991
Supports DDE and OLE
Add-on: The Professional Toolkit for Visual Basic

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1279 on Inquiry Card.

Visual Basic 1.0 combines graphical-interface design tools with a general-purpose programming language. You use the graphical design tools to create the user interface and then attach code to those items. The package includes an incremental compiler, automatic syntax checking, an integrated debugger, and on-line help. You can run your finished programs in Visual Basic or as stand-alone EXE files. (See "A Few of Our Favorite Things," June BYTE, and "Two Ways to Program BASIC for Windows," October 1991 BYTE.)

C / C++

Borland C++ 3.1, $495

Introduced: Feb. 1991
Latest release: June 1992
Supports DDE and OLE

Borland International, Inc.
1800 Green Hills Rd.
Scotts Valley, CA 95067
(800) 331-0877
(408) 438-8400
fax: (408) 439-9119
Circle 1280 on Inquiry Card.

Borland C++ 3.1 is a collection of programming tools for professional Windows developers who also develop under DOS. The package includes a command-line compiler, IDEs (integrated development environments) for Windows and DOS, a sophisticated debugger, and a fast optimizing compiler. (See "A Few of Our Favorite Things," June BYTE, and "Borland C++ 2.0 Moves into Windows Territory," June 1991 BYTE.)

Borland C++ Application Frameworks 3.1, $749

Introduced: Nov. 1991
Latest release: June 1992
Supports DDE and OLE

Borland International, Inc.
1800 Green Hills Rd.
Scotts Valley, CA 95067
(800) 331-0877
(408) 438-8400
fax: (408) 439-9119
Circle 1281 on Inquiry Card.

In addition to Borland C++ 3.1, the Borland C++ Application Frameworks 3.1 package includes ObjectWindows, Turbo Vision applications frameworks, run-time library source code, and the Windows API manual. The development system also includes the WinSpector utility for tracking down the source of Windows UAEs (unrecoverable applications errors).

Microsoft C/C++ Development System 7.0, $499

Introduced: Feb. 1992
Supports DDE and OLE

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1282 on Inquiry Card.

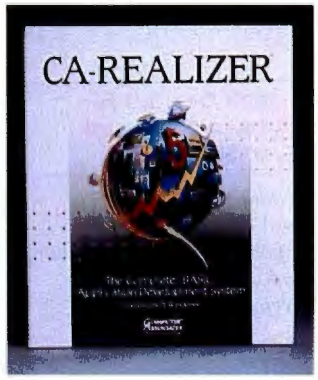
An OOP (object-oriented programming) development package, the Microsoft C/C++ Development System 7.0 includes the entire Windows SDK, the Windows 3.1 class libraries, the High-Performance Object Technology optimizing compiler, design and applications framework tools, the CodeView C++ debugger, the Programmer's Workbench, and Qualitas's 386Max. (See "Microsoft's Lucky Number," September BYTE.)

Microsoft QuickC for Windows 1.0, $199

Introduced: Aug. 1991
Supports DDE and OLE

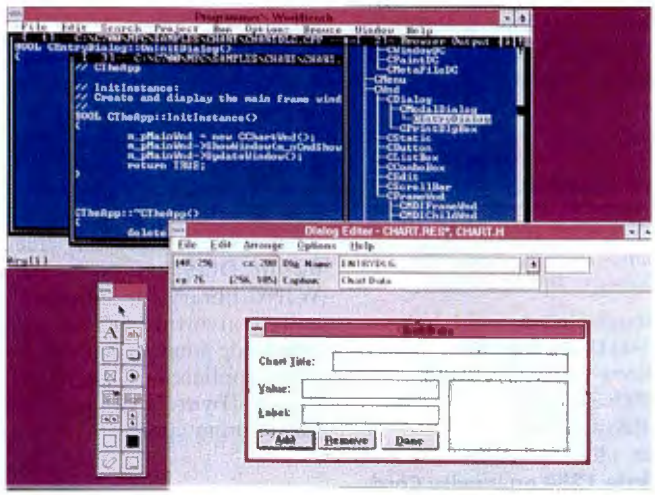
Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1283 on Inquiry Card.

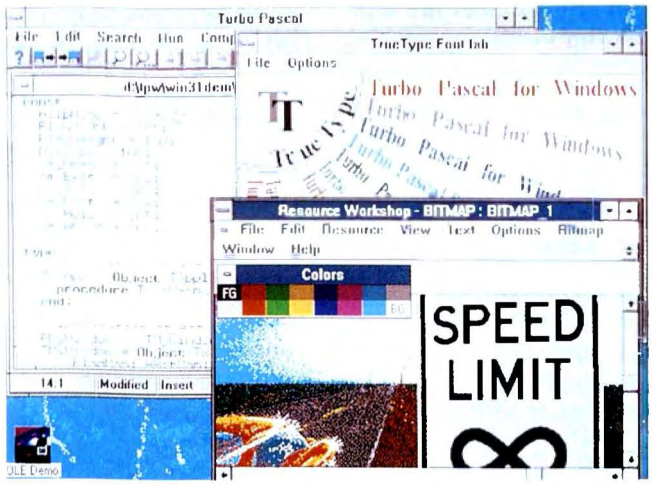
Microsoft QuickC for Windows 1.0 helps you develop and debug small Windows applications entirely within the Windows environment. The



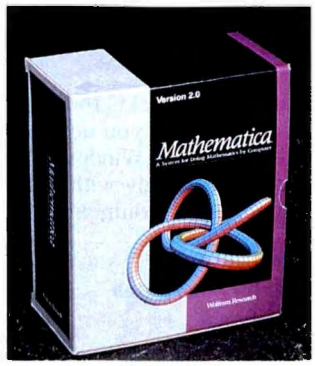
CA-Realizer 1.0, Computer Associates International

Microsoft C/C++ Development System 7.0, Microsoft





Turbo Pascal for Windows 1.5, Borland International



Mathematica 2.1 for Windows, Wolfram Research

package includes a compiler, a dialog-box editor, a debugger, an image object editor, a simple applications generator (i.e., QuickCase:W), a linker, a resource compiler, and a library manager. The on-line documentation includes hypertext links. (See "Swift Programming for Windows, in Windows," March BYTE.)

Turbo C++ for Windows 3.1, $149.95

Introduced: Nov. 1991
Latest release: June 1992
Supports DDE and OLE

Borland International, Inc.
1800 Green Hills Rd.
Scotts Valley, CA 95067
(800) 331-0877
(408) 438-8400
fax: (408) 439-9119
Circle 1284 on Inquiry Card.

Turbo C++ for Windows 3.1 is an inexpensive way to program in C and C++. The package includes the basic tools you need to create Windows applications, but it does not have the library source code, the professional tool set, or an optimizing compiler.

Zortech C++ 3.0 for Windows, DOS, and OS/2, $699

Introduced: Nov. 1990
Latest release: Aug. 1991
Supports DDE and OLE with Windows 3.1 Symantec Developers Kit

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(800) 441-7234
(408) 253-9600
fax: (408) 253-4092
Circle 1285 on Inquiry Card.

Zortech C++ 3.0 is a complete Windows development environment that includes an optimizing compiler, a source-level debugger, a royalty-free 32-bit DOS extender, the WINC library for automatically converting DOS command-line programs into Windows applications, and Blue Sky Software's WindowsMaker prototyper.

PASCAL

Turbo Pascal for Windows 1.5, $149.95

Introduced: March 1991
Latest release: June 1992
Supports DDE and OLE

Borland International, Inc.
1800 Green Hills Rd.
Scotts Valley, CA 95067
(800) 331-0877
(408) 438-8400
fax: (408) 439-9119
Circle 1286 on Inquiry Card.

An object-oriented applications development system, Turbo Pascal for Windows 1.5 supports Windows 3.1 features such as OLE, common dialog boxes, drag-and-drop operation, and TrueType fonts. The system also includes a speed bar, the Turbo Debugger, and the Resource Workshop, a graphical design tool for creating user interfaces. (See "A Few of Our Favorite Things," June BYTE.)

SMALLTALK

Smalltalk/V for Windows 2.0 , $499.95

Introduced: Jan. 1991
Latest release: June 1991
Supports DDE

Digitalk, Inc.
9841 Airport Blvd.
Los Angeles, CA 90045
(800) 531-2344
(310) 645-1082
fax: (310) 645-1306
Circle 1287 on Inquiry Card.

The granddaddy of OOP (object-oriented programming) languages, Smalltalk/V for Windows 2.0 lets you design applications by building complex objects out of simpler ones, eliminating repetitive compile-link-run loops. The package includes standard Smalltalk/V features such as source code browsers, inspectors, and push-button debuggers. In addition, Smalltalk/V supports the MDI (multiple document interface), the national language/double-byte character set, and DLLs.

MATHEMATICS

Mathcad 3.1, $495

Introduced: June 1991
Latest release: Feb. 1992
Supports OLE

MathSoft, Inc.
201 Broadway
Cambridge, MA 02139
(800) 628-4223
(617) 577-1017
fax: (617) 577-8829
Circle 1288 on Inquiry Card.

Mathcad 3.1 acts as a sophisticated calculator that can handle complex arithmetic and calculations such as FFTs (fast Fourier transforms), symbolic factoring of polynomials, Bessel functions, matrices, and simultaneous linear and nonlinear equation-solving statistics. The live document interface acts like a scratchpad and lets you use regular math notation; Mathcad automatically recalculates functions and graphs when you change relationships or constants. (See "A Few of Our Favorite Things," June BYTE, and "What You See Is What You Solve: Mathematica and MathCAD for Windows," May BYTE.)

Mathematica 2.1 for Windows, $995

Introduced: Jan. 1992
Latest release: June 1992

Wolfram Research, Inc.
100 Trade Center Dr.
Champaign, IL 61820
(800) 441-6284
(217) 398-0700
fax: (217) 398-0747
Circle 1289 on Inquiry Card.

Mathematica can handle numerical, symbolic, and graphical computations. The software includes a built-in high-level symbolic programming language, a modeling and analy-

sis tool, and a computation server that works with spreadsheets and other programs. The notebook interface lets you mix text, graphics, animation, and sound. (See "What You See Is What You Solve: Mathematica and MathCAD for Windows," May BYTE.)

MULTIMEDIA

AddImpact 1.0, $129

Introduced: June 1992
Supports DDE and OLE

Gold Disk
385 Van Ness Ave., Suite 110
Torrance, CA 90501
(310) 320-5080
fax: (310) 320-0208
Circle 1290 on Inquiry Card.

AddImpact 1.0 lets you create and embed sound, narration, and animation sequences into any OLE-compatible presentation graphics program or other Windows applications. Animation or sound clips become embedded icons in the client application. You simply click on the icons, and the sound or animation sequence begins.

Macromedia Action 2.0 for Windows, $495

Introduced: Oct. 1991
Latest release: July 1992
Supports DDE

Macromedia, Inc.
600 Townsend St., Suite 310W
San Francisco, CA 94103
(800) 288-8108
(415) 442-0200
fax: (415) 442-0190
Circle 1291 on Inquiry Card.

With the MPC-compatible Macromedia Action 2.0 for Windows, you can create interactive multimedia presentations that combine sound, text, and graphics animation. The software supports MIDI sound and features charting capabilities with automatic motion, a run-time player, multimedia templates, and an Import Presentation tool. (See "The Multimedia PC: High-Powered Sight and Sound on Your Desk," February BYTE.)

Microsoft Bookshelf for Windows, 1991 edition, $195

Introduced: Oct. 1991
Latest release: July 1992

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1292 on Inquiry Card.

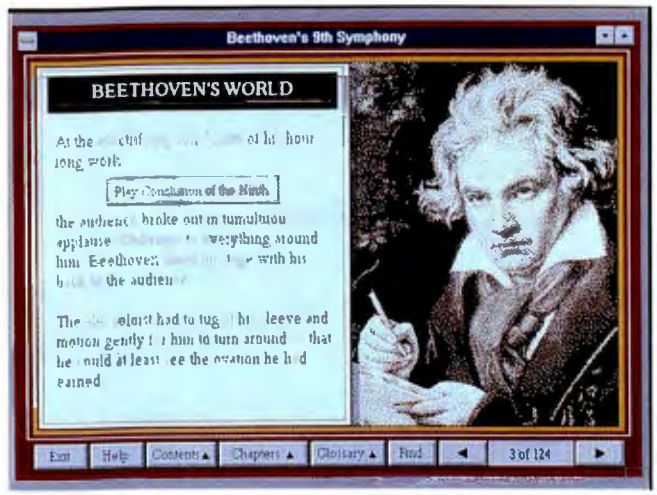
Microsoft Bookshelf for Windows is the quintessential CD-ROM package. A core set of multimedia reference materials for your home or office features sound, animation, and an information-retrieval tool. Microsoft Bookshelf includes a speaking dictionary, an encyclopedia, a thesaurus, two references for quotations, an almanac, and an atlas. (See "The Multimedia PC: High-Powered Sight and Sound on Your Desk," February BYTE.)

Microsoft Multimedia Beethoven: The Ninth Symphony 1.0, $79.95

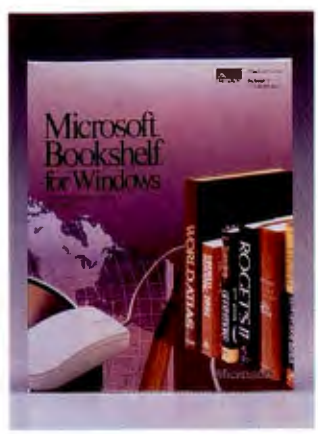
Introduced: Oct. 1991

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1293 on Inquiry Card.

Explore any section from the four movements of Beethoven's Ninth Symphony with Microsoft's multimedia program on CD-ROM. The program features a digital stereo audio track and accompanying sound and images that explain Beethoven's Ninth Symphony. You can learn about Beethoven's life, review a measure-by-measure commentary, play an interactive game based on the symphony, and learn about a symphony's musical architecture.



Microsoft Multimedia Beethoven: The Ninth Symphony 1.0, Microsoft



Microsoft Bookshelf for Windows, 1991 edition, Microsoft

OCR/SCANNING

NISCAN/GS OCR for Windows, $529

Introduced: Jan. 1991
Latest release: May 1992
Supports DDE and OLE

NISCA, Inc.
1919 Old Denton Rd.,
Suite 104
Carrollton, TX 75006
(800) 245-7226
(214) 242-9696
fax: (214) 245-0942
Circle 1294 on Inquiry Card.

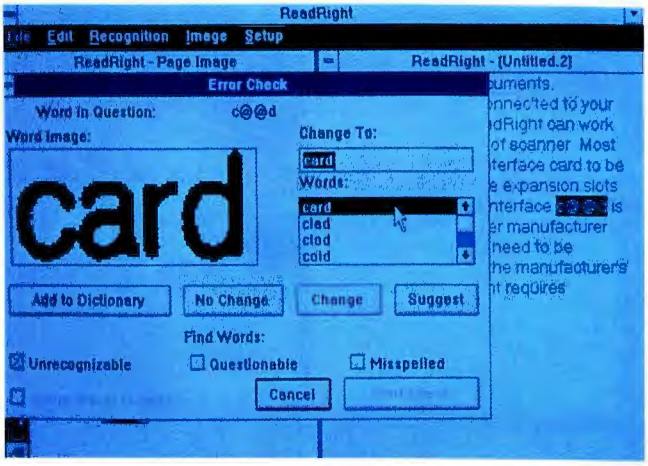
A bundled package containing a hand-held scanner and Perceive Personal OCR for Windows software, NISCAN/GS OCR for Windows also includes image-editing features for scanned photographs, halftones, and line art and supports 8-bit, 256-shade grayscale graphics images. It can read point sizes from 8 to 36, and it requires no training.

OmniPage Professional 2.0, $995

Introduced: Sept. 1991
Supports DDE

Caere Corp.
100 Cooper Court
Los Gatos, CA 95030
(800) 535-7226
(408) 395-7000
fax: (408) 354-2743
Circle 1295 on Inquiry Card.

OmniPage Professional 2.0 incorporates Hewlett-Packard's AccuPage OCR (optical character recognition) technology



ReadRight 3.1, Adobe Systems

ScanMan Model 256 with FotoTouch, Logitech

for scanning low-quality documents and Caere's AnyFont technology. It can read documents scanned upside down, in column format, or from dot-matrix printers, and it has a gray-scale editor that creates black-and-white or continuous-tone images with up to 256 shades of gray. The package also includes a spelling checker and an OCR training program. (See "Tame the Paper Tiger," April 1991 BYTE.)

ReadRight 3.1, $199

Introduced: Feb. 1991
Latest release: June 1991

Adobe Systems, Inc.
1585 Charleston Rd.
Mountain View, CA 94043
(800) 833-6687
(415) 961-4400
fax: (415) 961-3769
Circle 1296 on Inquiry Card.

ReadRight page-recognition software automatically detects the mode in which Windows is running and loads a DDL (document description language) that optimizes performance. Other features include the ability to monitor the recognition process to gauge accuracy, multiple zoom levels, a user dictionary, delayed processing, a pop-up error checker, and text/graphics page decomposition. (See "Tame the Paper Tiger," April 1991 BYTE.)

ScanMan Model 256 with FotoTouch, $449

Introduced: Aug. 1990
Latest release: Jan. 1992

Logitech, Inc.
6505 Kaiser Dr.
Fremont, CA 94555
(800) 231-7717
(510) 795-8500
fax: (510) 792-8901
Circle 1297 on Inquiry Card.

Logitech has bundled the ScanMan Model 256, an 8-bit, 256-gray-scale hand scanner, and FotoTouch, an image-editing software package that lets you stitch multipass images together. The software also includes features such as lighten, darken, and negative effects; resize and rotate; brighten; contrast; and zoom. An image-skew tool helps you correct skewing errors from imprecise scans.

WordScan Plus 1.1, $695

Introduced: July 1990
Latest release: May 1992
Supports DDE

Calera Recognition Systems, Inc.
475 Potrero Ave.
Sunnyvale, CA 94086
(800) 544-7051
(408) 720-0999
fax: (408) 720-1330
Circle 1298 on Inquiry Card.

WordScan Plus 1.1 is an omnifont OCR program that you can run stand-alone from within Word for Windows to scan text directly into a Word document. WordScan Plus also features deferred processing of scanned images, preview page, fax support, style sheets, multijob processing, and the Verifier, which marks questionable words or characters. (See "Tame the Paper Tiger," April 1991 BYTE.)

ORGANIZATIONAL CHARTING

OrgPlus for Windows 1.0, $199.99

Introduced: Feb. 1992

Banner Blue Software
39500 Stevenson Place,
Suite 204
Fremont, CA 94539
(510) 794-6850
fax: (510) 794-9152
Circle 1299 on Inquiry Card.

OrgPlus for Windows 1.0 lets you create corporate organizational charts that have up to 32,000 boxes and 50 levels. The package provides automatic chart drawing, customizable formatting, and compact layouts. You can enter and edit names, titles, and other information (including photographic images) directly into chart boxes. The package includes Adobe Type Manager.

Windows OrgChart 2.0, $149.95

Introduced: June 1991
Latest release: Oct. 1991

Micrografx, Inc.
1303 Arapaho Rd.
Richardson, TX 75081
(800) 733-3729
(214) 234-1769
fax: (214) 234-2410
Circle 1300 on Inquiry Card.

Windows OrgChart 2.0 lets you graphically construct organization charts and tree hierarchies. The software features automatic line drawing and box alignment and point-and-click facilities for adding, deleting, or promoting personnel; linking detailed notes; or including scanned photos. OrgChart can scale your charts to fit onto a page, and it lets you have multiple typefaces in each box. (See "Art for Business's Sake," April BYTE.)

PERSONAL FINANCE

ACCPAC Simply Accounting 2.0, $199

Introduced: April 1991
Latest release: Sept. 1992
Supports DDE

Computer Associates International, Inc.
1 Computer Associates Plaza
Islandia, NY 11788
(800) 342-5224
(516) 342-6000
fax: (516) 342-5329
Circle 1301 on Inquiry Card.

Designed for small business users, ACCPAC Simply Accounting 2.0 is an integrated, entry-level, graphical accounting system that features automatic transaction posting; pop-up customer, vendor, job, employee, account, and inventory lists; and month- and year-end closing routines that let you complete formatted balance sheets, income statements, and standard reports with a single keystroke.

Microsoft Money 1.0, $69.95

Introduced: Sept. 1991

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1302 on Inquiry Card.

Microsoft designed Microsoft Money 1.0 for individuals and small businesses that need a fast, easy way to keep track of their finances. The program works as an electronic checkbook and automates the routine tasks associated with paying bills, creating and tracking budget account balances, viewing and summarizing transactions, and reporting and reconciling financial statements.

Peachtree Accounting for Windows 5.0, $99

Introduced: Feb. 1991
Latest release: March 1992
Supports DDE and OLE

Peachtree Software, Inc.
1505-C Pavilion Place
Norcross, GA 30093
(800) 548-9179
(404) 564-5800
fax: (404) 564-5888
Circle 1303 on Inquiry Card.

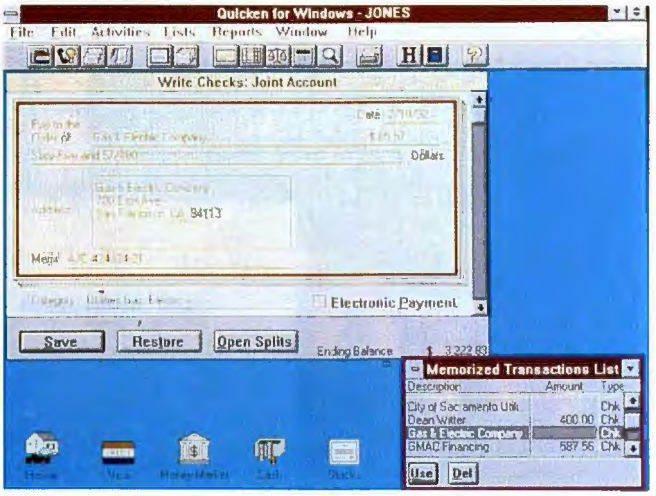
Peachtree Software's small-business accounting system lets you track daily receivables and payables, assess current inventory and other assets, examine profitability by item, perform weighted average costing, and create valuation and low-stock reports. Peachtree Accounting for Windows 5.0 includes a general ledger, invoicing, budgeting, payroll, job costing, bank reconciliation, and financial report writing.

Quicken for Windows 1.01, $69.95

Introduced: Oct. 1991
Latest release: March 1992
Supports DDE

Intuit
1830 Embarcadero
Palo Alto, CA 94303
(800) 624-8742
(415) 322-0573
fax: (415) 329-2785
Circle 1304 on Inquiry Card.

Quicken for Windows 1.01 keeps track of your checking, savings, credit cards, cash, stocks, bonds, mutual funds, mortgages, loans, assets, and liabilities. You can keep multiple account windows open simultaneously, automate recurring payments, and pay bills by modem with CheckFree. Quicken for Windows also creates cash flow, profit-and-loss, and balance-sheet reports.



Quicken for Windows 1.01, Intuit

Act for Windows 1.0, Contact Software International

PERSONAL INFORMATION MANAGERS

Act for Windows 1.0, $495

Introduced: June 1992
Supports DDE

Contact Software International, Inc.
1840 Hutton Dr., Suite 200
Carrollton, TX 75006
(800) 365-0606
(214) 919-9500
fax: (214) 919-9760
Circle 1305 on Inquiry Card.

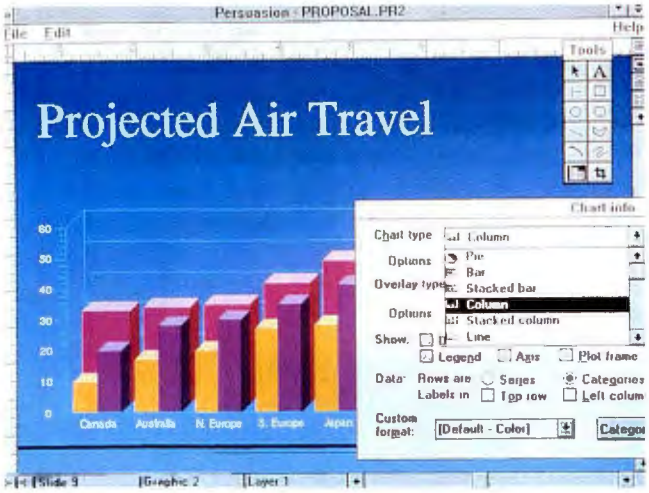
Designed for sales professionals, Act for Windows 1.0 is a contacts database with 71 customizable fields, password security, data import and export to dBase and RTF (Rich Text File) formats, and a pop-up calculator. The package also provides a calendar, a word processor, a spelling checker, a report generator, a macro builder, and a telephone book with auto-dialer. Act for Windows also features call, meeting, and task scheduling and prioritization and automatic scheduling for recurring events. (See "A Few of Our Favorite Things," June BYTE.)

Ascend 3.14, $299

Introduced: Nov. 1990
Latest release: Oct. 1991

NewQuest Technologies, Inc.
2550 South Decker Lake Blvd., Suite 26
Salt Lake City, UT 84119
(800) 877-1814
(801) 975-9992
fax: (801) 975-9995
Circle 1306 on Inquiry Card.

Combining an electronic calendar with the Franklin Day Planner, Ascend 3.14 prints



Persuasion 2.1, Aldus

Presentation Task Force 4.0, New Vision Technologies

pages that fit into the Day Planner notebook. You get a prioritized daily task list, an appointment schedule, an address and phone book, an auto-dialer, a master task list, a daily record of events, a personal journal, red tabs for flagging key information, a goal tracker, a weekly appointment view, and a file organizer. (See "Managing Your Contacts.")

OnTime 1.2, $129.95

Introduced: May 1991
Latest release: June 1992

Campbell Services, Inc.
21700 Northwestern Hwy.,
Suite 1070
Southfield, MI 48075
(800) 345-6747
(313) 559-5955
fax: (313) 559-1034
Circle 1307 on Inquiry Card.

The OnTime 1.2 scheduling program includes a tickler file, an appointment alarm, a to-do list, and an event calendar with day, week, and month views. You can categorize and prioritize events and print detailed, threefold itineraries, calendars, and to-do lists. OnTime is also available as a group scheduler. (See "Getting Groups On Schedule," September 1991 BYTE.)

PackRat 4.0, $395

Introduced: May 1988
Latest release: Oct. 1991
Supports DDE
Add-on: The PackRat Integration Library 1.0

Polaris Software
17150 Via Del Campo,
Suite 307
San Diego, CA 92127
(800) 722-5728
(619) 674-6500
fax: (619) 674-7315
Circle 1308 on Inquiry Card.

An all-in-one PIM (personal information manager), PackRat 4.0 provides an appointment calendar, a to-do list, a project tracker, a phone book with auto-dialer and log, a hard disk file manager, a finance manager, a reminder system, a time and billing manager, customizable SmartButtons, and free-form notes. The PackRat Integration Library ($29.95) lets you integrate PackRat with popular word processors. PackRat 4.0 is also available in a groupware version. (See "Managing Your Contacts.")

PRESENTATION SOFTWARE

ABC Flowcharter 1.13, $295

Introduced: Dec. 1989
Supports DDE

Micrografx, Inc.
1303 East Arapaho Rd.
Richardson, TX 75081
(800) 733-3729
(214) 234-1769
fax: (214) 234-2410
Circle 1309 on Inquiry Card.

ABC Flowcharter 1.13's point-and-click interface helps you create sophisticated flow-charts that break down complex procedures into simpler components. The software includes a navigational grid for moving through charts, automatic line drawing and shape alignment, drawing tools, a library of 30 standard flowchart shapes, a variety of arrowhead styles and sizes, and the ability to import custom shapes. (See "Art for Business's Sake," April BYTE.)

Aldus Persuasion 2.1, $495

Introduced: May 1991
Latest release: Feb. 1992
Supports DDE and OLE

Aldus Corp.
411 First Ave. S
Seattle, WA 98104
(800) 685-3540
(206) 622-5500
fax: (206) 343-4240
Circle 1310 on Inquiry Card.

Aldus Persuasion 2.1 helps you create presentation outlines, slides, speaker notes, and audience handouts with features such as multiple master pages; special-effects tools; an outline processor; automatic slide layout, charting, graphing, and drawing tools; on-screen transition effects; and the Persuasion Player on-screen viewer. Persuasion comes bundled with Adobe Type Manager. (See "The Perfect Pitch," December 1991 BYTE.)

CA-Cricket Graph 1.3.1, $129

Introduced: Aug. 1989
Latest release: March 1991

Computer Associates
International, Inc.
1 Computer Associates Plaza
Islandia, NY 11788
(800) 342-5224
(516) 342-6000
fax: (516) 342-5329
Circle 1311 on Inquiry Card.

The CA-Cricket Graph 1.3.1 charting program lets you create 12 chart types, including scatter, line, stacked bar, pie, column, text, area, stacked column, double *y* axes, bar, polar, and overlay combinations. You can customize graphs with eight bar patterns, 15 plot symbols, five line styles, four line widths, and 11 outline fonts. Editing features include stretch, shrink, regression curve fits, and depth effects. (See "Art for Business's Sake," April BYTE, and "The Perfect Pitch," December 1991 BYTE.)

Charisma 2.1, $495

Introduced: July 1990
Latest release: July 1991
Supports OLE

Micrografx, Inc.
1303 East Arapaho Rd.
Richardson, TX 75081
(800) 733-3729
(214) 234-1769
fax: (214) 234-2410
Circle 1312 on Inquiry Card.

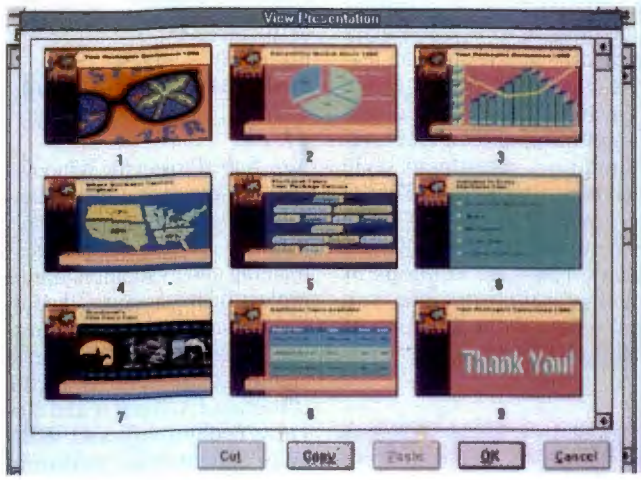
A business graphics package, Charisma 2.1 includes 80 templates, 40 predefined chart types, 2200 clip-art images, 30 import and export filters, special-effects tools, and a slide-show builder. The package also includes 41 scalable outline fonts, customizable bullets, 13 drawing tools, and TeleGrafx, a telecommunications utility that lets you send graphics files to imaging centers. (See "The Perfect Pitch," December 1991 BYTE.)

Claris Hollywood 1.0 version 2, $499

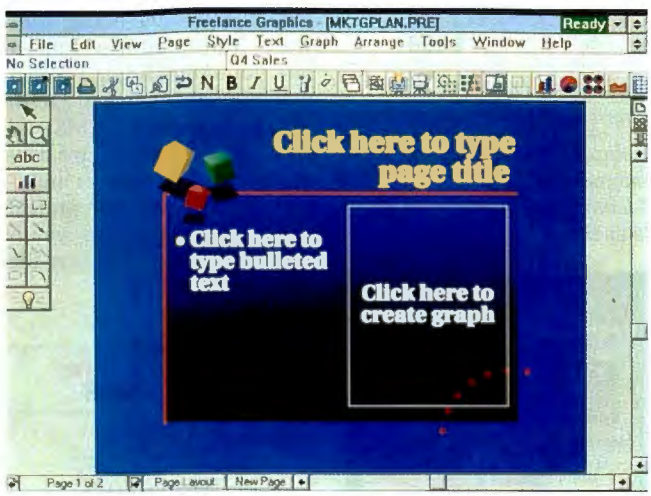
Introduced: May 1991
Latest release: Feb. 1992
Supports DDE

Claris Corp.
5201 Patrick Henry Dr.
Santa Clara, CA 95052
(408) 727-8227
Circle 1313 on Inquiry Card.

Claris Hollywood 1.0 version 2 lets you create transparencies, slides, hard copy, on-screen presentations, speaker notes, and audience handouts. The software features a slide sorter; on-screen presentation controls with fade, dissolve, and automatic slide "build" effects; integrated outliner links; a spelling checker; a chart builder; clip art; search and replace functions; and extensive file-exchange capabilities. (See "A Few of Our Favorite Things," June BYTE, and "The Perfect Pitch," December 1991 BYTE.)



Hollywood 1.0 version 2, Claris



Freelance Graphics for Windows 1.0, Lotus Development

Freelance Graphics for Windows 1.0, $495

Introduced: Oct. 1991
Latest release: March 1992
Supports DDE and OLE

Lotus Development Corp.
Graphics Product Group
161 First St.
Cambridge, MA 02142
(800) 343-5414
(617) 577-8500
fax: (617) 693-4551
Circle 1314 on Inquiry Card.

Freelance Graphics for Windows 1.0 provides more than 60 ready-made presentation pages, a customizable icon palette, a 10-level undo command, and task-oriented on-line tutorials. The business graphics package also includes a presentation outliner, a 130,000-word spelling checker, global change capability, a page sorter, and a screen-show builder. (See "A Few of Our Favorite Things," June BYTE.)

Harvard Graphics for Windows 1.0, $595

Introduced: Dec. 1991
Supports DDE

Software Publishing Corp.
3165 Kifer Rd.
Santa Clara, CA 95051
(408) 986-8000
fax: (408) 980-0729
Circle 1315 on Inquiry Card.

The Hypershow feature in Harvard Graphics for Windows 1.0 lets you create interactive presentations that display back-up charts and graphs when you select an on-screen button during the main presentation. This presentation graphics package offers 88 layouts, icons for creating slides, and 54 presentation styles. With the applications launcher, you can run another application from within Harvard Graphics for Windows. (See "Art for Business's Sake," April BYTE.)

PowerPoint 3.0, $495

Introduced: May 1990
Latest release: April 1992
Supports DDE and OLE

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1316 on Inquiry Card.

PowerPoint 3.0 supports embedded TrueType fonts and includes outlining and text-formatting functions, a tool for creating 24 shapes, a free-form drawing tool, and 84 predesigned graph types. The software provides tools for electronic presentations that include flying bullets, a run-time viewer, and 40 transition effects, such as wipes, dissolves, and fades. PowerPoint has a customizable toolbar and supports Windows for Pen Computing, MCI (Media Control Interface) sound, and AVI (Audio Video Interactive). (See "A Power Boost for PowerPoint," September BYTE.)

Presentation Task Force 4.0, $199

Introduced: June 1989
Latest release: Feb. 1992

New Vision Technologies, Inc.
38 Auriga Dr., Unit 13
Nepean, Ontario,
Canada K2E 8A5
(613) 727-8184
fax: (613) 727-8190
Circle 1317 on Inquiry Card.

Presentation Task Force 4.0 is a compendium of more than 3500 full-color clip-art images that you can use with Windows programs that import CGM files. Images are organized by subject and cataloged in the 400-page manual. You can print the images in color or in black and white.

Stanford Graphics 2.0, $495

Supports DDE and OLE

3-D Visions Corp.
2780 Skypark Dr.
Torrance, CA 90505
(800) 729-4723
(310) 325-1339
fax: (310) 325-1505
Circle 1318 on Inquiry Card.

The high-end Stanford Graphics 2.0 presentation graphics program includes data-analysis, statistical, and scientific functions in a 70-trillion-cell spreadsheet. The program features the Graph Gallery (more than 160 2-D and 3-D business graphs), on-screen data manipulation, intelligent style masters, and a WYSIWYG outliner. The Prime Time Screen Show feature lets you create run-time versions of your presentations that you can't view without a copy of Stanford Graphics.

PROJECT MANAGEMENT

CA-SuperProject for Windows 2.0a, $895

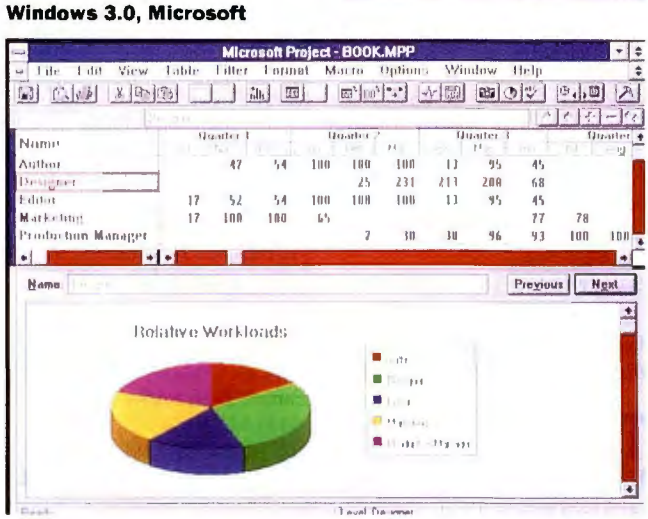
Introduced: Oct. 1991
Latest release: May 1992

Computer Associates International, Inc.
1 Computer Associates Plaza
Islandia, NY 11788
(800) 342-5224
(516) 342-6000
fax: (516) 342-5329
Circle 1319 on Inquiry Card.

CA-SuperProject for Windows 2.0a is a group of project management and presentation tools that you can use for progress tracking and evaluation, multiproject management, scheduling, resource leveling, and costing. The package lets you create Gantt, Cost/Resource, PERT (Program Evaluation and Review Technique), and WBS (Work Breakdown Structure) charts, and it accepts data from Time Slips' Time Sheets Professional time and billing software. Multiplatform support lets you consolidate project management between DOS, Windows, and VAX/VMS systems, and a MDI (multiple document interface) allows multiple views of the same project or of different projects simultaneously. (See "Tracking the Elusive Project.")

On Target 1.0, Symantec

Microsoft Project for Windows 3.0, Microsoft



Microsoft Project for Windows 3.0, $695

Introduced: May 1990
Latest release: Jan. 1992
Supports DDE and OLE

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1320 on Inquiry Card.

Microsoft Project for Windows 3.0 lets you manage schedules, resources, and expenses. The software lets you create PERT and Gantt charts, model resource use, manage resources across multiple projects, and track your progress. Microsoft Project for Windows performs automatic resource leveling and has a customizable toolbar and macro capability. (See "Tracking the Elusive Project.")

On Target 1.0, $399

Introduced: April 1991

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(800) 441-7234
(408) 253-9600
fax: (408) 253-4092
Circle 1321 on Inquiry Card.

On Target 1.0 provides basic project management and planning assistance without a steep learning curve, replacing project management lingo with plain English. Key features include a point-and-click interface, a schedule assistant, starter schedules, a graphical time table, and calendar reports. You can create reports and presentations with predesigned or custom formats. (See "Tracking the Elusive Project.")

Time Line for Windows 1.0, $699

Introduced: March 1992
Supports DDE and OLE

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(800) 441-7234
(408) 253-9600
fax: (408) 253-4092
Circle 1322 on Inquiry Card.

Time Line for Windows 1.0 tracks, controls, and reports the status of complex projects, and it creates detailed schedules with up to 8000 tasks per file. You can create effort-driven, critical-path, and project-/task-priority scheduling and make individual resource calendars, perform resource leveling, and schedule forward or backward. Most of Time Line's functions are accessible through an icon bar. (See "Tracking the Elusive Project.")

SPREADSHEETS

Lotus 1-2-3 for Windows 1.1, $595

Introduced: Aug. 1991
Latest release: April 1992
Supports DDE

Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
(800) 343-5414
(617) 577-8500
fax: (617) 253-9150
Circle 1323 on Inquiry Card.

In addition to a new Windows interface, the Lotus 1-2-3 for Windows 1.1 graphical spreadsheet offers the standard DOS interface and file compatibility with other versions of Lotus 1-2-3. Among the features are more than 70 customizable smart icons, zoom, in/out, fast preview, and support for DOS macros. The spreadsheet comes bundled with Adobe Type Manager. (See "Spreadsheets Under Scrutiny" in this issue, and "Captains of Crunch," March BYTE.)

Microsoft Excel for Windows 4.0, $495

Introduced: Oct. 1987
Latest release: March 1992
Supports DDE and OLE

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1324 on Inquiry Card.

The advanced analytical tools in Microsoft Excel for Windows 4.0 snap in and out to save memory. The spreadsheet package also includes drag-and-drop operation, wizards (i.e., on-line assistants that walk you through complex tasks), automatic spreadsheet formatting, shortcut menus, task-oriented toolbars, and a chart and report builder. Microsoft Excel will also run Lotus 1-2-3 macros. (See "Spreadsheets Under Scrutiny" in this issue, and "Captains of Crunch," March BYTE.)

Quattro Pro for Windows 1.0, $495

Introduced: October 1992
Supports DDE

Borland International, Inc.
1800 Green Hills Rd.
Scotts Valley, CA 95067
(800) 331-0877
(408) 438-8400
fax: (408) 439-9119
Circle 1325 on Inquiry Card.

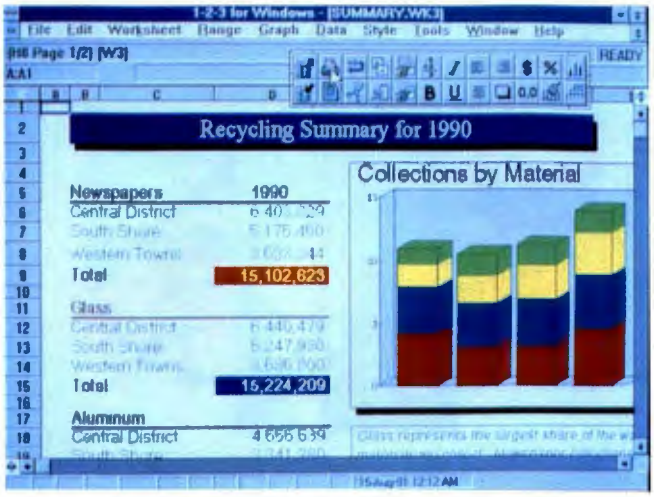
Quattro Pro for Windows 1.0 lets you create spreadsheets that are set up as Notebooks. The Dialogue Builder lets you write customized Quattro Pro applications, the Data Base Desktop provides a data link to dBase and Paradox data, and the Object Inspector Menu lets you take advantage of the right mouse button. Quattro Pro for Windows also includes a full presentation package with graphics and page-layout facilities. (See "Spreadsheets Under Scrutiny" in this issue, and "Captains of Crunch," March BYTE.)

Wingz for Windows 1.1a, $499

Introduced: July 1990
Latest release: Summer 1992
Supports DDE
Add-on: The Wingz-DataLink

Informix Software, Inc.
4100 Bohannon Dr.
Menlo Park, CA 94025
(800) 438-7627
(415) 926-6300
fax: (415) 926-6593
Circle 1326 on Inquiry Card.

A graphical spreadsheet, Wingz for Windows 1.1a provides more than 140 built-in functions, graphing and charting capabilities, analytical and presentation graphics tools, WYSIWYG print previews, and the Hyperscript applications development language. You can access Informix SQL (Structured Query Language) databases from within a Wingz spreadsheet using the optional Wingz-DataLink software. (See "A Few of Our Favorite Things," June BYTE.)



Lotus 1-2-3 for Windows 1.1, Lotus Development

UTILITIES/ENHANCEMENTS

Adobe Type Manager 2.0 for Windows, $99

Introduced: June 1990
Latest release: Nov. 1991

Adobe Systems, Inc.
1585 Charleston Rd.
Mountain View, CA 94043
(800) 833-6687
(415) 961-4400
fax: (415) 961-3769
Circle 1327 on Inquiry Card.

Adobe Type Manager 2.0 for Windows adds 13 scalable fonts to the Windows 3.1 environment and works with Type 1 fonts to smooth out the jagged edges on paper and on the screen. The on-screen font-manager software automatically downloads new fonts to PostScript printers and can optionally defer to printer-resident Hewlett-Packard scalable fonts of the same name on HP LaserJet III printers. Additional fonts are available. (See "Windows Display Managers File Rough Edges from Text," June 1991 BYTE.)

Bitstream FaceLift 2.0 for Windows, $99

Introduced: Aug. 1990
Latest release: March 1992

Bitstream, Inc.
215 First St.
Cambridge, MA 02142
(800) 522-3668
(617) 497-6222
fax: (617) 868-4732
Circle 1328 on Inquiry Card.

Bitstream FaceLift 2.0 for Windows gives you smoother-appearing fonts on-screen and from your printer. The package can create fonts in any size for most screen displays and for printers supported by Windows 3.0 and 3.1. Version 2.0 features increased character-generation speed. PostScript Type 1 support, 16 scalable fonts, and access to 14 additional character sets. Other fonts are available. (See "Windows Display Managers File Rough Edges from Text," June 1991 BYTE.)

HiJaak for Windows 1.0, Inset Systems

Bitstream MakeUp 1.01, $149

Introduced: Feb. 1992
Latest release: Aug. 1992

Bitstream, Inc.
215 First St.
Cambridge, MA 02142
(800) 522-3668
(617) 497-6222
fax: (617) 868-4732
Circle 1329 on Inquiry Card.

Bitstream MakeUp 1.01's five typefaces and clip-art images let you create special effects with type. You get full typographic controls, including line spacing and kerning, which you can use to create masks, shadows, 3-D type, and perspective or to edit the Bézier outlines of characters.

Fastback Plus Windows 1.0, $189

Introduced: Feb. 1992

Fifth Generation Systems, Inc.
10049 Reiger Rd.
Baton Rouge, LA 70809
(504) 291-7221
fax: (504) 291-5453
Circle 1330 on Inquiry Card.

A high-speed automated backup program, Fastback Plus Windows 1.0 features an express menu, a Quick Tag feature for selecting files and directories, automatic formatting of disks or tapes, data compression, file encryption, error correction, and on-line help. You can also back up files from more than one disk drive and to any DOS device, including Bernoulli cartridges, optical media, and removable hard drives. Fastback Plus Windows is network-compatible.

HiJaak for Windows 1.0, $249

Introduced: Feb. 1992
Supports OLE

Inset Systems, Inc.
71 Commerce Dr.
Brookfield, CT 06804
(203) 740-2400
fax: (203) 775-5634
Circle 1331 on Inquiry Card.

HiJaak for Windows 1.0 can capture, view, edit, print, and convert images. It can handle conversions for 24 raster formats, 25 fax-board formats, and 16 vector formats and perform conversions in the background. The graphics utility supports the MDI (multiple document interface) and drag-and-drop file viewing.

NewWave 4.0, $195

Introduced: Nov. 1987
Latest release: March 1992
Supports DDE and OLE

Hewlett-Packard Co.
974 East Arques Ave.
Sunnyvale, CA 94086
(800) 554-1305
(408) 720-3006
fax: (408) 720-3560
Circle 1332 on Inquiry Card.

NewWave 4.0 is a Windows desktop replacement program that extends the Windows drag-and-drop metaphor. The program replaces the file manager with a series of nested folders and file drawers and turns files into objects that, when you click on them, can launch their original applications. To print a file, you drag and drop objects onto the print icon. (See "Four Windows Desktops.")

Norton AntiVirus 2.0 for DOS and Windows, $129

Introduced: Jan. 1992

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(800) 441-7234
(408) 253-9600
fax: (408) 252-4694
Circle 1333 on Inquiry Card.

The Norton AntiVirus 2.0 package can find and repair more than 1000 viruses. The software scans your files, your hard disk's boot sector, and your PC's memory. It scans automatically in the background and detects changes to files that may indicate an unknown virus. You can load the scanning TSR program into high memory. The package also features password protection and recursive scan and repair.

Norton Backup 2.0 for Windows, $149

Introduced: July 1991
Latest release: June 1992

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(800) 441-7234
(408) 253-9600
fax: (408) 252-4694
Circle 1334 on Inquiry Card.

Norton Backup 2.0 for Windows' drag-and-drop operation simplifies and automates data backup. The package features emergency DOS restore, 40- or 80-QIC (quarter-inch cartridge) tape-drive support, backup reports, file-version checking, file compression, password protection, and enhanced network support. Norton Backup automatically formats floppy disks during backups.

Norton Desktop 2.0 for Windows, $179

Introduced: June 1991
Latest release: April 1992
Supports DDE

Symantec Corp.
10201 Torre Ave.
Cupertino, CA 95014
(800) 441-7234
(408) 253-9600
fax: (408) 252-4694
Circle 1335 on Inquiry Card.

The Windows-based file management and repair tools in the Norton Desktop 2.0 for Windows package include drag-and-drop operation, TrueType support, backup capability, antivirus functions, file-repair programs, file viewers, a macro recording capability, a desktop editor, network support, and automatic desktop arrangement. Norton Desktop can also uninstall itself. (See "Four Windows Desktops.")

Publisher's PowerPak, $79.95

Introduced: June 1989
Latest release: June 1992

FastFonts 3.0, $99.95

Introduced: June 1992

Atech Software
5964 La Place Court, Suite 125
Carlsbad, CA 92008
(619) 438-6883
fax: (619) 438-6898
Circle 1336 on Inquiry Card.

A font management utility, Publisher's PowerPak can scale fonts from 6-point type to 1000-point on-the-fly while presenting smoother on-screen images. The package supports more than 450 printers. FastFonts 3.0 is an enhanced version of PowerPak that adds special-effects editing, scalable clip art, expanded type selection, and a font metrics editor.

QAPlus/Win 5.0, $159.95

Introduced: Feb. 1992

Diagsoft, Inc.
5615 Scotts Valley Dr.,
Suite 140
Scotts Valley, CA 95066
(800) 342-4763
(408) 438-8247
fax: (408) 438-7113
Circle 1337 on Inquiry Card.

QAPlus/Win 5.0 tunes and troubleshoots Windows and DOS software and performs diagnostic tests on your system board, floppy drives, COM ports, mouse, add-in boards, hard drive, keyboard, printer, and LAN connections. It offers a disk performance test, DOS and Windows configuration data, on-line tuning help, a log file, and a report utility that outputs files in dBase IV format.

Saber Menu System for Windows 2.0, $89 (single user)

Introduced: Feb. 1991
Latest release: March 1992
Supports DDE and OLE

Saber Software Corp.
P.O. Box 9088
Dallas, TX 75209
(800) 338-8754
(214) 361-8086
fax: (214) 361-1882
Circle 1338 on Inquiry Card.

The Saber Menu System for Windows 2.0 lets you create a consistent network front end for Windows and DOS clients. Menu creation features include dynamic item configuration, dialog box prompting, and application key definitions. The software automatically creates and manages Windows PIF and INI files.

SuperPrint 2.2, $149

Introduced: May 1990
Latest release: May 1992

Zenographics, Inc.
4 Executive Cir.
Irvine, CA 92714
(800) 366-7494
(714) 851-6352
fax: (714) 851-1314
Circle 1339 on Inquiry Card.

The SuperPrint 2.2 printing utility provides enhancements such as on-the-fly font scaling, print queuing, background printing, and print acceleration. The software supports TrueType and ATM, and it includes a CAS (Communicating Applications Specification)–compatible fax driver and color-correction capabilities.

Windows Workstation 4.1, $995 (10-user server license)

Introduced: Nov. 1988
Latest release: April 1992
Supports DDE

Automated Design
Systems, Inc.
375 Northridge Rd., Suite 270
Atlanta, GA 30350
(800) 366-2552
(404) 394-2552
fax: (404) 394-2191
Circle 1340 on Inquiry Card.

Windows Workstation 4.1 lets you create a centralized Windows environment for clients on LAN Manager, NetWare, or Vines LANs. You use a Program Manager replacement feature to create shared, server-based Windows group menus, to configure LAN printers, and to provide centralized Windows print-queue management. Windows Workstation lets you restrict network access by user or group and add new functions to program groups or items with the Multi-Set script language.

WinTools 1.0, $149

Introduced: Jan. 1992
Supports DDE

Tool Technology Publishing
1125 A St., Suite 107
San Rafael, CA 94901
(415) 459-3700
fax: (415) 459-1079
Circle 1341 on Inquiry Card.

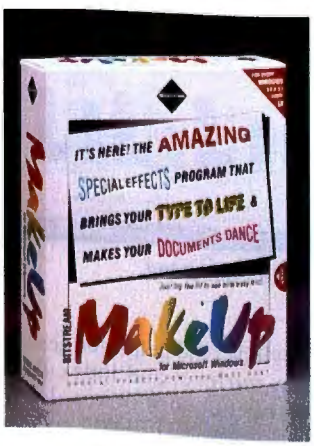
WinTools 1.0 is a shell program and customization system that replaces Windows' Program Manager, Task Manager, and File Manager. The program provides training icons for hierarchical launching, drag-and-drop operation, file system and desktop integration, and customizable network security. WinTools also includes a component called Big Sky that provides 16 virtual screens, each of which may hold a program, and the Image Librarian, which contains more than 100 images. (See "Four Windows Desktops" in this issue, and "Software in a Supporting Role," February BYTE.)

XTree Gold for Windows 1.0, $99

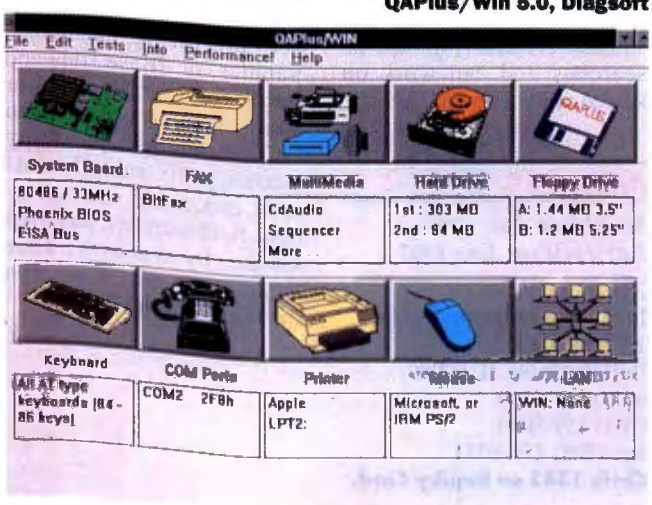
Introduced: June 1992

XTree Co.
4330 Santa Fe Rd.
San Luis Obispo, CA 93401
(805) 541-0604
fax: (805) 541-8053
Circle 1342 on Inquiry Card.

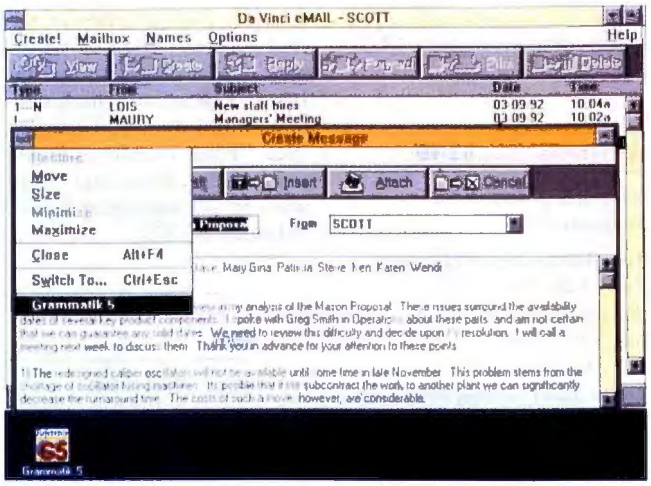
XTree Gold for Windows 1.0 replaces the Windows File Manager and adds a file viewer that supports more than 50 file types. The software provides windows that automatically



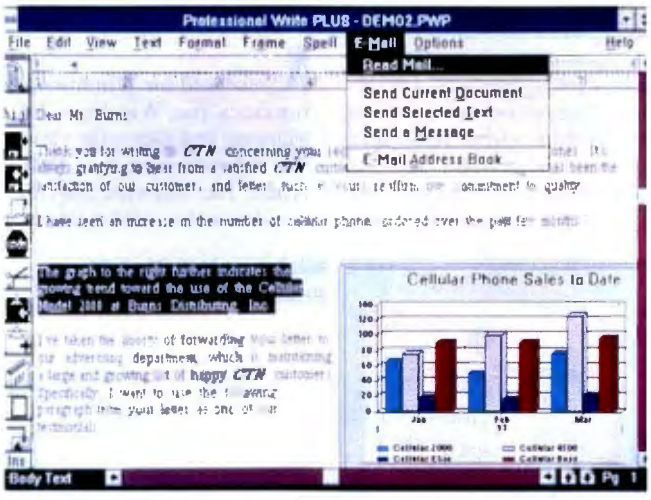
Bitstream MakeUp 1.01, Bitstream



QAPlus/Win 5.0, Diagsoft



Grammatik 5 for Windows, Reference Software International



Professional Write Plus 1.0, Software Publishing

resize themselves to prevent overlapping and a drag-and-drop interface that simplifies the creation of compressed PKZip files. XTree Gold for Windows stores the directory structure in memory for fast file searches and can work on shared volumes on a LAN.

ZyIndex 5.0, $395

Introduced: June 1991
Latest release: June 1992

ZyLab, a division of Information Dimensions, Inc.
100 Lexington Dr.
Buffalo Grove, IL 60089
(800) 544-6339
(708) 459-8000
fax: (708) 459-8054
Circle 1343 on Inquiry Card.

ZyIndex 5.0 helps you search for, retrieve, and index files across network drives, local hard drives, CD-ROMs, and removable media. You can view word processing documents, graphics, or dBase files and search for a single word or phrase. ZyIndex also lets you use Boolean logic, proximity searches, prefix and suffix wild cards, conceptual searches by topic, field searches, and even searches by synonyms. (See "Searching for Common Threads," June BYTE.)

WORD PROCESSING/ WRITING TOOLS

Ami Pro 3.0, $495

Introduced: March 1989
Latest release: July 1992
Supports DDE and OLE

Lotus Development Corp.
Word Processing Division
1000 Abernathy Rd. NE
Building 400, Suite 1700
Atlanta, GA 30328
(800) 831-9679
(404) 391-0011
fax: (404) 698-7653
Circle 1344 on Inquiry Card.

A WYSIWYG word processor with graphics and page-layout capabilities, Ami Pro 3.0 features fast formatting, a document viewer, image enhancement, drag-and-drop operation, smart icons, a macro language, the SmartMerge mail-merge tool, and envelope and label printing. Ami Pro 3.0 comes bundled with the Adobe Type Manager font management program, and it supports Windows MDI (multiple document interface). (See "Writing in Style," June BYTE.)

DeScribe Word Processor 3.0, $495

Introduced: Oct. 1991
Supports DDE

DeScribe, Inc.
4047 North Freeway Blvd.
Sacramento, CA 95834
(916) 646-1111
fax: (916) 923-3447
Circle 1345 on Inquiry Card.

The DeScribe Word Processor 3.0 combines WYSIWYG word processing, drawing, and desktop publishing tools. You can control fonts, point size, leading, and kerning on-screen and zoom from 10 percent to 500 percent. Text tools and a graphics ruler instantly reformat copy, and built-in drawing tools simplify incorporating and modifying graphics, charts, and logos. Additional features include tables, sorting, mail merge, indexing, and the ability to undo multiple operations. (See "Writing in Style," June BYTE.)

Grammatik 5 for Windows, $99

Introduced: June 1986
Latest release: April 1992

Reference Software International
330 Townsend St., Suite 123
San Francisco, CA 94107
(800) 872-9933
(415) 541-0222
fax: (415) 541-0509
Circle 1346 on Inquiry Card.

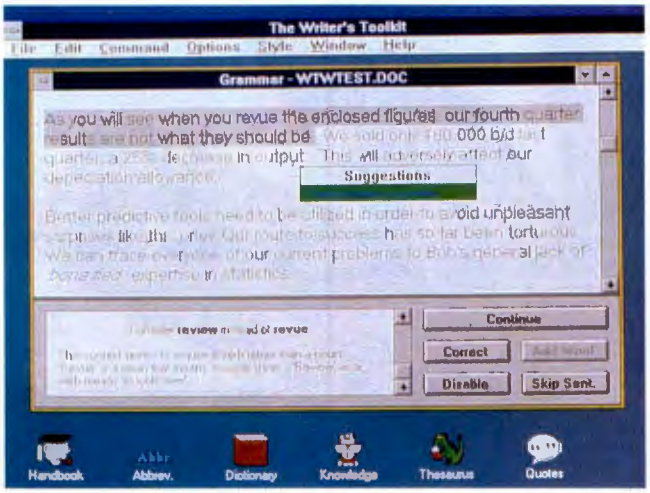
With Grammatik 5 for Windows, you can proofread text in any Windows word processing document via the Clipboard. The software detects errors in grammar, style, usage, punctuation, and spelling; explains the problem; and makes suggestions for changes where appropriate. Grammatik 5 for Windows analyzes and compares documents for readability, and you can train it to recognize different styles. (See "Can a Grammar and Style Checker Improve Your Writing?," August 1991 BYTE.)

Lotus Write 2.0 for Windows, $199

Introduced: Feb. 1992
Supports DDE and OLE

Lotus Development Corp.
Word Processing Division
1000 Abernathy Rd. NE
Building 400, Suite 1700
Atlanta, GA 30328
(800) 831-9679
(404) 391-0011
fax: (404) 698-7653
Circle 1347 on Inquiry Card.

Actually a trimmed-down version of Ami Pro, Lotus Write 2.0 for Windows is an entry-level WYSIWYG word processor with features such as



The Writer's Toolkit for Windows 2.0, Systems Compatibility

smart icons, a thesaurus, a 130,000-word spelling checker, an outliner, automatic bullets, mail-merge notes and footnotes, and interactive dialog boxes. The software also includes tools for creating frame shadows and rounded corners, the ATM font manager, and support for the Windows MDI. (See "Looking Good for Less.")

Microsoft Word for Windows 2.0, $495

Introduced: Dec. 1989
Latest release: Oct. 1991
Supports DDE and OLE

Microsoft Corp.
1 Microsoft Way
Redmond, WA 98052
(800) 426-9400
(206) 882-8080
fax: (206) 936-7329
Circle 1348 on Inquiry Card.

Microsoft Word for Windows 2.0 is a kitchen-sink WYSIWYG word processor with page-layout capabilities that let you easily create columns, borders and shading, drawings, charts, and tables. Features include drag-and-drop text, an outliner, drawing and graphing tools, an envelope generator, a print-merge function, bullets, a grammar checker, a dictionary, an equation editor, and a graphical file finder. (See "Writing in Style," June BYTE.)

Professional Write Plus 1.0, $249

Introduced: March 1991
Supports DDE

Software Publishing Corp.
3165 Kifer Rd.
Santa Clara, CA 95051
(408) 986-8000
Circle 1349 on Inquiry Card.

A WYSIWYG word processor, Professional Write Plus 1.0 includes page-layout functions, a customizable icon bar, predefined document templates, an E-mail front end that works with any MHS (message handling service)–compatible E-mail system, the Grammatik for Windows grammar checker, a thesaurus, and a spelling checker. (See "Looking Good for Less" in this issue, and "Writing in Style," June BYTE.)

RightWriter for Windows, $99.95

Introduced: Nov. 1991
Supports DDE

Que Software
11711 North College Ave.
Carmel, IN 46032
(800) 992-0244
(317) 573-2500
fax: (317) 573-2655
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The RightWriter for Windows grammar and style checker proofreads your Windows documents for grammar, style, usage, and punctuation errors by way of the Clipboard. It also reads most word processor file formats, including the RTF (Rich Text File) format. When you run RightWriter against selected text, it automatically reanalyzes updated sentences as you make changes. (See "Can a Grammar and Style Checker Improve Your Writing?," August 1991 BYTE.)

The Writer's Toolkit for Windows 2.0, $129

Introduced: Nov. 1991
Latest release: Feb. 1992
Supports DDE

Systems Compatibility Corp.
401 North Wabash Ave.,
Suite 600
Chicago, IL 60611
(800) 333-1395
(312) 329-0700
fax: (312) 670-0820
Circle 1351 on Inquiry Card.

The Writer's Toolkit for Windows 2.0 is a complete resource for writers. This comprehensive word processor companion offers the Houghton-Mifflin CorrecText Grammar and Style Checker, the American Heritage Electronic Dictionary, the Concise Columbia Dictionary of Quotations, Roget's II Electronic Thesaurus, the Houghton-Mifflin Abbreviation Program, The Written Word III—Principles of Grammar and Style, and The Dictionary of Common Knowledge.

WordPerfect 5.1 for Windows, $495

Introduced: Nov. 1991
Latest release: May 1992
Supports DDE

WordPerfect Corp.
1555 North Technology Way
Orem, Utah 84057
(800) 451-5151
(801) 225-5000
fax: (801) 228-5077
Circle 1352 on Inquiry Card.

The Windows version of WordPerfect 5.1 combines page-layout, graphics, and text capabilities. The package includes a customizable button bar, an equation editor, a spelling checker, a thesaurus, and a file manager/viewer. WordPerfect 5.1 for Windows also features drag-and-drop operation, macros, and file compatibility with the DOS version of WordPerfect. (See "WordPerfect for Windows," March BYTE.)

WordStar for Windows 1.5, $119

Introduced: Sept. 1991
Latest release: June 1992
Supports DDE and OLE

WordStar International, Inc.
201 Alameda Del Prado
Novato, CA 94949
(800) 227-5609
(415) 382-8000
fax: (415) 883-1629
Circle 1353 on Inquiry Card.

A high-end WYSIWYG word processor with desktop publishing functions, WordStar for Windows 1.5 includes features such as a button bar and toolbox with drawing tools; drag-and-drop operation; table generation; predefined page-layout templates; 14 graphics file filters; and an on-line interactive tutorial. The word processor comes bundled with Correct Grammar 2.0 (a grammar, spelling, and style checker) and the Correct Writing for Windows style guide. (See "Writing in Style," June BYTE.) ■

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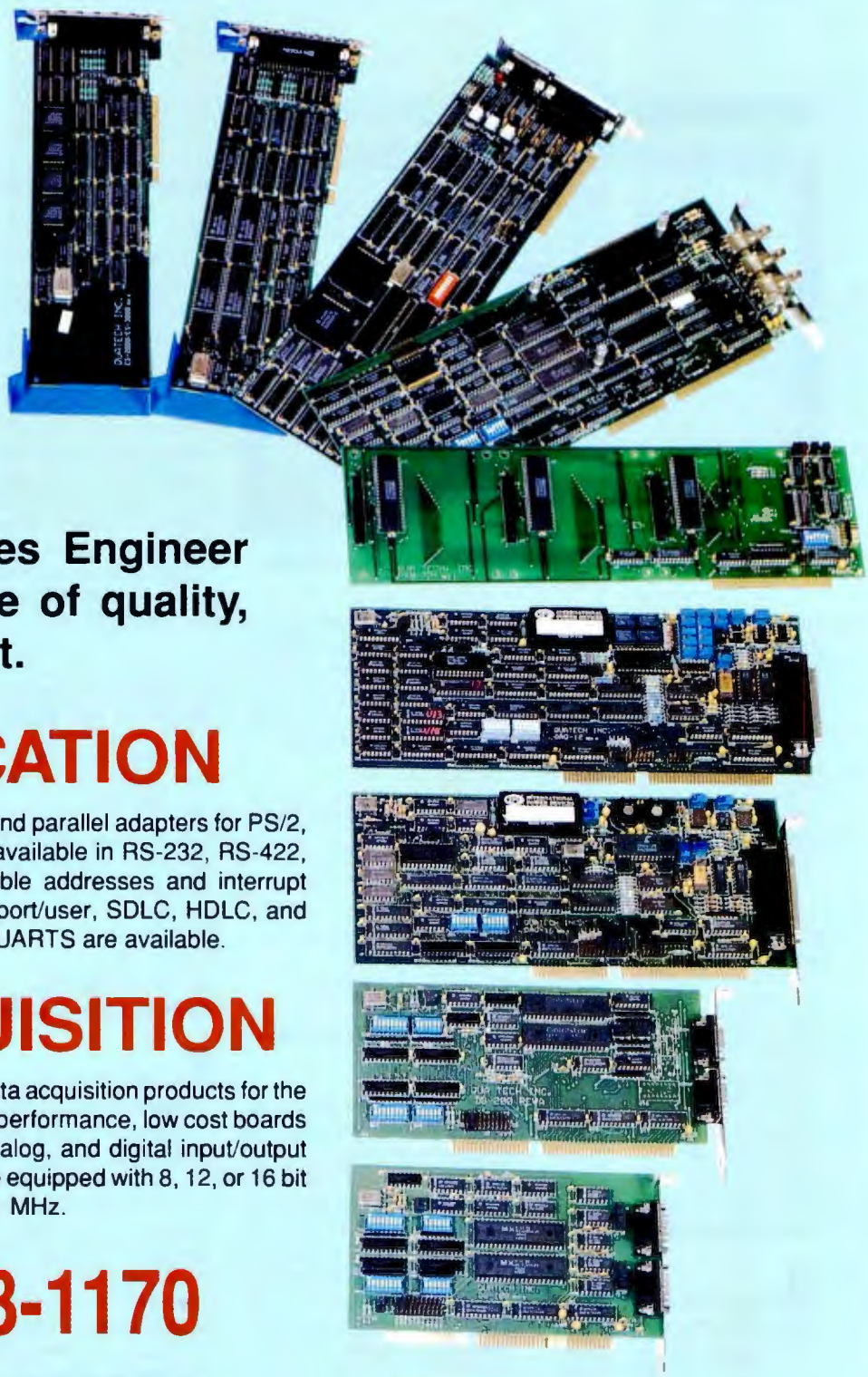

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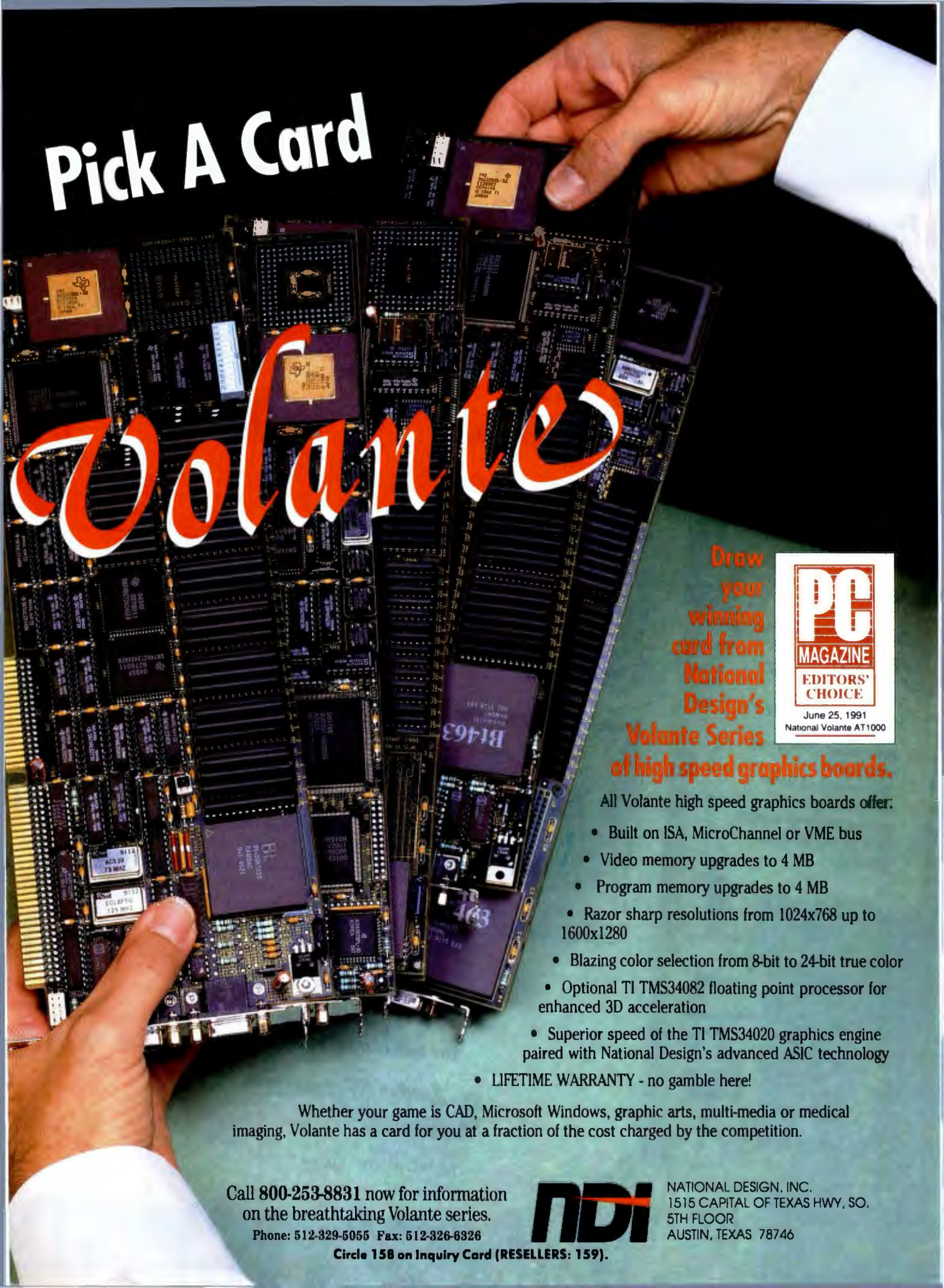

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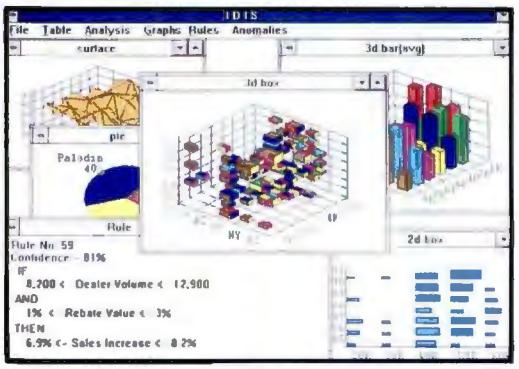

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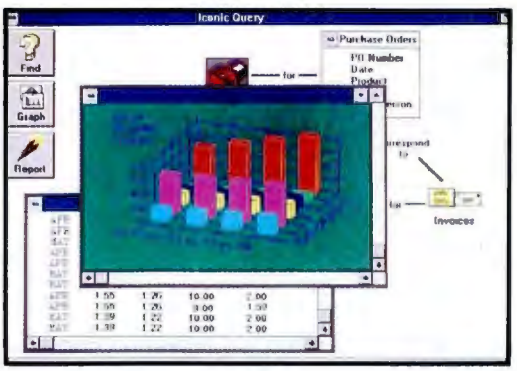

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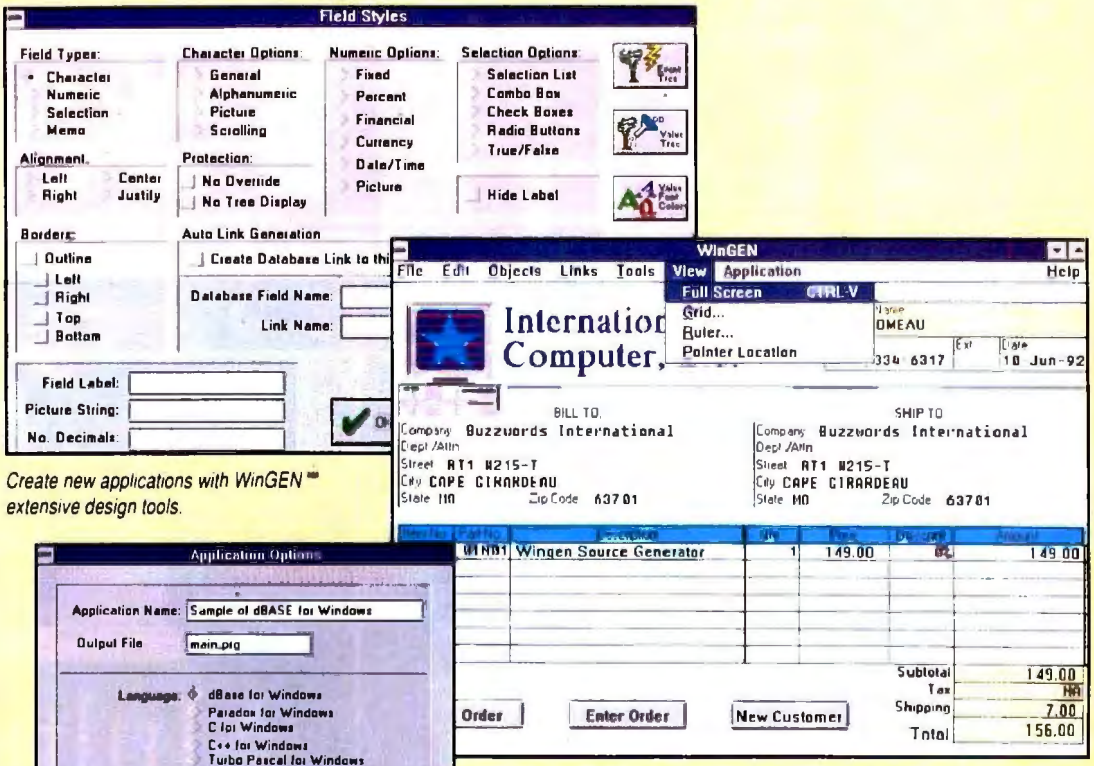

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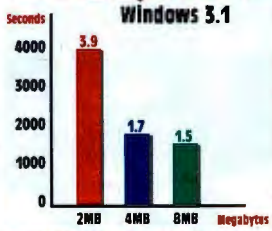

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- Reduces your system's need to access the hard disk
- Speeds up programs which use virtual memory
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*This graph displays the amount of time it takes to run one specific Windows application with the indicated amount of memory.

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PS/2 70-A21; A61; B21; B61
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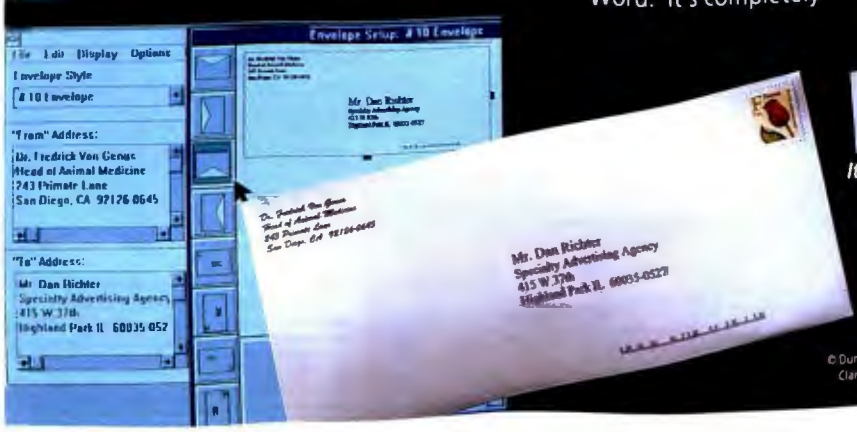

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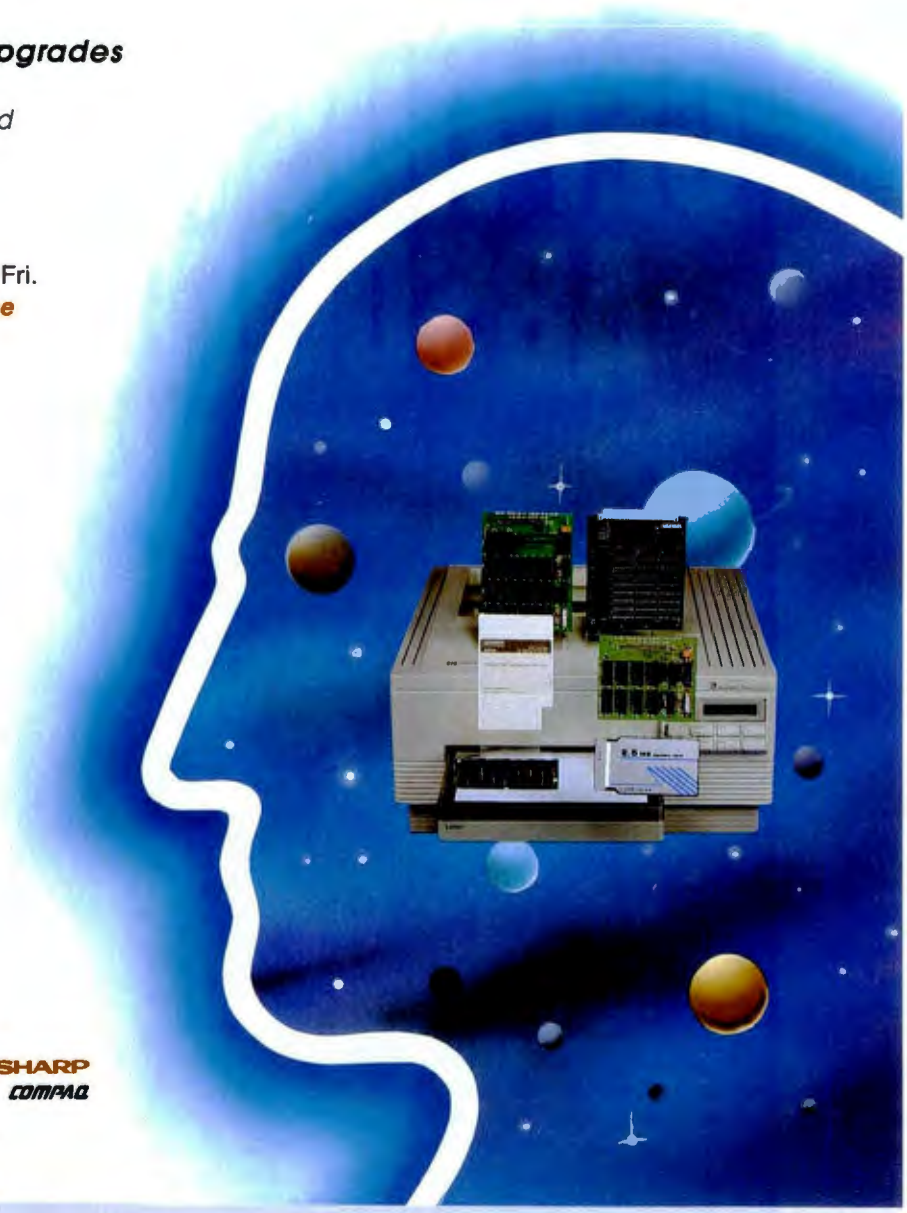

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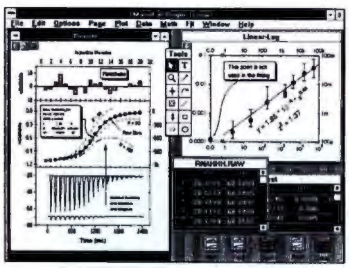

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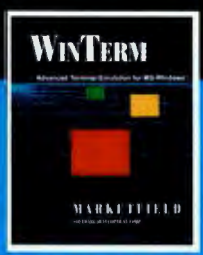

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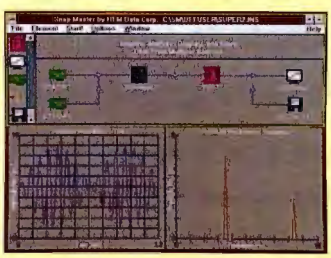

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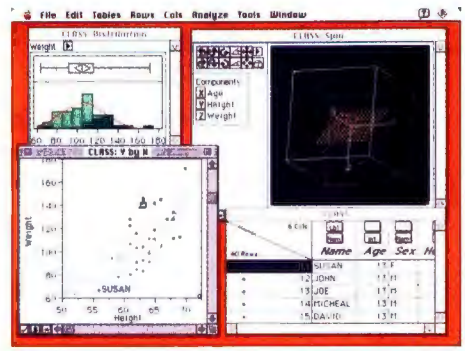

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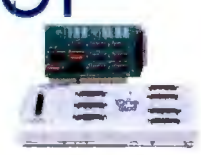

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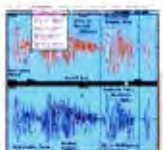

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City Country Code

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2 ❑ Programmer/Systems Analyst
3 ❑ Administration/Management
4 ❑ Sales/Marketing
5 ❑ Engineer/Scientist
6 ❑ Other

B. What is your level of management responsibility?
7 ❑ Senior-level 9 ❑ Professional
8 ❑ Middle-level

C. Are you a reseller (VAR, VAD, Dealer, Consultant)?
10 ❑ Yes 11 ❑ No

D. What operating systems are you currently using? (Check all that apply)
12 ❑ PC/MS-DOS 15 ❑ Unix
13 ❑ DOS + Windows 16 ❑ MacOS
14 ❑ OS/2 17 ❑ VAX/VMS

E. For how many people do you influence the purchase of hardware or software?
18 ❑ 1-25 20 ❑ 51-99
19 ❑ 26-50 21 ❑ 100 or more

Windows 1992 90 96 99

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Accessories/Supplies	1
Add-in Boards	2
Bar Coding	3
Communications/Networking	4
Computer Systems	5
Data Acquisition	6
Disks & Optical Drives	7
Diskettes/Duplicators	8
Fax Boards/Machines	9
Graphics Tablets/Mice/ Pen Input	10
Keyboards	11
LAN Hardware	12
Laptops & Notebooks	13
Mail Order	14
Memory/Chips/Upgrades	15
Miscellaneous Hardware	16
Modems/Multiplexors	17
Monitors & Terminals	18
Multimedia	19
Printers/Plotters	20
Programmable Hardware	21
Scanners/OCR/Digitizers	22
Tape Drives	23
UPS	24

Software

Business	25
CAD/CAM	26
Communications/Networking	27
Data Acquisition	28
Database	29
Educational	30
Engineering/Scientific	31
Entertainment	32
Graphics	33
Macintosh	34
Mail Order	35
Mathematical/Statistical	36
Miscellaneous Software	37
On-Line Services	38
Operating Systems	39
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59	85	111	137	163	189	215
60	86	112	138	164	190	216
61	87	113	139	165	191	217
62	88	114	140	166	192	218
63	89	115	141	167	193	219
64	90	116	142	168	194	220
65	91	117	143	169	195	221
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68	94	120	146	172	198	224
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235	260	285	310	335	360	385
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242	267	292	317	342	367	392
243	268	293	318	343	368	393
244	269	294	319	344	369	394
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250	275	300	325	350	375	400
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254	279	304	329	354	379	404
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414	440	466	492	518	544	570
415	441	467	493	519	545	571
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418	444	470	496	522	548	574
419	445	471	497	523	549	575
420	446	472	498	524	550	576
421	447	473	499	525	551	577
422	448	474	500	526	552	578
423	449	475	501	527	553	579
424	450	476	502	528	554	580
425	451	477	503	529	555	581
426	452	478	504	530	556	582
427	453	479	505	531	557	583
428	454	480	506	532	558	584
429	455	481	507	533	559	585
430	456	482	508	534	560	586
431	457	483	509	535	561	587
432	458	484	510	536	562	588
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595	620	645	670	695	720	745
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597	622	647	672	697	722	747
598	623	648	673	698	723	748
599	624	649	674	699	724	749
600	625	650	675	700	725	750
601	626	651	676	701	726	751
602	627	652	677	702	727	752
603	628	653	678	703	728	753
604	629	654	679	704	729	754
605	630	655	680	705	730	755
606	631	656	681	706	731	756
607	632	657	682	707	732	757
608	633	658	683	708	733	758
609	634	659	684	709	734	759
610	635	660	685	710	735	760
611	636	661	686	711	736	761
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769	795	821	847	873	899	925
770	796	822	848	874	900	926
771	797	823	849	875	901	927
772	798	824	850	876	902	928
773	799	825	851	877	903	929
774	800	826	852	878	904	930
775	801	827	853	879	905	931
776	802	828	854	880	906	932
777	803	829	855	881	907	933
778	804	830	856	882	908	934
779	805	831	857	883	909	935
780	806	832	858	884	910	936
781	807	833	859	885	911	937
782	808	834	860	886	912	938
783	809	835	861	887	913	939
784	810	836	862	888	914	940
785	811	837	863	889	915	941
786	812	838	864	890	916	942
787	813	839	865	891	917	943
788	814	840	866	892	918	944
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948	973	998	1023	1048	1073	1098
949	974	999	1024	1049	1074	1099
950	975	1000	1025	1050	1075	1100
951	976	1001	1026	1051	1076	1101
952	977	1002	1027	1052	1077	1102
953	978	1003	1028	1053	1078	1103
954	979	1004	1029	1054	1079	1104
955	980	1005	1030	1055	1080	1105
956	981	1006	1031	1056	1081	1106
957	982	1007	1032	1057	1082	1107
958	983	1008	1033	1058	1083	1108
959	984	1009	1034	1059	1084	1109
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966	991	1016	1041	1066	1091	1116
967	992	1017	1042	1067	1092	1117
968	993	1018	1043	1068	1093	1118
969	994	1019	1044	1069	1094	1119
970	995	1020	1045	1070	1095	1120
971	996	1021	1046	1071	1096	1121
972	997	1022	1047	1072	1097	1122

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1123	1149	1175	1201	1227	1253	1279
1124	1150	1176	1202	1228	1254	1280
1125	1151	1177	1203	1229	1255	1281
1126	1152	1178	1204	1230	1256	1282
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1128	1154	1180	1206	1232	1258	1284
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1131	1157	1183	1209	1235	1261	1287
1132	1158	1184	1210	1236	1262	1288
1133	1159	1185	1211	1237	1263	1289
1134	1160	1186	1212	1238	1264	1290
1135	1161	1187	1213	1239	1265	1291
1136	1162	1188	1214	1240	1266	1292
1137	1163	1189	1215	1241	1267	1293
1138	1164	1190	1216	1242	1268	1294
1139	1165	1191	1217	1243	1269	1295
1140	1166	1192	1218	1244	1270	1296
1141	1167	1193	1219	1245	1271	1297
1142	1168	1194	1220	1246	1272	1298
1143	1169	1195	1221	1247	1273	1299
1144	1170	1196	1222	1248	1274	1300
1145	1171	1197	1223	1249	1275	1301
1146	1172	1198	1224	1250	1276	1302
1147	1173	1199	1225	1251	1277	1303
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1306	1331	1356	1381	1406	1431	1456
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1308	1333	1358	1383	1408	1433	1458
1309	1334	1359	1384	1409	1434	1459
1310	1335	1360	1385	1410	1435	1460
1311	1336	1361	1386	1411	1436	1461
1312	1337	1362	1387	1412	1437	1462
1313	1338	1363	1388	1413	1438	1463
1314	1339	1364	1389	1414	1439	1464
1315	1340	1365	1390	1415	1440	1465
1316	1341	1366	1391	1416	1441	1466
1317	1342	1367	1392	1417	1442	1467
1318	1343	1368	1393	1418	1443	1468
1319	1344	1369	1394	1419	1444	1469
1320	1345	1370	1395	1420	1445	1470
1321	1346	1371	1396	1421	1446	1471
1322	1347	1372	1397	1422	1447	1472
1323	1348	1373	1398	1423	1448	1473
1324	1349	1374	1399	1424	1449	1474
1325	1350	1375	1400	1425	1450	1475
1326	1351	1376	1401	1426	1451	1476
1327	1352	1377	1402	1427	1452	1477
1328	1353	1378	1403	1428	1453	1478
1329	1354	1379	1404	1429	1454	1479

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True 3-D Consolidation	Y	N	Y
EASE OF USE			
Right Mouse Button Formatting	Y	Y	N
Object Inspectors	Y	N	N
Context-sensitive SpeedBars	Y	Y	Y
SpeedFill and SpeedFormat	Y	Y	Y*
Drag and Drop	Y	Y	N
GRAPHICS AND PRESENTATIONS			
3-D Graphs	Y	Y	N
Slide Show with Light Table	Y	N	N
Live Linked Graph Types and Formatting in Slide Shows	Y	N	N
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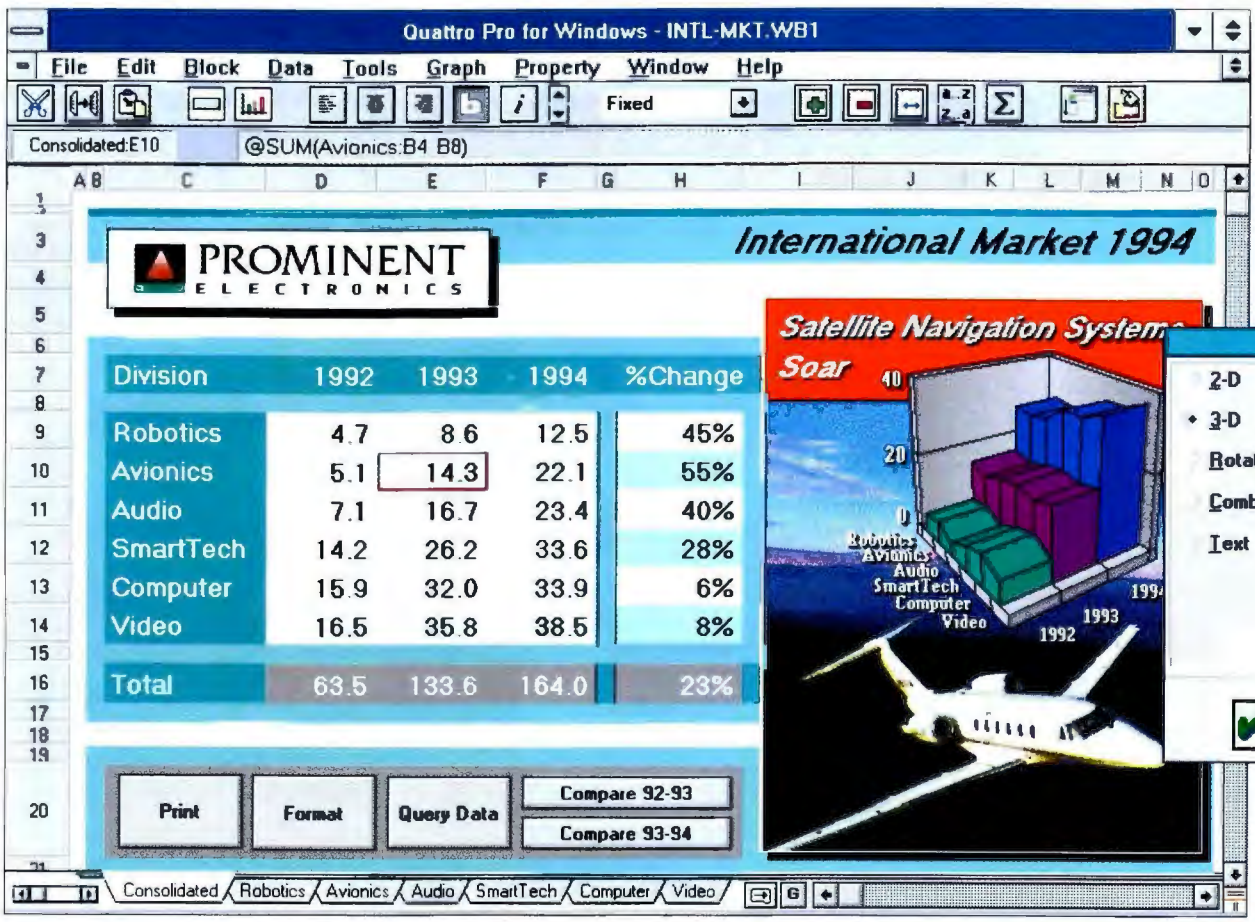
COMPATIBILITY			
Reads Quattro Pro, Excel, 1-2-3 Files and Styles (including Allways & Impress)	Y	N	N
Runs Your QPro & 1-2-3 Macros†	Y	N	N
ANALYSIS			
Optimizer	Y	Y	Y

*Requires add-in.

†Some 1-2-3 macros may require modification.

Quattro Pro f
the most usable s



Quattro Pro for Windows *the most usable spreadsheet ever made. Built with Borland's renowned object-oriented technology, Quattro® Pro for Windows is packed with hot new features you won't find in any other spreadsheet.*

NEW! Spreadsheet Notebooks with customizable Tabs are nothing less than a revolution in spreadsheet ease of use. Now you can intuitively organize and manage your spreadsheet data.

NEW! Object Inspector™ menus end the hassle of searching through menus. They're simpler than 1-2-3. Just click the right mouse button anywhere on the screen to get a list of what you can change and change it right there.

NEW! Database Desktop™ is the easiest way to incorporate dBASE® and Paradox® data into your spreadsheet. Just what you'd expect from Borland, the leader in database technology.

NEW! SpeedFill™ and SpeedFormat™ slash setup time by automatically filling in spreadsheet headings and formats.

NEW! SpeedBars™ are context-sensitive and customizable. SpeedBar icons give you pushbutton access to your most frequently used commands.

NEW! Presentation Graphics and drawing tools that rival those of Freelance and Harvard Graphics are built-in. You don't need to buy a separate graphics package.

YES! Compatible with Lotus 1-2-3 files, macros, and publishing styles and with Excel .XLS files.

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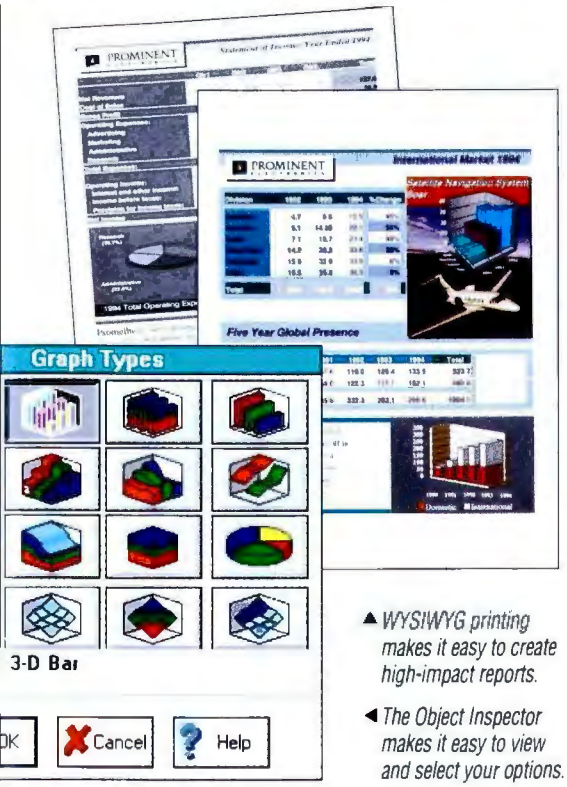

▲ *WYSIWYG printing makes it easy to create high-impact reports.*

◀ *The Object Inspector makes it easy to view and select your options.*

...is also the most powerful

OBJECT INSPECTOR
The Right Choice

Never before has so much spreadsheet power also meant this much user productivity. Spreadsheet Notebooks and Object Inspector menus are breakthrough concepts that make it easy to tap the awesome functionality of Quattro Pro.

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Quattro Pro for Windows is the most advanced, yet easiest-to-use spreadsheet ever created for the personal computer. Thanks to the use of new object-oriented technology, Borland has radically simplified the use of the world's most feature-rich spreadsheet. With Quattro Pro for Windows you get your work done faster because you work visually. Simple point-and-click operations are all that's needed to complete any spreadsheet task—from building your spreadsheet to creating dazzling graphical reports.

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QUATTRO PRO

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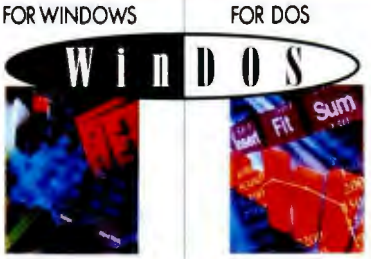

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Quattro Pro for DOS has won more awards for excellence than any spreadsheet in history. Its unique combination of pushbutton spreadsheet power and Intelligent Graphs has already made millions of users switch to Quattro Pro.

Outstanding Lotus 1-2-3 compatibility

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