

A PENTON PUBLICATION

AUGUST 1991

# Electronics

FIRST MAGAZINE OF GLOBAL ELECTRONICS MANAGEMENT

A man in a dark suit, white shirt, and red tie is shown in profile, pointing his right hand towards a computer monitor. The background is a dark, abstract, colorful pattern of lines and dots, suggesting a digital or data environment.

## THE BATTLE FOR THE SOFTWARE VENDOR

PAGE 44





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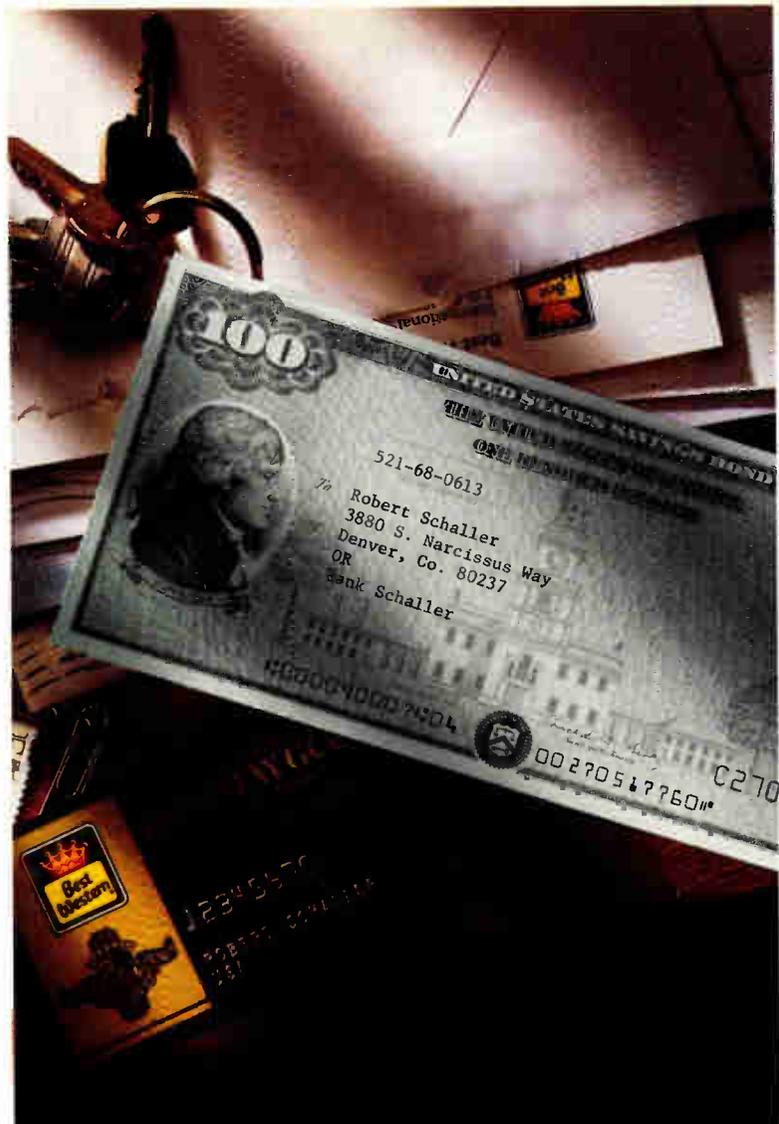
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**CIRCLE 207**

World Radio History



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# Electronics

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# JUSTICE DELAYED AND DENIED

**T**oday's battle over intellectual-property rights has all the contentiousness of 19th-century battles over land. Instead of hired guns facing one another across a line drawn in the dirt, well-groomed lawyers eye each other in an open courtroom. But many property owners believe they are being done in by this form of redress and are beginning to demand relief [*Electronics*, February 1991, p. 51]. Michael C. Maibach, director of government affairs at Intel Corp. and an announced candidate for the U.S. House of Representatives seat from California's 14th district, says that intellectual-property owners face formidable foes who have time on their side. The volume of lawsuits going through U.S. District Courts delays speedy resolution by years, a large part of the life cycle of many high-tech products. An owner's complaint is that violators unlawfully use intellectual property for years before a court hands down a ruling that directs them to stop and to compensate the injured party. Meanwhile the violator can charge a lower price for products based on the property while the owner—to stay afloat in the market—must eat the costs of expensive R&D and meet the violator's price.

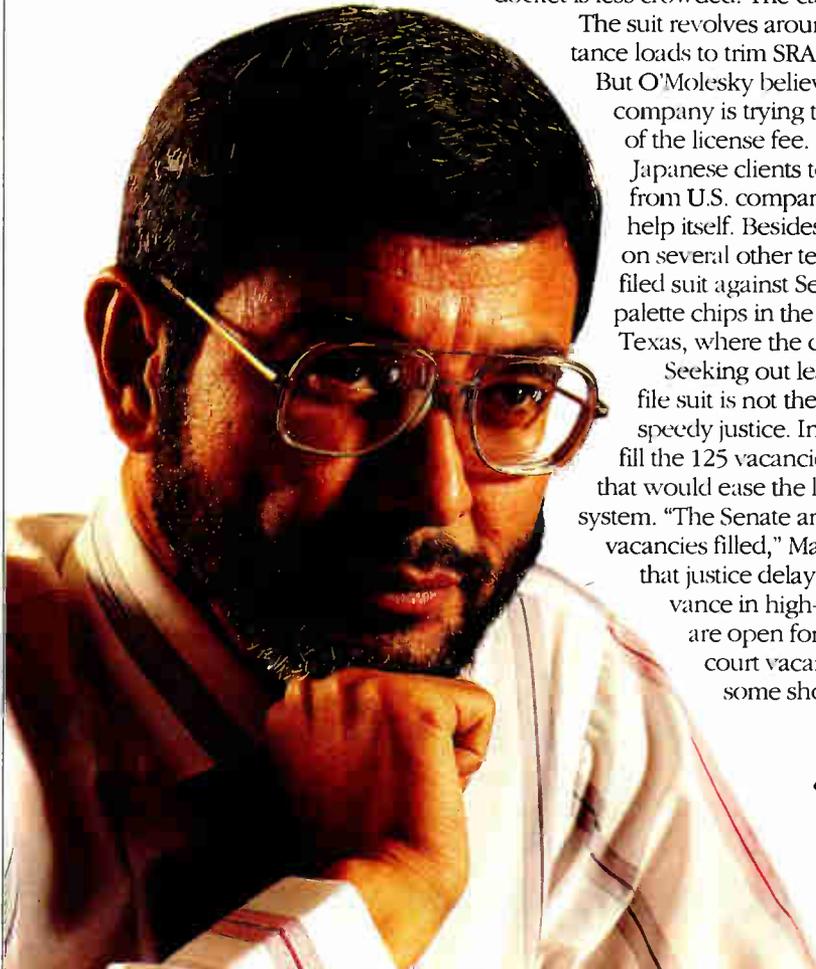
There is no more glaring example than the recent spate of suits and countersuits between SGS-Thomson Microelectronics Inc. of Carrollton, Texas, and Seiko Epson Corp., Epson America Inc., and SMOS Systems Inc. over SRAM patents. "We have signed 15 out of the top 20 semiconductor makers as licensees" for this technology, says Mark O'Molesky, vice president of business development at SGS-Thomson, "and we were negotiating a license with Seiko. Then, out of the blue, Seiko filed suit in San Francisco U.S. District Court asking for a declaratory judgment to determine if they were infringing SGS patents." In effect, Seiko was asking the courts to determine if it had to pay for a license. Seiko chose district court in San Francisco because its heavy docket could mean a four-to-five-year wait until the case was heard. SGS-Thomson got a change of venue to district court in Dallas-Fort Worth, where the docket is less crowded. The case will be heard in February 1993.

The suit revolves around four patents involving poly-resistance loads to trim SRAM cell size from six transistors to four.

But O'Molesky believes the real motive is that the Japanese company is trying to coerce SGS-Thomson to cut the price of the license fee. American law firms are advising

Japanese clients to sue first to extract better settlements from U.S. companies. SGS-Thomson has taken a step to help itself. Besides SRAMs, Seiko was negotiating licenses on several other technologies SGS-Thomson owns. It has filed suit against Seiko for violations of patents on color-palette chips in the federal court in Midland-Odessa, Texas, where the docket is even shorter than in Dallas.

Seeking out less crowded federal courts in which to file suit is not the solution to the basic problem of speedy justice. Intel's Maibach believes one remedy is to fill the 125 vacancies in district courts nationwide, a move that would ease the logjam of lawsuits now clogging the system. "The Senate and Justice Department need to get these vacancies filled," Maibach says. We agree. The old axiom that justice delayed is justice denied has particular relevance in high-tech industries where market windows are open for only a couple of years at most. Filling court vacancies would be one way to provide some short-term relief. □



*Jonah McLeod*

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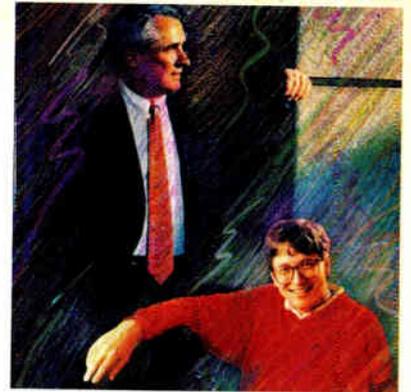
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# Electronics

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**Executive Briefing: Anatomy of "coopetition"**  
 HP's 95LX palmtop computer is the fruit of a remarkable partnership among erstwhile rivals, and may signal a new paradigm for the way complex product development is handled.

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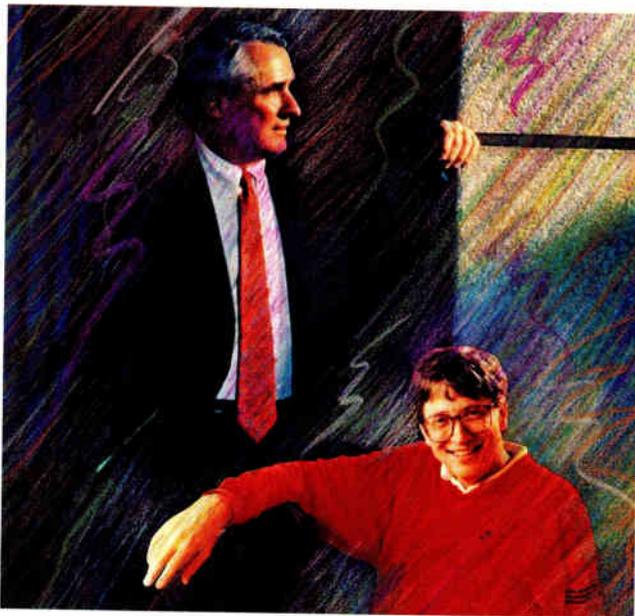
**In Europe, DOS leads but OS/2 is gaining**  
 Computer vendors are hoping the two operating systems will one day merge; "a fragmentation of the OS market will only hurt the [PC] industry," says a German executive.

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**COVER: FRIEND OR FOE?**  
**Life on the front lines of the great OS war**  
 Microsoft has laid down the gauntlet to IBM as the two giants in their fields do their best to woo independent software vendors to their dueling, next-generation operating systems.



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**The PC war may spur a showdown in LANs**  
 If Microsoft is right, the desktop OS winner could impact network operating systems as well—but don't tell that to competitor Novell.



Jesse H. Neal  
 Editorial Achievement Awards

1956 Merit, 1965 First  
 1975 Merit, 1976 Merit  
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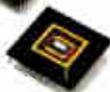
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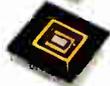
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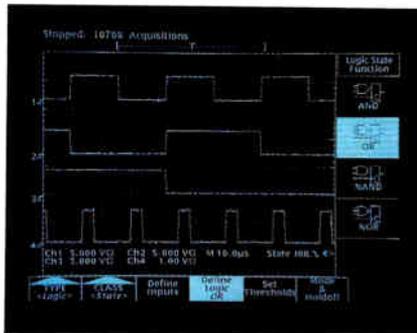
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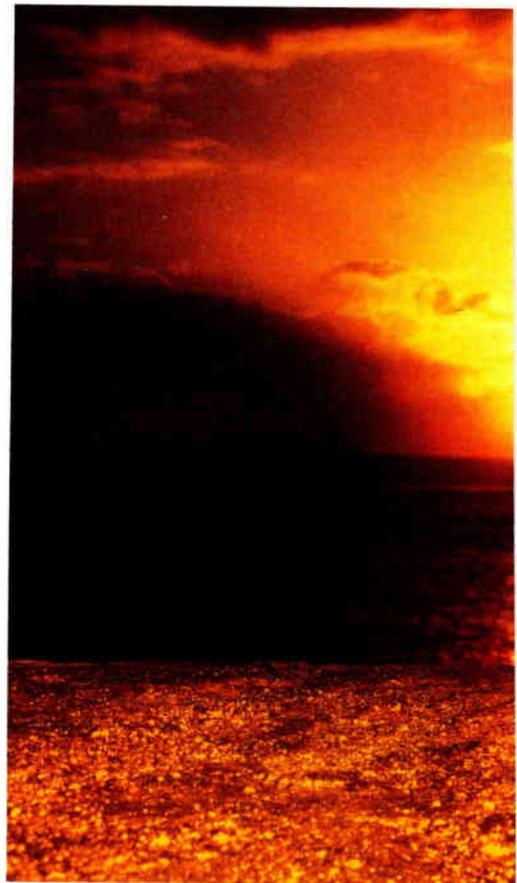
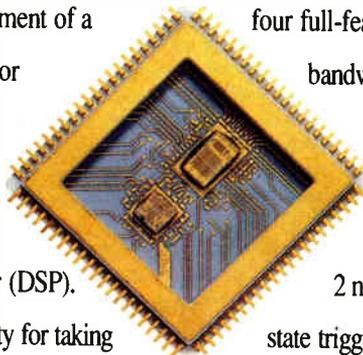
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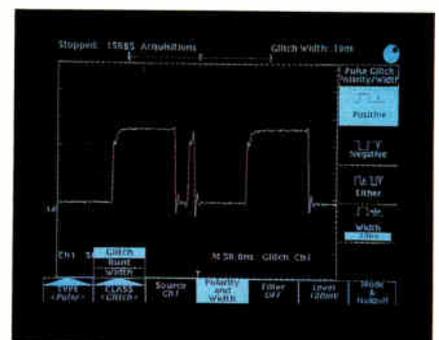
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CIRCLE 176

# DENMARK

## WORKERS ARE WELL EDUCATED, AND ALMOST ALL SPEAK ENGLISH A COUNTRY WHERE EVERYTHING WORKS

BY HOWARD WOLFF

**W**hen executives of electronics manufacturers let it be known that they are shopping for overseas locations, they can depend on at least one thing: a veritable blizzard of literature, videotapes, and marketers from nations east and west. All of them extoll proximity to markets, high-quality infrastructure, and economies of operation; to varying degrees, they're all correct.

But amid all the salesmanship, there are places that seem to have about them an air of quiet competence; they are nations whose people go about their business steadily and confidently year after year. One of these is Denmark.

To the average American, the word "Denmark" conjures up "The Little Mermaid," Hans Christian Andersen, and sleek, spare design. However, the small Scandinavian nation has quietly established among international managers a solid reputation as a nation where everything works.

The list of blue-chip global electronics producers that have established branches in Denmark contains some impressive names. Among them are AMP, Data General, Digital Equipment, Hewlett-Packard, Intel, IBM, Motorola, National, Raytheon, Sony, and Texas Instruments. All told, there are now 250 to 300 U.S. companies in Denmark; General Electric Co., which established itself there before World War II, was the first. The largest is, unsurprisingly, IBM Corp. It builds minicomputers and writes software and manuals; revenue last year was \$1.2 billion with 25% of that coming from exports.

Now the Danish government is aim-

ing its efforts at smaller companies: those with annual sales in a range starting at \$20 million to \$30 million and going up to \$300 million to \$400 million. Such companies would have products that satisfy a need in Europe: they also would have decided to focus on the European Community rather than the Pacific Rim. For them, Denmark would become the ideal assembly and distribution center, a gateway to Scandi-

never considered Denmark the home market; rather, they look to all of Europe as their domestic market."

The result is that 90% of goods manufactured in Denmark is sent elsewhere. Of that, the largest single amount, 20%, goes to Germany (with the newly united Germany, totals for 1991's first quarter are up 25% over last year's period). Following are, in order, the UK, Sweden, France, Spain, and the U.S.

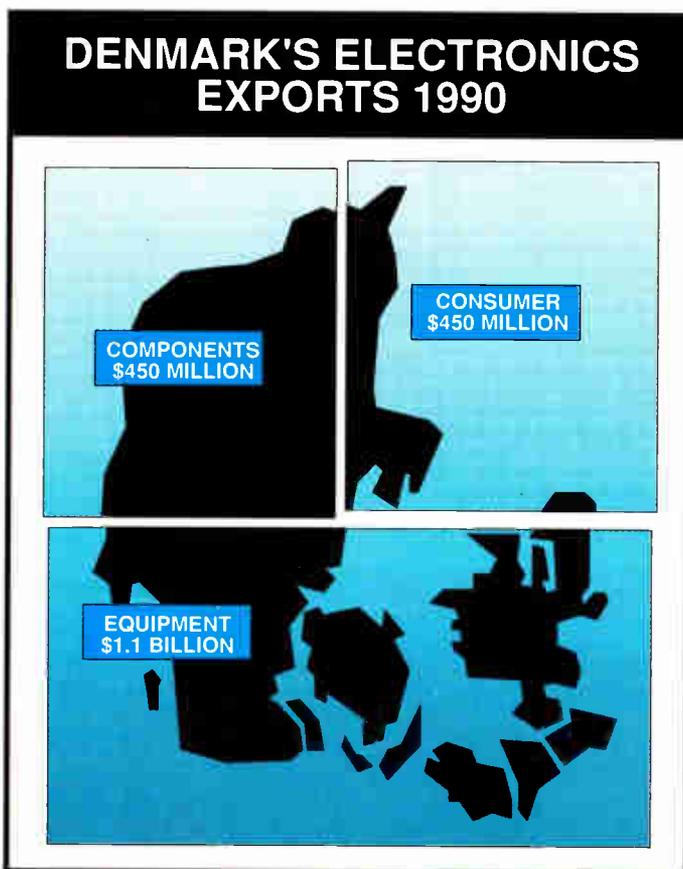
The country offers no financial incentives as such—no tax exemptions or low-interest government loans. "You must be competent from the beginning," says Hoyer. However, "We feel our other advantages more than make up for that," he says.

What are they? Denmark is known as "the country of the thinking worker," where 90% of the population speaks fluent English—"it's our second language," says Hoyer. Moreover, the country has a sound economy, low inflation (2.6%), low communications costs, low corporate taxes (38%), and favorable depreciation schedules.

Hourly wages, normal for a skilled European industrial worker, average \$14 or \$15—but that includes all fringes, which in other places can cost the employer 10% to 15% on top of the salary. Personal

income taxes are high, as are the imposts on cars and cigarettes, and there is a value-added tax. But those levies take care of many government-provided services, such as day care, that must be paid for by individuals in the U.S.

However, Americans engaged in research and living in Denmark are exempt from income tax. In addition, the legislature is considering lowering the



navia, the Baltic area, and Germany.

And that's where Danish officials believe they have an advantage: the Danes are experienced exporters. "Denmark's population is only 5 million [about the same as Massachusetts], so the so-called home market doesn't amount to much," says Niels S. Hoyer, commercial counselor at the Danish consulate in New York. "Actually, Danish manufacturers

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World Radio History

# PENTON CONTINUES COMMITMENT TO RECYCLING



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**Penton Publishing**

tax rate for American executives.

U.S. companies also may maintain dollar accounts in Danish banks; there is no penalty for profits that are repatriated back to America. Similarly, money earned in other nations may be deposited in Danish banks and then sent back to the U.S. without penalty.

Also, for companies that choose to locate in two less-developed areas of Denmark—Aalborg in the north and Lolland in the south—which have been hurt by shipyard closings, EC Industrial Revenue Bonds are available. These are guaranteed by the government.

Still, Denmark has not been immune to the current economic bad news. The banking business in particular has seen some hard times, and last year five banks were merged into two large ones, the better to compete in a unified Europe and to weather the downturn. "There are structural weaknesses in the Danish economy caused by foreign debt and high income tax," acknowledges Hyer. "The public sector is too big; we should strengthen our industrial base."

The general mood in the country is upbeat. "In the 1980s," says Hoyer, "we had a huge foreign debt. But now there is a surplus in the balance of payments. So if you had talked to many Danes in the '80s, you would have detected an underlying pessimism: there was a high unemployment rate. But now the mood is more optimistic. Though raises have been low, the man in the street understands that that's what keeps inflation down. Today's low inflation rate contrasts with conditions in the 1960s and 1970s, when the rate ran 8% to 12% and it was necessary to grant huge raises to keep pace."

**F**or Bernard R. Smedley, senior vice president of Motorola Inc., and general manager of the Radio-Telephone Systems Group, one of Denmark's attractions is its work force. His company acquired the Danish manufacturer Stomo of Copenhagen in 1986 in a move designed to strengthen Motorola's presence in Europe prior to the scheduled unification in 1992.

Smedley says Denmark was selected for the experience and quality of the company's engineers and because of Stomo's involvement in EC research and development programs on mobile radio technology. "The Danish education system turns out very competent engineers and technicians. Work disci-

pline is high here too, and time schedules are critically important in large R&D projects," says Smedley.

At IBM Denmark, assistant general manager John Meldgaard agrees, adding, "In general, Denmark provides superior public services and has well-developed public utilities and communication systems. And education levels are very high," he says.

And now IBM, with bases in Copenhagen, Allerød, and Lynby, will be able to help make those communication systems even better. The company has formed a joint venture with KTAS, the Danish telephone company, to provide domestic subscribers with new telecommunications services.

**O**ther qualities attracted AT&T Co. In 1987, it established in Copenhagen a joint-venture company with Nordiske Kabel-og Traadsfabrikker (NKT), a Danish-based European market leader in the fiber-optic industry. The new company, Lycom, develops, produces, and markets optical fibers, primarily for customers in Europe and the Third World.

Among the reasons AT&T chose to work with NKT is its state-of-the-art production facilities and technology, which match AT&T's.

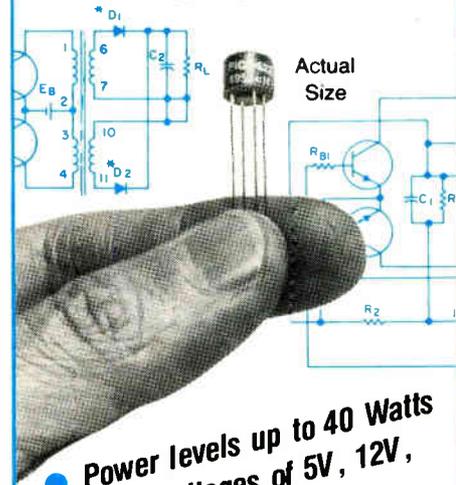
"Denmark is a leading country in optical fibers," says Howard Wells, president and chief executive of Lycom, "with the highest per capita utilization rate in Europe. And Denmark is a member of the EC, but is geographically situated so that we can give the best service to our customers within the Nordic countries as well."

Wells is bullish on life in Denmark. "Also important for us is the high quality of life here—it is easy to have a good social life in Denmark," he says. That almost everyone speaks English makes things easier."

Perhaps summing up best is Kat-suichi Morii, president of Sony Scandinavia in Copenhagen. "Denmark was chosen as the base of our operations in the Nordic area for a variety of reasons," he says. "Logistics, for one thing, are well-developed: there's easy access from here both to our suppliers around Europe and to customers throughout Scandinavia. The high educational level of the Danish work force was a particularly important consideration given the nature of our operations. It's also easy to arrange financing in Denmark." □

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# COMPAQ AND ITS RIVALS ARE READY

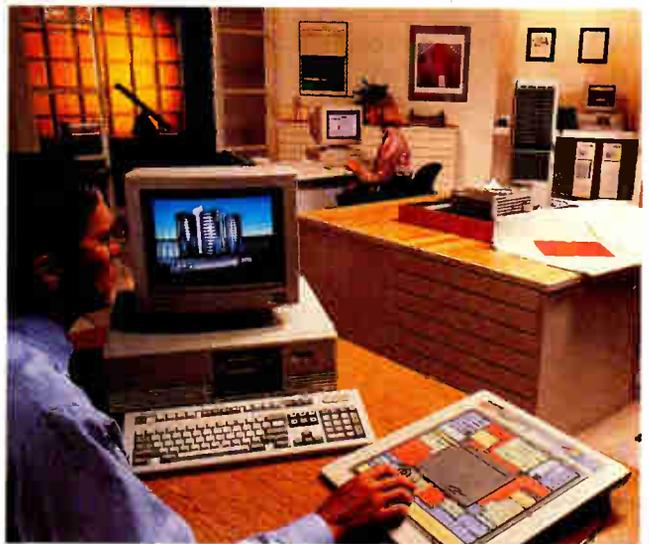
A raft of alert computer vendors was ready and waiting when Intel Corp. of Santa Clara, Calif., introduced the 50-MHz version of the 486 microprocessor. Heading the list was Compaq Computer Corp. of Houston, like the other manufacturers attracted to the chip in question, called the 486 DX, by its blazing speed: it is 50% faster than the 33-MHz version. Intel says the new microprocessor will be in full production in the fourth quarter.

Three models of Compaq's

Deskpro 486/50L using the processor, described by the company as its most powerful PCs to date, are available, with prices beginning at \$11,299.

Compaq was among about a dozen other computer vendors that jumped on the 486/50 bandwagon when Intel unveiled it in late June. The others include Acer America Corp. of San Jose, Calif.; Lightning Computers of San Francisco; and Wang Laboratories Inc. of Lowell, Mass.

Intel says the 486/50 is compatible with major PC



Compaq's new Deskpro 486/50h is the most powerful desktop machine yet from the Houston company.

operating systems, including MS-DOS, OS/2, Windows 3.0, and Unix. It's intended for "power-PC" systems and

servers, used extensively in networks, graphics, and multiprocessing applications. The chip sells for \$665. □

## COMMERCE'S RULING: 'A BULLET IN THE HEAD' FOR LAPTOP VENDORS

The U.S. computer industry will be holding its collective breath until late August, when the International Trade Commission decides whether a stiff antidumping tariff on active-matrix LCDs will or will not be levied. The Commerce Department last month recommended a 63% duty on the screens, a Japanese-made component that observers say will be widely used in coming generations of laptop computers. Now the ITC must rule by Aug. 23 on whether the U.S. flat-panel industry has been injured by the artificially low Japanese prices; if so, the duties will go into effect.

Representatives from Apple, Compaq, IBM, Grid, and Tandy all crowded into the ITC injury hearing in mid-July. Their basic message: if the tariff is levied, "we quite probably will have to move all our portable [computer] manufacturing outside the

U.S.," says William P. Fasig, manager of international and government affairs for Apple Computer Inc. in Washington. "The flat-panel display vendors get nothing out of this," he says. "We get virtually a bullet in the head."

The computer makers have argued since the dumping complaint was first filed that they have no choice but to use Japanese products, because no U.S. vendor is manufacturing production quantities of active-matrix LCDs or the other types of screens named in the suit.

The seven small U.S. display makers that brought the complaint counter that low prices have cornered the market for the Japanese and kept the Americans out. "How can you expect any rational business person to go into the business with that level of dumping going on?" asks James M. Hurd, president and CEO of Planar Sys-

tems Inc. in Beaverton, Ore., one of the complainants. Hurd says the duties would offer "a new lease on life" for the U.S. industry, since more costly Japanese screens would be less attractive.

However, Lawrence Walders, counsel for the Japanese manufacturers, pointed out in his ITC testimony that the big U.S. companies that devised active-matrix LCDs exited the field, leaving the Japanese to bear the R&D burden of bringing the technology to market.

Active-matrix technology is the preferred choice for upcoming laptop and notebook PCs, so a large duty on these products could be crippling for U.S. computer makers. Apple is the only U.S. vendor now using such displays in its portables; most of the current crop rely on passive-matrix LCDs, on which the Commerce ruling proposes no duties. □

## NOW OEMs LOOK UNDER THE HOODS

A new phenomenon is taking hold among computer manufacturers that buy hard-disk drives. These large corporate purchasers are beginning to characterize the production drives received from their suppliers despite the fact that incoming inspections show yields that average 99.8%.

Because drives are a major component on every computer shipped, explains Rich Freedland, president of Helios Corp. of Sunnyvale, Calif., if supply is disrupted, an OEM stands to lose \$1 million to \$5 million a day. By characterizing the drive, the OEM is evaluating the manufacturing process of the supplier. Using a specially configured servo writer from Helios, the OEM can evaluate how well a drive stays on track. □

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## ACE: THE '90s SOLUTION...

**F**rom the broadest perspective, the Advanced Computing Environment (ACE) initiative is about setting a standards framework that encompasses the entire computer industry. In the 1980s, standardization and broad industry support for software and hardware fueled the availability of choices, leading to the explosive growth of the PC market. ACE will establish a foundation for the standardization needed to make advanced networked computing systems the dominant solution of the '90s.

There is little disagreement over the direction of computing solutions that will be required in the future: advanced networks of desktop and server computers; and open, cost-effective multi-vendor systems offering a safe, evolutionary path for long-term planning. Users have told us they want to be able to choose from a variety of hardware and software to increase the flexibility and security of their computing investments. And they want the wide applications availability that comes from a broadly supported standards-based environment. The ACE initiative brought together, for the first time, all the critical elements crucial to accomplishing this total solution.

There's no way one hardware platform and one operating system can meet the entire range of needs of a typical medium or large company. There's also no way a solution that is not standards-based and supported by a broad base of vendors can meet all their needs. To satisfy all these very important customer requirements, the five dozen ACE companies are establishing a standards framework that includes two hardware architectures and two operating systems—with the maximum degree of compatibility, flexibility, and interoperability among systems. The two key ACE elements are:

• **Dual hardware architectures:** In addition to building upon the existing x86-based PC standard for hardware, ACE provides an open-standard speci-

fication for MIPS RISC-based hardware. The ACE initiative is fully open to all computer companies and has standardized on nonproprietary microprocessors that are commercially available to all vendors developing compatible systems and add-on products.

• **Two operating systems:** At the software level, ACE will provide two powerful, advanced, and standardized operating systems, one Unix-based—the Santa Cruz Operation's Open Desktop—and one PC-based, OS/2 3.0, a powerful 32-bit operating system based on Microsoft Corp.'s New Technology foundation. Just as standard PC operating

systems helped foster a wide range of personal productivity applications, we expect these standardized operating systems to attract a large base of applications for mission-critical computing. Open Desktop supports all major Unix standards and incorporates the best available technologies, including the Open Software Foundation's Motif

graphical user interface and Sun Microsystems Inc.'s Network File Sharing System. OS/2 3.0 will support more than 35,000 existing PC applications as well as new 32-bit Windows applications.

Because both of these operating systems are supported by the five dozen ACE companies, there is no doubt that we will see the development of thousands of new applications in addition to the 40,000 existing PC and Unix applications—all running on standard platforms defined by ACE. Products for end users will be available in 1992.

The net result is that customers will have the broadest selection of choices to meet their computing needs. ACE has all the right pieces in place to meet customer needs more effectively than any other available approach. For this reason, I believe that ACE will become the predominant standard in the industry for advanced computing within this decade.—*J. Rod Cannon, president and CEO, Compaq Computer Corp.*



Joseph R. (Rod) Cannon

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# ...OR MIXED-UP CONFUSION?

There is a general belief in the industry that the way to create the next-generation platform and operating-system standards is to form a consortium and declare that a standard has been made. This is what the Advanced Computing Environment is trying to do. But in reality, only the market creates a standard. There are three reasons why initiatives such as ACE have the potential for failure. First, they claim to be standard and open but are neither. Second, they lack a committed evangelist with a deep-seated desire to make the effort a success. Finally, such initiatives lack a well-defined focus. They define a hodgepodge of products that the customer must make sense of.

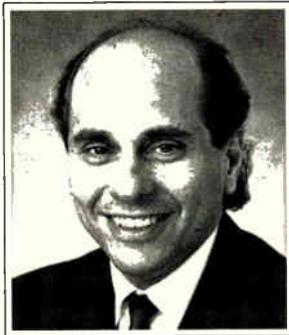
They also have difficulty clearly defining the terms "standard" and "open," thereby creating confusion in the marketplace. A standard is created when purchasers buy a large number of a given product. However, not all standards are open. One prime example is the Apple Macintosh. It is a recognized standard platform, but no one would ever say that the Macintosh is open. Customers must purchase the hardware and software from Apple alone. ACE talks about a standard, yet to date, no product has been purchased by customers or even shipped.

These consortia confuse the market in their claims to be open. Not so. Open means multivendor. It means that all software and hardware application-program interfaces are defined, are free of legal restrictions, and have little or no costs associated with them. With ACE, only the five consortium leaders are privy to the group's specifications. MIPS Computer Systems Inc. controls the hardware and chip specs. All others must pay a steep licensing fee and bind themselves to develop ACE-compliant hardware in order to build a product. That is as proprietary as you can get.

Contrast this with the Sparc/SunOS platform. There are 190 members of

Sparc International with more than 30 companies shipping diverse products. All of this volume supports the SunOS operating system as a standard. At last count, there were over half a million installed Sparc/SunOS systems, making it the third-largest volume platform in the industry and a de facto standard.

In addition, Sparc/SunOS is open and multivendor. Any hardware vendor can acquire the Sparc specifications and build a compatible system. Chips are readily available on the open market from at least seven semiconductor vendors, each designing and developing its own Sparc implementation. No one is



Ed Zander

waiting for Sun Microsystems Inc. to issue a mask set for the next version of the hardware. In addition, SunSoft as well as others market SunOS, independent of Sun Microsystems. Another reason that Sparc has been successful is similar to the reason that IBM, Microsoft, and Intel—and, for that matter, Apple—have been successful in the PC arena. These companies have bet their futures on supporting a standard set of technologies and continuously innovating upon them. It is this lack of a clear commitment by member companies in consortia like ACE that makes it difficult for them to succeed.

Today, ACE endorses two hardware architectures and multiple software architectures. But what customers want is simplicity. Customers and software vendors do not want infinite choices. They want a clear direction on a company's products and business strategy. They want to know that a given technology is the one to which a company will devote its best minds and resources for the delivery of powerful and easy-to-use products. Standards bodies have a place in guiding the standards process in the industry. But there is no reason for the existence of vendor-driven initiatives that serve the needs of consortium members at the expense of the end user.—Ed Zander, president, SunSoft Inc.

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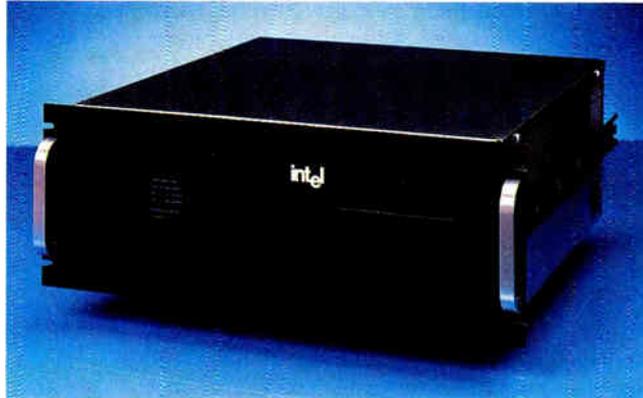
# TO WATCH

## INTEL UNVEILS RUGGED PC

**A** rugged, rack-mountable microcomputer from Intel Corp.'s Systems Group in Hillsboro, Ore., strikes a happy medium between garden-variety PCs and expensive machines that meet military specifications.

Priced at \$4,000 and designed for original-equipment manufacturers, the model 302i is based on a 25-MHz Intel 386 microprocessor. It comes in a standard 19-in. rack-mountable chassis. Positive-pressure, filtered air flow keeps dust out. Its hard disk is shock-mounted for vibration protection and add-in cards are held in place by a locking bar to keep them from detaching if the computer is in a vibration-prone environment.

The 302i also offers a high



**Intel's rack-mountable unit makes designing PCs into industrial systems easier and less costly.**

level of serviceability. Any component in the system can be replaced in less than eight minutes with a screwdriver. The CPU board is tray mounted and special connectors are used to make servicing easier.

Other features include 64-Kbytes of cache memory, eight expansion slots, a 230-W power supply, two serial ports, one parallel port, and PC-AT compatibility. The 302i began shipping in late July. □

### CHIPS READ OR WRITE AT TOUCH OF A PROBE

**A** new way of tagging and identifying parts and products has been developed by Dallas Semiconductor Corp.

The MicroCan Touch Memory data carrier embeds a rewritable memory chip in a steel can the size of a dime and reads it with a probe using a 1-wire signaling scheme. Up to 4-Kbit versions of the DS199X are available, says the Dallas, Texas, company.

Data transfer takes place at 16 Kbits/s and a cyclic redundancy check (CRC) algorithm based on a 48-bit serial number assures data integrity, especially during write cycles. Secure versions of the devices with 64-bit passwords are also available. An evaluation kit costs \$75 and the devices about \$3 each. □

### SUN'S NEWEST SPARC POWERS A 21-MIPS DISKLESS WORKSTATION

**A** new Sparc microprocessor delivers the higher performance in two workstations from Sun Microsystems Inc., Mountain View, Calif.

The low-end Sparcstation ELC replaces the SLC at the same \$4,995 price for a diskless version, but offers almost twice the performance. The ELC's 33-MHz processor executes 21 million integer instructions/s or 3 million floating-point operations/s vs 12.5 mips and 1.2 megaflops for the SLC [*Electronics*, June 1990, p. 75].

The monochrome ELC is for entry-level applications such as database management, document-image processing, and computer-aided software development. In contrast, the Sparcstation IPX is an accelerated-graphics desktop unit that sells for \$13,495 in a configuration

with a color monitor, GX graphics accelerator and 207 Mbytes of mass storage.

A 40-MHz CPU in the IPX enables it to deliver 28.5 mips and 4.2 mflops. respec-

### CHIP SET LINKS ETHERNET TO FIBER

**M**icro Linear Corp. is pushing the frontiers of Ethernet into fiber optics with a highly integrated chip set that significantly reduces design time and cost.

Before the San Jose, Calif., company's two-ship solution, systems houses had to design their own fiber-optic interface to Ethernet using discrete devices. The transceiver consists of the ML4661, a fiber-optic interleaver link (FOIRL) transceiver, and the ML4621 fiber-optic quantizer. Together, they provide all the functionality needed to implement an IEEE 802.3 FOIRL media-attachment unit.

Available now, the ML4661 is \$21 each and the ML4621 is \$6.50 each in 1,000-unit purchases. □

### BENCHMARQ'S CHIP MAXIMIZES BATTERY LIFE

**A** power-management chip from Benchmarq Microelectronics Inc. is designed especially for battery-operated computers, cellular phones, and instruments.

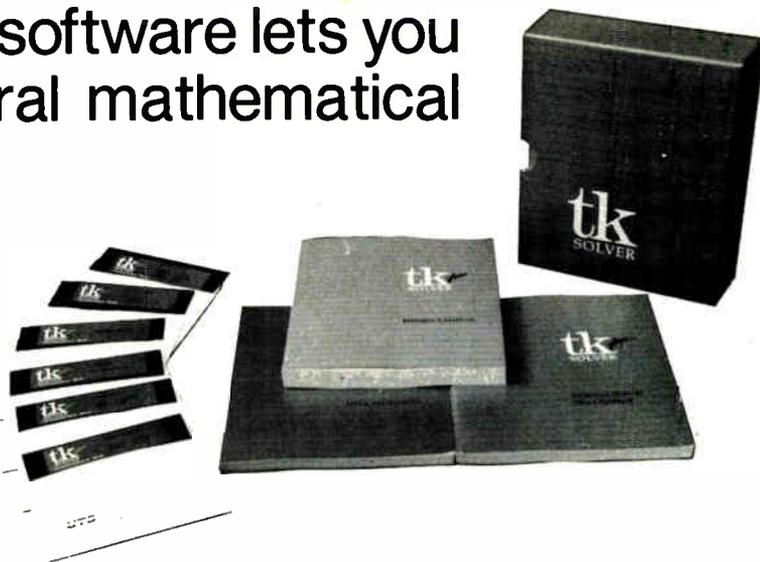
The bq2001 Energy Management Unit provides accurate, reliable power metering, fast charge control, and sophisticated system-management services, says the Carrollton, Texas, company. Battery-conditioning routines, for example, can restore lost capacity resulting

from extended storage or mistreatment and inhibit the so-called memory effect that plagues NiCd batteries.

Fabricated in 18-V bi-CMOS, the bq2001 operates at 5V but handles systems up to 12V. It consumes 700 nA. An internal micro regulator powered by the main battery provides backup for a clock and other low-current ICs. When a system's battery is removed, a small lithium cell powers the bq2001. It costs \$10 each. □

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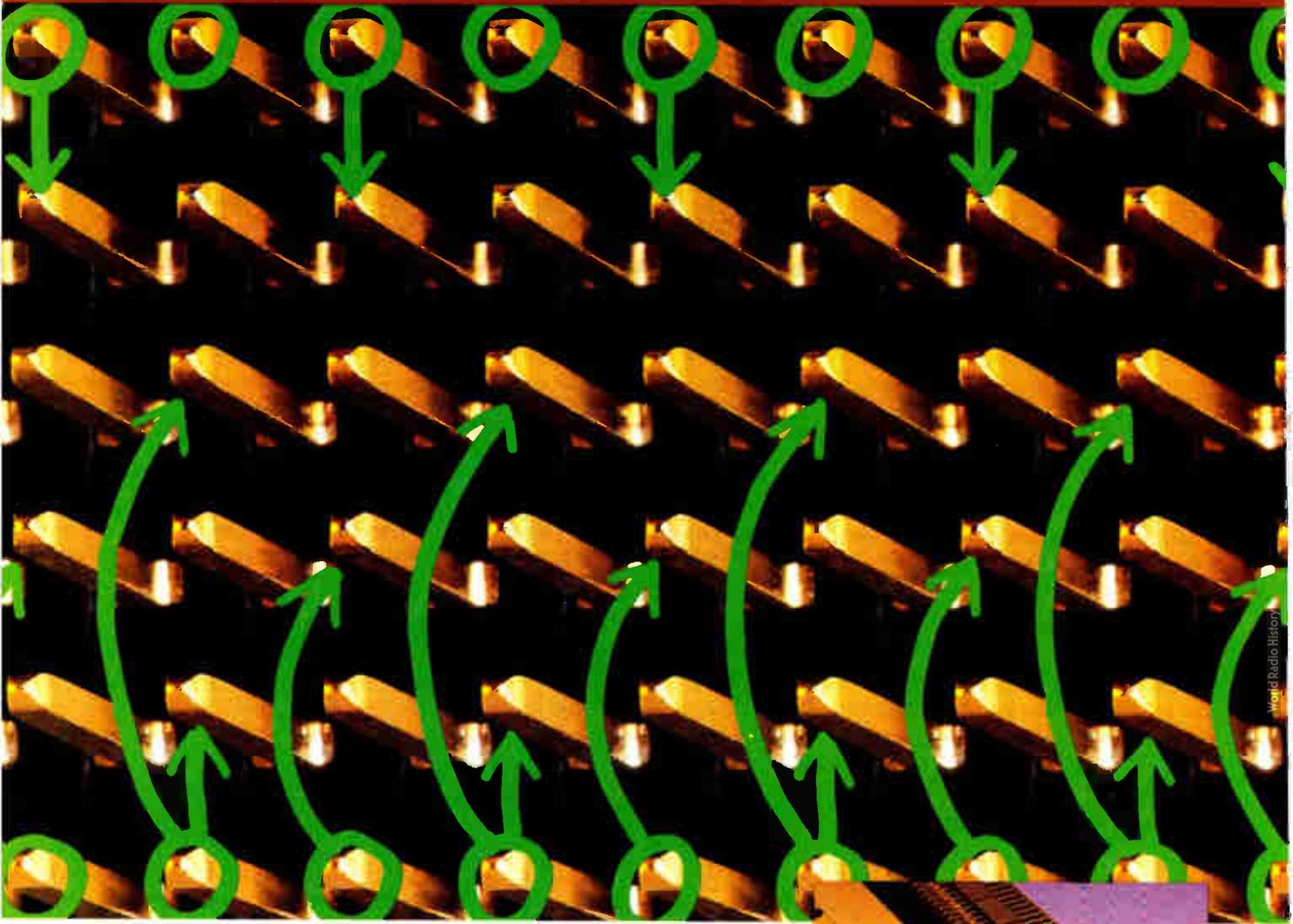
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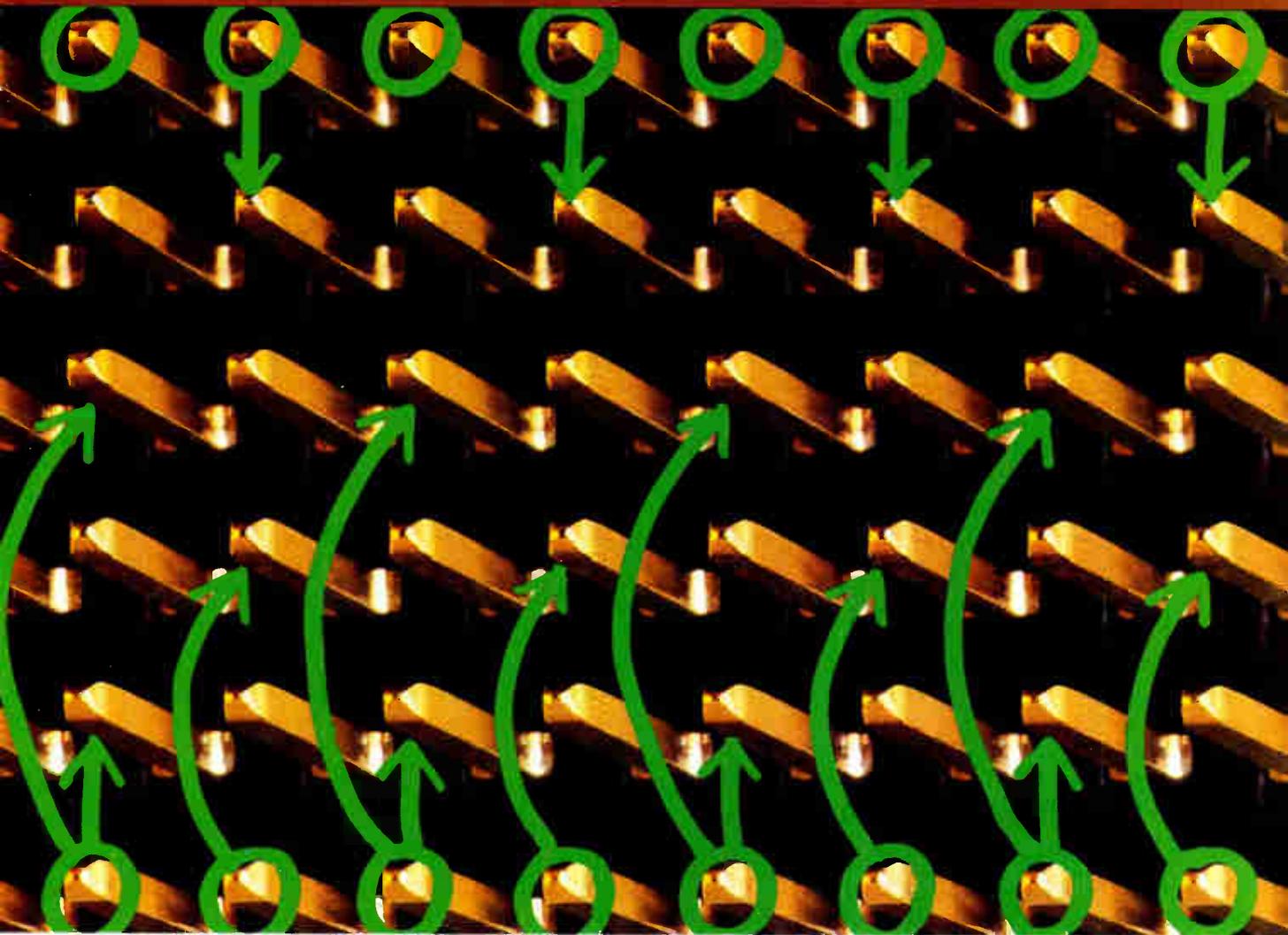
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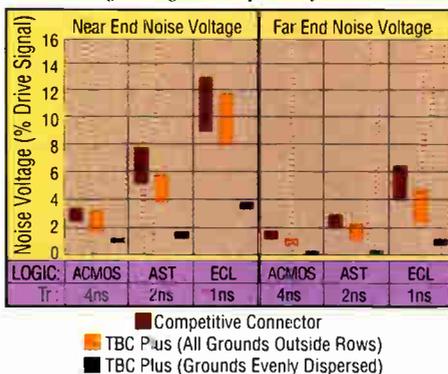
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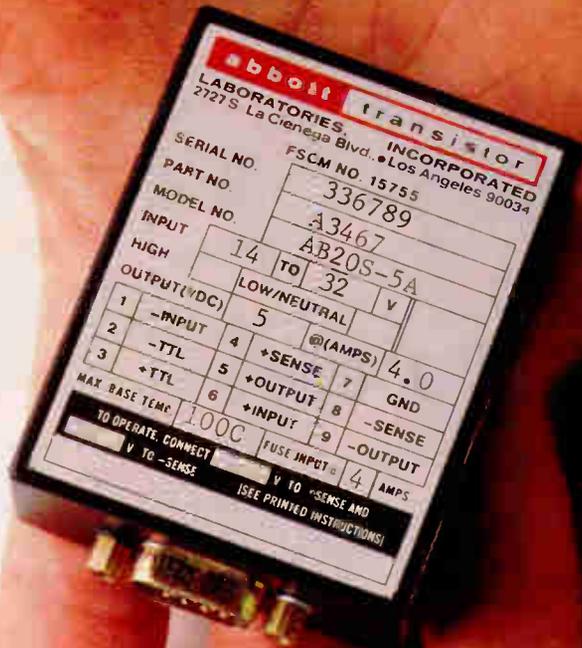
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CIRCLE 219

## NEWS

ALLIANCE WITH IBM WOULD ESTABLISH  
A NEW COMPANY AND OPERATING SYSTEM

## A BIG BLUE HUE FOR APPLE

BY LAWRENCE CURRAN

The second shoe may not drop for months in the wake of the agreement by Apple Computer Inc. and IBM Corp. to launch a joint venture, but this alliance has a better chance to succeed than some other industry affiliations because millions of each firm's customers want it to work. It's also clear that one of the reasons for the alliance is that Apple, in Cupertino, Calif., and IBM, based in Armonk, N.Y., want to provide some counterbalance against the howling success of Microsoft Corp.'s Windows environment on personal computers.

A key provision of the agreement is establishment of an independently managed, jointly owned company to develop an object-oriented operating system. That software will run on a variety of Apple and IBM computers, and will also be sold to other hardware vendors.

Besides the joint company, another part of the July accord will have Big Blue and Apple joining to develop hooks that more easily integrate the Apple Macintosh PC into IBM client-server networks. Other elements of the agreement would enable Apple to adopt in future Macintosh PCs single-chip versions of the IBM RS/6000 Power PC architecture, and unite the two firms to develop and license software to stimulate multimedia technology.

The RISC chip work also involves Motorola Inc., which will join with IBM to design and fabricate a single-chip version of IBM's RISC architecture, then will serve Apple, IBM, and other computer vendors as a foundry for the advanced RISC family.

Products stemming from the partnership would reach the market "over the next two to three years," says Paul Bergevin, IBM spokesman on the al-

liance. "We're well down the road to completing contracts. We expect to have them done by the end of the year," he says.

Bergevin says of the planned joint-venture company that "it will be its own entity. The intent on funding is to have 50-50 participation between the two of us." No details are available about its location or staffing.

Alliances in the computer industry have a spotty history. The once-friendly relationship between IBM and Microsoft has erupted into warfare over disagree-

hopes, and because "a lot of customers are rooting for this to work."

The two firms share "a deep and abiding concern about Microsoft's role that may serve to unite them," Yarnis maintains. "And the relationship is based on more than the two saying 'let's get together and do lunch.' Apple is well along on an object-oriented operating system" in its so-called Pink Project, Yarnis says. "People at Apple maintain that this is real stuff; there's computer code behind it."

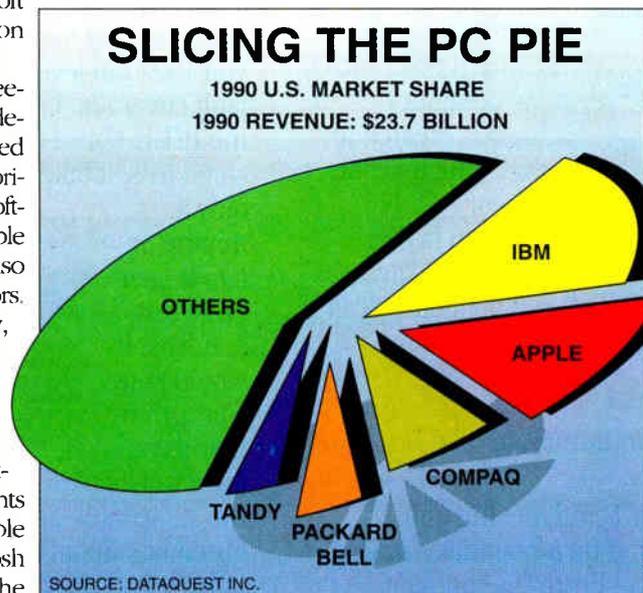
Object-oriented programming facilitates the development of programs that interact with one another. For example, changes in a spreadsheet imported to a word-processing program would be reflected automatically back in the original spreadsheet.

Frank Lynn, president of Frank Lynn & Associates Inc., a market-research firm in Chicago, says that another reason that object-oriented techniques will be a boon to hardware vendors is that they will greatly ease the chore of porting software applications to new versions of an operating system and hardware platform. This will cut the cost for a software vendor to support a new version of an operating system—say, OS/2.

As for Apple and IBM customer backing, Yarnis points out that "customers are saying that if Apple and IBM can work together, that would meet our wildest dreams. These users also wouldn't mind if this alliance serves to break Microsoft's monopoly," he adds.

For his part, Peter Burris, senior IBM analyst at International Data Corp., the Framingham, Mass., market-research organization, says the company to be formed by the two is pivotal to the success of the alliance. "How that company is formed will provide the first clues to how successful this arrangement will be," Burris says.

Will Zachmann, president of Canopus Research, a Duxbury, Mass., market-research firm, says the joint-venture company is less important than some near-term benefits both Apple and IBM



**IBM had 16.9% and Apple 12.1% of the U.S. market for PCs last year.**

ments between the two about PC operating systems (see p. 44). But this partnership has a better chance, says Jonathan Yarnis, vice president for personal computing at the Gartner Group, the Stamford, Conn., computer industry market-research firm.

Yarnis cites three reasons for his view: the significant threat to both Apple and IBM in Microsoft's growing strength on the desktop, the fact that the relationship is based on more than just

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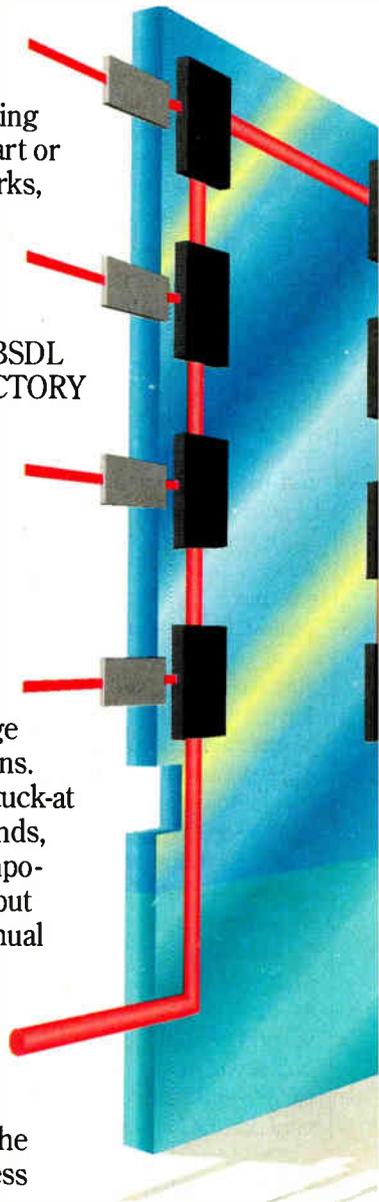
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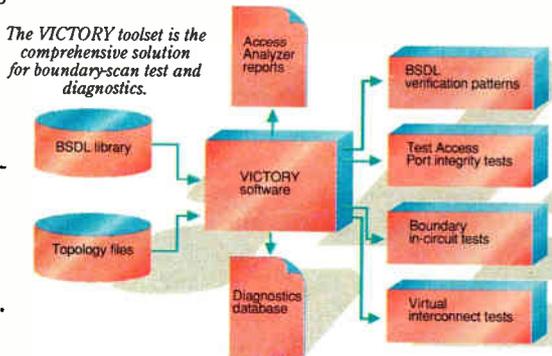
*Concurrent engineering takes on new meaning when you use VICTORY's Access Analyzer to optimize board layout for testability and cost-efficiency.*

Now you can find stuck-at faults, broken wire bonds, wrong or missing components—even open input pins—all without manual diagnostic probing. VICTORY's fault diagnostics clearly spell out both fault type and fault location. And that's just the manufacturing process



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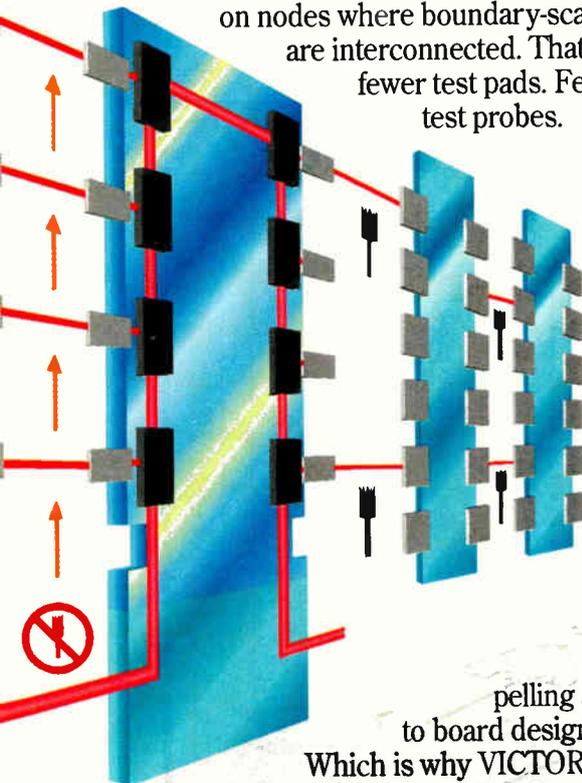
The VICTORY toolset is the comprehensive solution for boundary-scan test and diagnostics.

# scan is a breakthrough board testing theory.

feedback you need to eliminate defects where it's most cost-effective—at the source.

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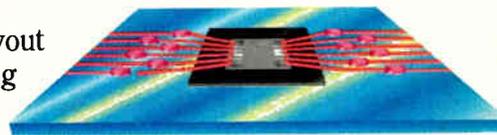
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Which is why VICTORY's Access Analyzer was developed. With this concurrent engineering tool, designers get testability information early in the design process. They can easily see where test points are required for visibility and where they can be dropped, for opti-

mized board layout without lowering fault coverage.



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*Get high fault coverage at low cost when you test boundary-scan boards with our new Z1800VP system and VICTORY software.*

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may reap. Affiliation with IBM may give Apple "badly needed momentum in large corporate accounts," Zachmann says. And IBM gains a hedge against the possibility of Apple winning its copyright lawsuit against Microsoft.

Apple contends that Windows copies elements of the Apple Macintosh graphical user interface. If Apple wins, the huge momentum behind Windows could be squelched, leaving IBM and countless Windows users vulnerable. "I can't imagine that IBM would conclude such an agreement without getting the rights to something that allows them to incorporate Mac-like features into the AIX shell," Zachmann maintains. AIX is IBM's version of Unix.

To succeed, the alliance partners will have to subordinate two dissimilar corporate cultures to the common good. IDC's Burris says a cultural merger is important. "I'm not inculcated into either culture, but looking at it from the outside, it seems the two are very different. The biggest potential impediment to the [joint firm] is whether or not the Apple rank and file buy into the alliance." □

## PARSYTEC IS MAKING A SPLASH WITH ITS GC LINE OF PARALLEL PROCESSORS

# WELCOME TO THE CLUB

BY JOHN GOSCH

**A** small, \$13.5-million German computer company, with the look of a successful Silicon Valley-style startup, has wedged into the select club of supercomputer builders alongside the likes of Cray Research, IBM, Intel Supercomputer Systems, and Thinking Machines. And what has propelled Aachen-based Parsytec GmbH to a top position in this field is a line of parallel supercomputers sporting performance figures that are nothing less than landmark characteristics.

Parsytec's GC family of multiple-instructions-multiple-data machines spans a computing power range of 0.4 to 400 gigaflops—that's up to 400 bil-

lion floating-point operations/s. The largest configuration packs some 16,384 32-bit microprocessors, which makes it what the company says is the first "supermassive" parallel system to go to market.

And check **SUPERCOMPUTERS** the price-performance ratio: an average Parsytec system offers 1 gigaflops for about \$280,000.

The machines are Europe's entry into the field of true supercomputing, and their remarkable performance is not only a triumph for Parsytec but also for the European computer industry: the microprocessors are T9000 Transputers from Inmos Ltd., the UK affiliate of the Italian-French semiconductor maker SGS-Thomson Microelectronics

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which has headquarters in Milan and Paris. And the Dutch compiler specialist Associated Computer Experts (ACE) in Amsterdam is providing an optimizing Fortran 77 compiler for the system's software. The software itself was developed at a number of European software houses working closely with the Aachen company.

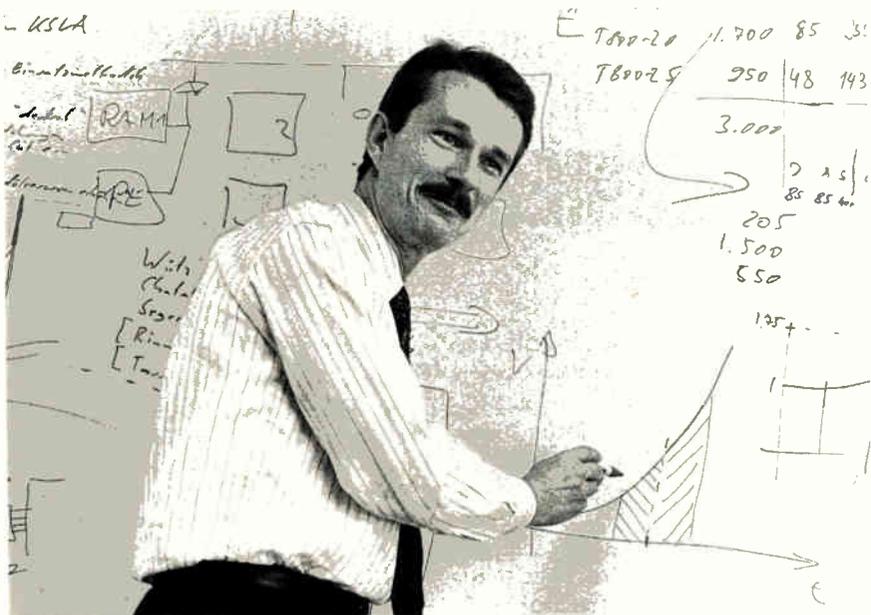
Parsytec, with 130 employees and sales offices in the U.S. and UK, will unveil GC prototypes at the Systems '91 computer show to be held in Munich in October. Deliveries will start in the first quarter of 1992.

The company already has orders for six machines, three from Germany and three from the U.S. Of the machines headed across the Atlantic, two are for the Naval Research Laboratories in Washington and one is to be installed at the Science Support Laboratories in Ford Ord, Calif. The bill those three systems will total \$3 million. Each of the six machines will be equipped with up to 256 microprocessors delivering 6.4 gigaflops.

The market that Parsytec is playing in is expanding by leaps and bounds. The present worldwide supercomputer market, for both parallel and classical vector types, is about \$1.65 billion, according to figures from market researcher Dataquest Inc. of San Jose, Calif. Of that, massively parallel machines account for only \$150 million, but their sales are growing stronger—the increase is up to 50% a year compared with only 2% for vector systems. It's in that fast-growing parallel computer sector that Parsytec hopes to become a market leader with its supermassive GC engines.

**W**ith today's computing resources, says Falk D. Kübler, Parsytec's founder and managing director, many problems are difficult, if not impossible, to solve. For example, simulating both global and local atmospheric flow phenomena in climate research cannot be efficiently done even with today's most powerful computers. Other tasks such as simulating combustion processes in engines to optimize their fuel consumption are also difficult to handle.

What's needed, Kübler says, "are computers from 100 to 1,000 times faster and more powerful" than the systems now available. Conventional vector computers now perform between 1



**Falk D. Kübler, founder and president of Germany's Parsytec GmbH, believes the GC series meets the need for enormously powerful machines.**

and 10 gigaflops; the next generation will probably rate between 10 and 25 gigaflops. That's not enough to cope with the enormous simulation challenges of the future. "The power required to meet these challenges can be achieved only through parallel processing," Kübler says.

For optimum results, parallelism should be coupled with a maximum of microprocessors in a computer. Although there is a tenfold increase in processor power every three and a half years, greater advances can be made at the systems level, Kübler explains. The size of the system—that is, the number of nodes or microprocessors it contains—can be increased tenfold every two years.

Only parallel processing can best exploit the increase in both processor power and system size and produce the benefits resulting from multiplying these two factors. Consistent with these considerations, the Parsytec GC family opens the field of supermassive multiple-instructions-multiple-data parallel computers that can face the computing and simulation challenges of the future. (The company's name, Parsytec, is a contraction of "parallel systems technology." The "GC" in the new family's designation stands for "grand challenges.")

The Parsytec GC series is the first parallel computer family to provide fail-safe operation through redundant processors, error-correcting memory, and an error-tolerant communication struc-

ture, says Friedrich Lücking, product planning manager. Of considerable significance, too, is the family's large scalability of 1 to 1,000 (derived from 0.4 gigaflops to 400 gigaflops).

Such scalability means that if the available computational power does not suffice for a particular task, then it can be successively raised by using additional processors. Because of limitations in construction, most of today's parallel computers can be expanded only up to a certain size and cover a performance range of little more than 1 to 10.

**T**he GC line's wide scale is made possible by a connecting structure whose complexity remains the same with increasing numbers of processors. This, Lücking points out, is the only way to ensure consistent and efficient handling of all configurations in the GC series and to minimize the hardware and software investments.

The various models in the family consist of a three-dimensional network of up to 8 by 8 by 16 building blocks or clusters, each with 16 Transputers interconnected by a number of links. This results in a platform for applications that profit from the large scaling potential and require dedicated topologies. Four clusters arranged in a 3-d formation are integrated in a so-called GigaCube housing, and the GigaCubes can be connected as needed for a particular application. □

# MENTOR STARTS SHIPPING PART OF ITS 8.0 TOOLS ON THE SPARC WORKSTATIONS

## SUN COMES UP BIG AT DAC

BY JONAH McLEOD

If there was one winner at the late spring Design Automation Conference in San Francisco it was Sun Microsystems Inc. The Mountain View, Calif., workstation maker scored big when Mentor Graphics Corp. of Beaverton, Ore., made the official announcement that it is now shipping portions of its System 8.0 CAE/CAD tools software on Sun's Sparc-based workstations.

"Sun platforms now have a 45% share of the design-automation market," declared Tom Bruggere, chairman and CEO of Mentor. He noted that Mentor's customers prefer the Sun platform over clone systems, a finding that no doubt

made the day for Scott McNealy, president of Sun.

But the Mentor backing wasn't the only support for Sun that surfaced at the conference. Still another major CAE/CAD vendor, Intergraph Corp. of Huntsville, Ala., announced that it was porting all of its software over to the Sun platform. Intergraph has acquired most of the assets of the former Dazix last December, and that CAD vendor had already ported most of its tools to the Sun platform.

What's more, Intergraph is adapting all of its mechanical, mapping, and architectural system software for the Sun machines. For Intergraph, this represents a significant about-face because the company originally had purchased

the Clipper RISC microprocessor from Fairchild to ensure a CPU for its proprietary family of workstations.

The Intergraph and Mentor announcements firmly positioned Sun as the preeminent workstation supplier in the design-automation market. However, the announcement that could trigger the greatest number of shipments was the one that took the wraps off an agreement between Sun and Orcad of Hillsboro, Ore.

The reason, says Orcad president John Durbetaki, is that Sun's biggest-selling software package now accounts for sales of something less than 250 units a month. "We expect to be accounting for unit sales of 500 workstations a month," he says.

Durbetaki says he expects that Orcad software will help ship 45,000 units over the next five years. That is considerable since Orcad currently has 60,000 installed PC seats. Others already on the Sun platform or planning to port include Cadence Design Systems, Racal-Redac, Valid Logic, Viewlogic, and Aldec. □

CAE/CAD

Advertisement

## Small Company's New Golf Ball Flies Too Far; Could Obsolete Many Golf Courses

Pro Hits 400-Yard Tee Shots During Test Round

Want To Shoot An Eagle or Two?

By Mike Henson

MERIDEN, CT — A small golf company in Connecticut has created a new, super ball that flies like a U-2, putts with the steady roll of a cue ball and bites the green on approach shots like a dropped cat. But don't look for it on weekend TV. Long-hitting pros could make a joke out of some of golf's finest courses with it. One pro who tested the ball drove it 400 yards, reaching the green on all but the longest par-fours. Scientific tests by an independent lab using a hitting machine prove the ball out-distances major brands dramatically.

The ball's extraordinary distance comes partly from a revolutionary new dimple design that keeps the ball aloft longer. But there's also a secret change in the core that makes it rise faster off the clubhead. Another change reduces air drag. The result is a ball that gains altitude quickly, then sails like a glider. None of the changes is noticeable in the ball itself.

Despite this extraordinary performance the company has a problem. A spokesman put it this way: "In golf you need endorsements and TV publicity. This is what gets you in the pro-shops and stores where 95% of all golf products are sold. Unless the pros use your ball on TV, you're virtually locked out of these outlets.

TV advertising is too expensive to buy on your own, at least for us.

"Now, you've seen how far this ball can fly. Can you imagine a pro using it on TV and eagle-ing par-fours? It would turn the course into a par-three, and real men don't play par-three's. This new fly-power forces us to sell it without relying on pros or pro-shops. One way is to sell it direct from our plant. That way we can keep the name printed on the ball a secret that only a buyer would know. There's more to golf than tournaments, you know."

The company guarantees a golfer a prompt refund if the new ball doesn't cut five to ten strokes off his or her average score. Simply return the balls — new or used — to the address below. "No one else would dare do that," boasted the company's director.

If you would like an eagle or two, here's your best chance yet. Write your name and address and "Code Name S" (the ball's R&D name) on a piece of paper and send it along with a check (or your credit card number and expiration date) to National Golf Center (Dept. S-110) 500 S. Broad St., Meriden, CT 06450. Or phone 203-238-2712, 8-8 Eastern time. No P.O. boxes, all shipments are UPS. One dozen "S" balls cost \$24.95 (plus \$3.00 shipping & handling), two to five dozen are only \$22.00 each, six dozen are only \$109.00. You save \$55.70 ordering six. Shipping is free on two or more dozen. Specify white or Hi-Vision yellow.

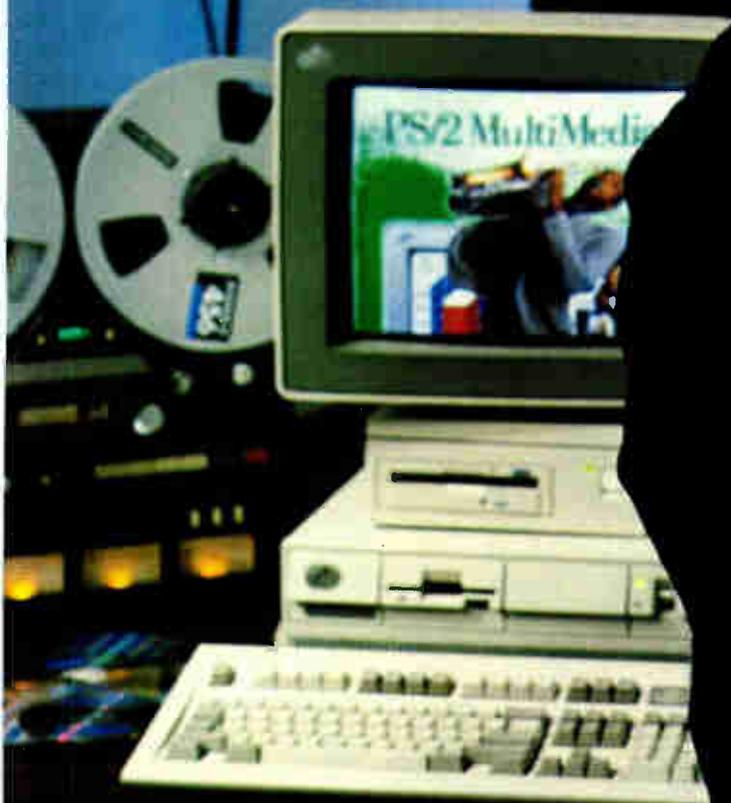
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## WHITE PAPER ON DIGITAL VIDEO

### A REVOLUTION IN VIDEO



This White Paper was developed  
by Dataquest Inc. and Electronics  
and written by Samuel Weber

*IBM video guru Brad Beitel  
surveys the company's  
AudioVisual Connection products*

# THE DAWN OF A New Age

*A new information age is about to be launched, built on the already profound changes the TV and the personal computer have wrought in our world. The catalyst is digital video, the merging of computers and TV technology. Digital video gives users of desktop computers unprecedented power to capture and manipulate still or moving images. Users can share the displayed information, interact with it, edit, store, and transmit it.*

## **ADDING A NEW DIMENSION**

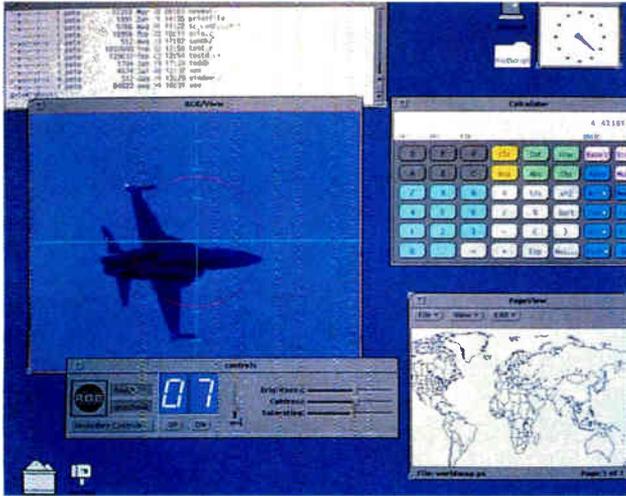
*Digital video will bring a new dimension to human communications by combining text, audio, and still or motion pictures in an integrated multimedia presentation on the desktop. The potential impact on business, education, science, medicine, sales, and entertainment is so great that chip makers, systems houses, and software designers are racing to develop components, equip-*

Fluent Machines' Fluency system



ment, and applications for this exciting new market, says a recent survey by Dataquest Inc., the San Jose, Calif., market-research house.

**MOVING FROM ANALOG TO DIGITAL**



Images from RGB Spectrum's Videalink 1600U scanner

*Just what is digital video? There are various technical definitions, but a good general one is the digital processing of still and motion pictures that may originate in analog form.*

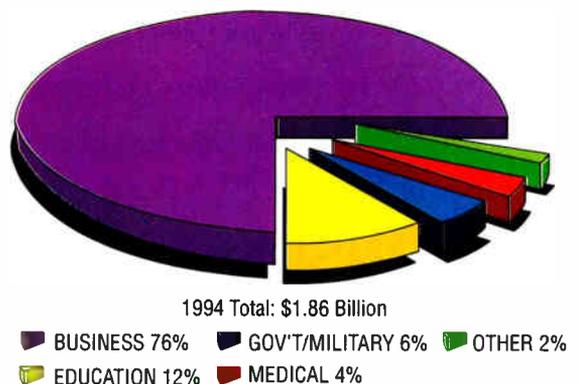
*Sources could be TV broadcasts or cable inputs, video cassette recorders,*

*video cameras, CD-ROMs, or laser discs. Conversion to an appropriate digital format permits users to manipulate, edit, or enhance the displayed images on a PC, TV, workstation, or video game. Additional processing also can bolster image clarity and quality by eliminating ghosts, snow, or other distortions.*

*However, there are fundamental incompatibilities between a broadcast TV signal and the ability of a computer or workstation to display it. For starters, there are three TV standards to contend with, each significantly different from the other: NTSC in the U.S. and Japan, PAL in most of Europe, and Secam in France and the USSR. Moreover, a TV receiver display creates a picture using interlaced scanning, in which an electron beam scans every other horizontal line on the screen. Modulating the intensity of the beam produces the image that the viewer sees.*

*By contrast, computer displays use progressive-scanning techniques in which every horizontal line on the screen is scanned. Differences in screen refresh rates, resolution, and color-encoding methodologies multi-*

**U.S. DESKTOP DIGITAL VIDEO MARKET**



1994 Total: \$1.86 Billion

■ BUSINESS 76%   
 ■ GOV'T/MILITARY 6%   
 ■ OTHER 2%  
■ EDUCATION 12%   
 ■ MEDICAL 4%

**(Excludes Video Teleconferencing)**

SOURCE: DATAQUEST INC.

*ply the complexity of the conversion. To make PCs and video compatible takes special decoding and processing circuitry. The system can be seen as a model partitioned into input-, feature-, and output-processing sections.*

**HOW THE PROCESSING HAPPENS**

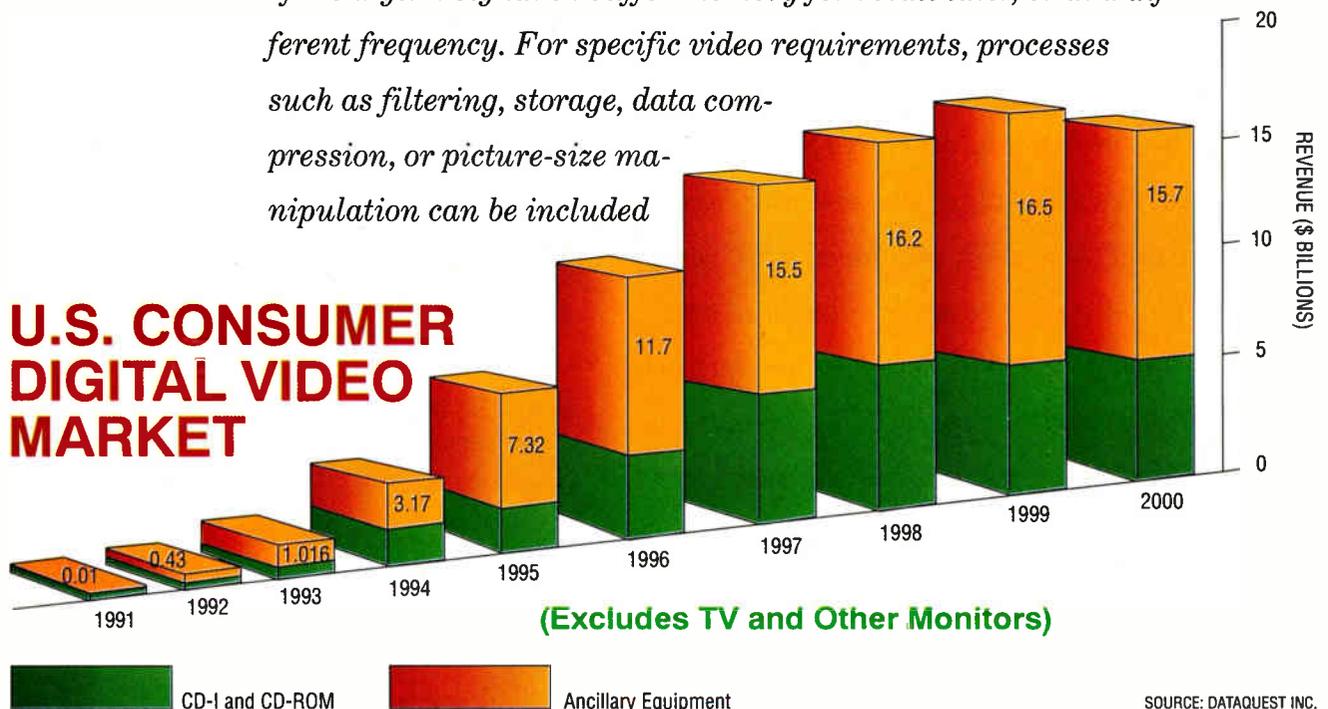
*The input processor, chosen for the desired broadcast standard, comprises an analog-to-digital converter that handles both video and color (chroma) inputs; and a decoder that accepts digitized video, performs horizontal and vertical synchronization, and outputs the monochrome and color—or luminance and chrominance—data. The final link is a clock generator to lock the video’s sync signal with the system clock.*



Windowed images from VideoLogic’s DVA-4000/ISA digital video adapter

*The feature-processing section accepts the luminance and chroma data, interpolates samples, and converts them to red-green-blue signals as it performs necessary corrections. It provides large high-speed storage of the digital signal in buffer memory for recall later, or at a different frequency. For specific video requirements, processes such as filtering, storage, data compression, or picture-size manipulation can be included*

**U.S. CONSUMER DIGITAL VIDEO MARKET**



SOURCE: DATAQUEST INC.

Simply defined,  
digital video is  
the digital  
processing of  
pictures that  
may originate in  
analog form.

**W**

**E TOOK THE VISION  
OUT OF TELEVISION...**



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# AND GAVE IT TO COM



# PUTER GRAPHICS.

## PHILIPS DELIVERS DIGITAL VIDEO NOW.

Real world images communicate with exceptional power. That's why they're now being integrated into the PC and workstation world through digital video — the fusion of video and computer technologies. Wherever you now find computer graphics, in fact, you'll soon find video images easily captured and smoothly integrated with graphics, text and sound. Philips' Digital Video Architecture, DIVA, can bring the excitement of multimedia applications to any user's desktop.



Already, DIVA has opened up active markets for makers of engineering workstations, personal computers, test equipment and medical systems. It's helping to expand applications in desktop publishing, presentations, training, CAD, scientific visualization, video conferencing, networking — and building a foundation for a whole new era of multimedia applications.

## OVERCOMING TECHNOLOGY DIFFERENCES.

Merging video and computer technologies would seem to be perfectly natural. But it's still not easy. In video, for example, color is encoded into brightness (luminance) and color (chrominance), whereas in computers it's done in an RGB color

space. Scanning, too, is a problem: video pictures are created with interlaced horizontal lines, while computers typically use progressive scan. Vertical and horizontal resolutions may also vary. And screen refresh rates differ: video uses 50 or 60 Hz, while computers may use higher rates. These and other fundamental incompatibilities have multiplied the complexity of merging these technologies.

## THE PHILIPS SOLUTION.

Philips' Digital Video Architecture offers a complete family of digital video components that provide the critical enabling technology for the next generation of multimedia systems. Now, for the first time, designers have access to complete front-to-back hardware links between computers and the myriad of video display, broadcast and recording equipment.

## MEETING THE DESIGN CHALLENGES.

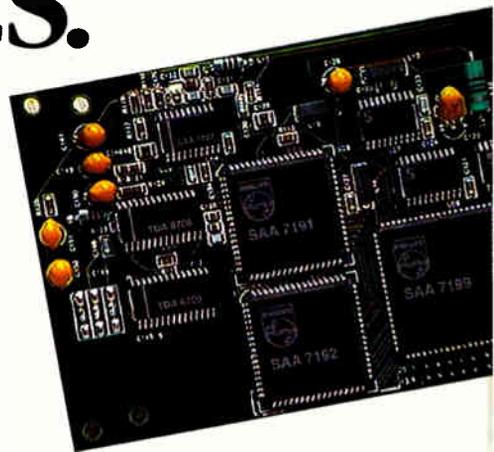
Philips' DIVA meets all four of the essential design criteria necessary to fully integrate video and computer technologies:

### International standards.

The Philips chipset supports all major international broadcast standards — NTSC, PAL and SECAM — plus the CCIR601 digital video standard (known in the U.S. as D1).

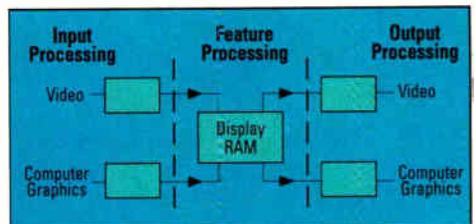
**All digital.** The Philips implementation is fully digital, operating at 5 volts, with on-chip digital filters. This results in adjustment-free systems.

**Distortion-free images.** These components can process, display and print video images without distortion. They use a line-locked clocking scheme to produce clean digital conversion from both highly accurate broadcast signals, as well as VCRs, videodiscs, and still/video cameras, which often have large time-base errors.



**Open architecture.** The concept of building blocks supports an open architecture that makes it easy to implement and upgrade systems. DIVA (shown below) neatly partitions designs into input, output and feature — processing subsystems, allowing data to be easily manipulated for specific video requirements.

Beyond these essential criteria, Philips Digital Video Architecture offers a variety of features and price/performance alternatives, making it easy to tailor solutions for high-end industrial and business/professional applications, as well as low-end consumer products. DIVA supports existing video compression standards and allows portability across platforms.



Philips Digital Video Architecture enables easy upgrading of performance and addition of features.



# I N DIGITAL VIDEO, TI

incoming analog signal's horizontal line-sync pulse. Internal discrete time oscillators are used to synchronize the pixel clock to horizontal sync and to deoculate the chrominance. This combination of quartz stability and adaptive handling of video line frequency delivers picture elements that are in identical positions in each frame, for exact processing of horizontal (X), vertical (Y) and time (T)

**Analog-to-digital converter.** With a unique folding and interpolating architecture, Philips A/D converters are specifically designed for digitizing composite video. The TDA8708 handles source select, clamping, and automatic gain control, and provides drive for external low-pass filters. The TDA8709 also offers separate chroma inputs for S-VHS applications.

**Digital multi-standard decoders.** Philips' family of 7- and 8-bit digital multi-standard decoders accepts digitized

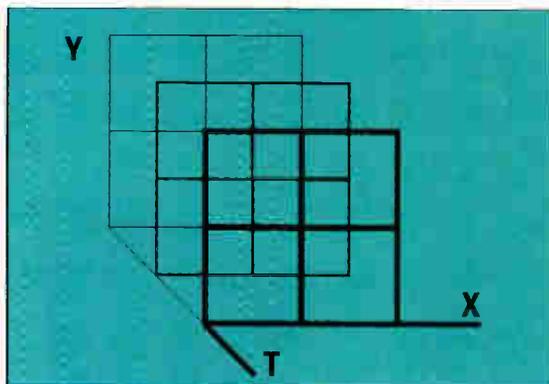
## IN DIGITAL VIDEO, TIMING IS EVERYTHING.

One of the major challenges in combining computer and video technologies has been timing, particularly when the video signal originates from a non-broadcast source. Timing errors can result in pixel jitter, rendering the video image unusable for display, storage, processing and compression.

To solve these problems, Philips uses a sample clock that locks onto the

dimensions. This line-locked clock approach eliminates pixel jitter, "tearing" and loss of color, even under adverse conditions.

### Orthogonal Sampling Structure



Processing in the horizontal (X), vertical (Y), and time (T) dimensions requires that picture elements are in identical positions in each frame. Philips' unique line-locked-clock implementation satisfies this requirement.

### DIVA BUILDING BLOCKS.

Philips offers a powerful chipset that includes an 8-bit A/D converter, clock generator circuit, digital multi-standard decoders, digital color space converters and digital encoders — everything you need for high-performance video.

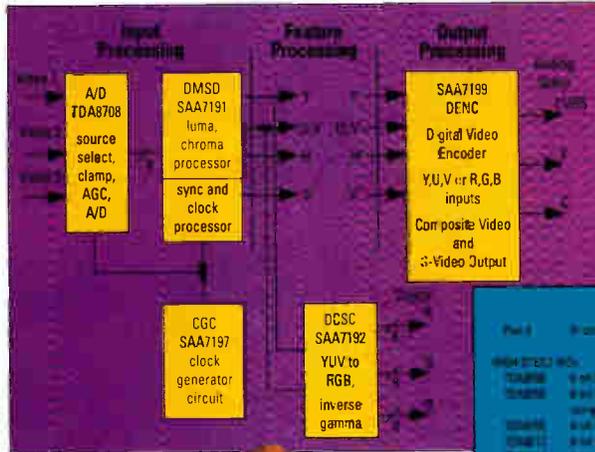
composite video and performs horizontal and vertical synchronization. They decode the signal into luminance (Y) and chrominance (U,V) outputs for further processing or compression. The SAA7191 decoder, for instance, uses frequencies and pixel counts that provide square pixels, which prevent distortion of on-screen images, and maintain precise WYSIWYG matches of hard-copy printout and displayed video. The SAA7151A decoder is compatible with CCIR601 and provides support for the SCART connector commonly used in Europe.

**Digital color space converter.** The SAA7192 digital color converter accepts Y:U:V input from the color converter; interpolates samples and digitally converts Y:U:V to R:G:B color. This output can be manipulated as color graphics or directly converted into analog red, green, and blue through D/A converters.

**Digital video encoder.** The newest member of the Philips digital family,

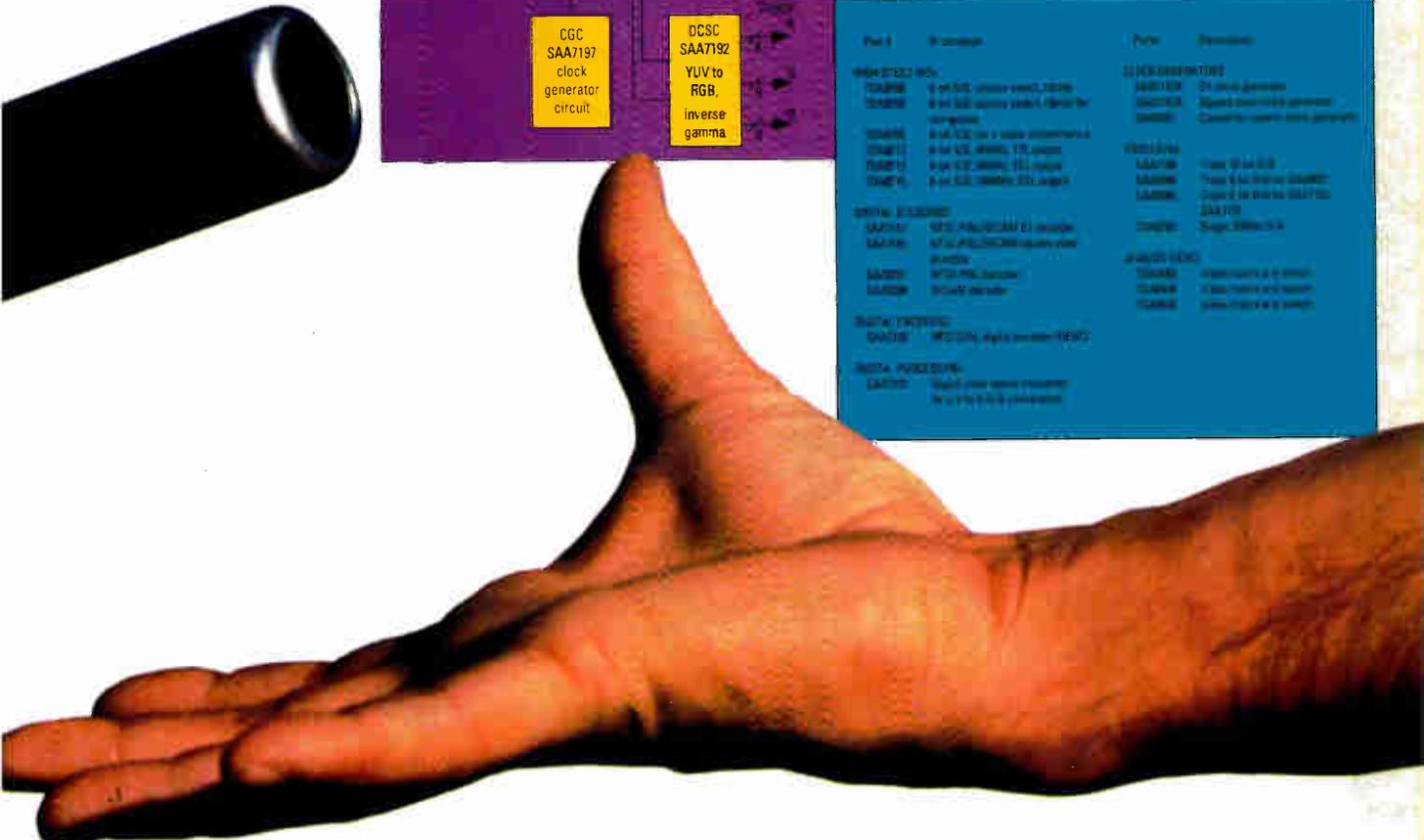
# TIMING IS EVERYTHING.

the SAA7199 encodes digital video or RGB graphics for storage on videotape or for display on a conventional television monitor. The SAA7199 helps turn personal computers into



*An example of a Desktop Video Chipset.*

Part #	Description	Part #	Description
<b>VIDEO PROCESSING:</b>			
TDA8708	A/D converter, source select, clamp, AGC, A/D	SAA7191	DMSD processor
TDA8709	A/D converter, source select, clamp, AGC, A/D	SAA7192	DCSC processor
TDA8710	A/D converter, source select, clamp, AGC, A/D	SAA7197	CGC clock generator
TDA8711	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8712	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8713	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8714	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8715	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8716	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8717	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8718	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8719	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8720	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8721	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8722	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8723	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8724	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8725	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8726	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8727	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8728	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8729	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8730	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8731	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8732	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8733	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
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TDA8740	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8741	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
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TDA8744	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8745	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8746	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8747	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8748	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8749	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor
TDA8750	A/D converter, source select, clamp, AGC, A/D	SAA7199	DENC processor



video production studios that perform editing, titling and special effects functions.

By solving these difficult timing problems today, the Philips digital video chipset helps you meet time-to-market challenges on your next multimedia product.

**BACKED BY PHILIPS TECHNOLOGY AND WORLD-WIDE SUPPORT.**

Today, video is moving out of the home and into the workplace —

using digital video solutions from Philips. Our advanced chipset is a direct result of our years of research in television, video and digital electronics technologies.

At Philips, we have all the building blocks in place today for the next generation of all-digital video solutions. And we back these components with a world-wide network of applications engineers and sales representatives. For product literature, application notes, or evaluation boards, call today. In the U.S., call 800-227-1817, Ext. 735. Or contact your nearest sales representative from the list provided.



at this stage. The output of RGB signals in digital form can be manipulated as digital graphics, or luminance and chroma (Y-U-V) signals, which can be converted to RGB in the output stage for acceptance by a computer. In turn, in the output processor they can be transformed back into analog—after filtering and digital-to-analog conversion—for subsequent display.

**PRODUCTS ARE HERE AND NOW**

Chip sets and boards to accomplish these functions are becoming widely available, testimony to the burgeoning of this exciting technology. Products play on a variety of platforms, including the Apple Macintosh, IBM-compatible PCs, and Commodore's Amiga computer as

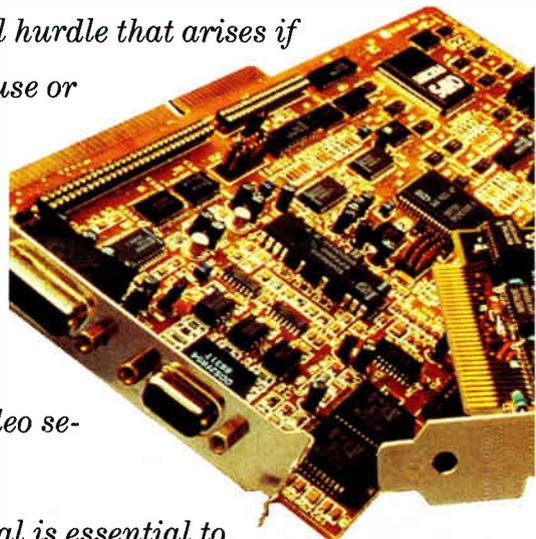


Screen produced by Matrox's Illuminator 16 board with Windows 3.0 driver

well as Sun and NeXT workstations. Boards may be simple frame grabbers that capture individual TV frames for manipulation on a computer, or complex units that handle the windowing of full-motion color video and other images. Other boards and software permit editing, titling, and special effects for the production of presentations for commercial, or consumer use. Encoders permit the storage of the enhanced or edited computer graphics for display on a TV monitor or to be saved on videotape.

**A SIGNIFICANT TECHNICAL HURDLE**

There is another significant technical hurdle that arises if the user wants to store images for future use or transmit them over a network: these are tasks that consume huge amounts of memory and bandwidth if the quality of the image is to be maintained. Storing a single digitized color photo may consume 25 Mbytes, while a 1-min., full-motion video sequence would require about 2 Gbytes.



Thus, compression of the digital signal is essential to

Video chip sets  
and boards are  
now widely  
available, a  
testament to the  
future of this exciting  
new technology.

*effectively utilize digital video over existing communication lines or to store images in memory of reasonable size. First into the marketplace with compression techniques were Philips Electronics with Compact Disc-Interactive (CD-I) and Intel Corp. with Digital Video Interactive (DVI).*

**QUEST FOR STANDARDS**

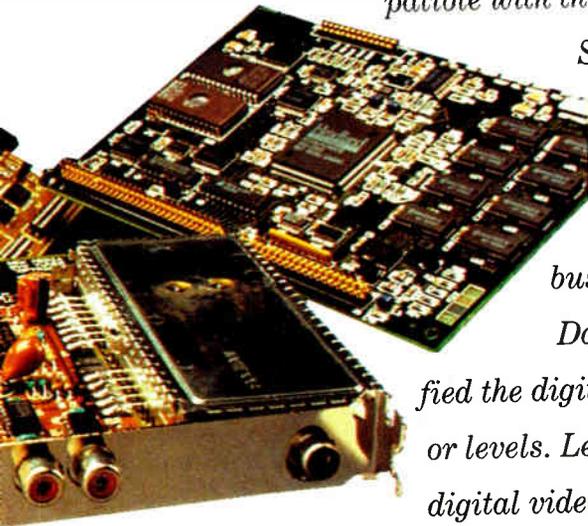
*Both companies started with proprietary compression schemes but are now actively involved in the international standards-making process being handled by two organizations: the International Consultative Committee for Telegraph and Telephone (CCITT), which is working on video phones, and the International Standards Organization (ISO), which is working on computer images. The ISO initiative rests with two groups, the Joint Photographic Experts Group (JPEG) and the Moving Picture Experts Group (MPEG), which are focusing on still and full-motion video methodologies, respectively. A third important compression standard, H.261 (commonly called Px64), is under development by a CCITT working group for video conferencing and telephones. In the U.S., teleconferencing equipment is available from several companies and is being used by business, education, and government. Most of it is designed to be ultimately compatible with the final international standard.*



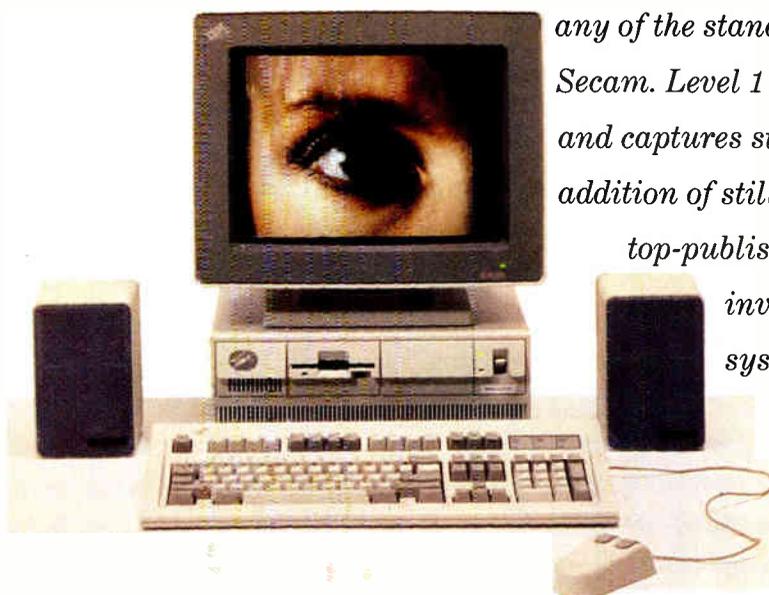
Primroses from Computer Friends' ColorSnap 32+ video board

*Sometime next year, at least one U.S. manufacturer of teleconferencing equipment plans to introduce mass-produced video phones for business and consumer use.*

*Dataquest market analysts have classified the digital video market into three categories or levels. Level 1 systems operate from analog or digital video inputs derived from broadcast TV, laser discs, or videotape. The systems will accept*



Super Video Windows board from New Media Graphics



IBM's Audio Visual Connection

*any of the standard TV formats—NTSC, PAL, or Secam. Level 1 displays live motion on a desktop PC and captures still frames in memory. It permits the addition of stills and titles for presentations, desktop-publishing documents, or other applications involving limited distribution. Level 1 systems require no compression, and the vast majority of products now on the market are in this category.*

**PLAYBACK-ONLY SYSTEM**

*Level 2 is a playback-only system that derives its precompressed*

*inputs from off-line compression techniques. The content is in the form of CD-ROMs. Intel's DVI and Philips's CD-I are primarily Level 2 systems, but DVI offers an edit-level algorithm that operates in real time as well as an off-line, presentation-level algorithm. Level 2 provides random access of archival video data, such as catalogs or encyclopedias. Educational, entertainment, and training programs are among the products being developed.*

*The most powerful of all the categories is Level 3. With full real-time compression and decompression, this type of system can display, store, and transmit full-motion video. It permits complete authoring of multimedia programs as well as video communication, simulation, entertainment, video conferencing, and other sophisticated applications. This is not a consumer market; users will most likely be the skilled professionals who create mass-produced multimedia packages.*

*All indications are that the digital video market looms as huge. The technology will impact every segment where video is used and can intersect with computer technology. In addition to the business and commercial world, digital video will make its mark on such con-*



Imaging Technology's frame grabbers in action

The technology will impact every segment where video can intersect with the world of computers.

sumer hardware as video cameras, VCRs, video-disc players, color TVs, and electronic games. Advertising, cable TV, VCR rental, and film box-office revenues will be affected.

### **SURGING DEMAND FROM PRIMARY USERS**

Dataquest forecasts that, starting from a relatively small base this year, the U.S. desktop digital video market for business, health care, government, and educational applications will surge to \$1.86 billion by 1994, excluding video teleconferencing equipment.

Dataquest estimates that \$1.6 billion—86%—of this market will be primary users of delivered material on Level 1 or Level 2 systems.

The rest—\$257 million—will be in production types of Level 3 equipment.

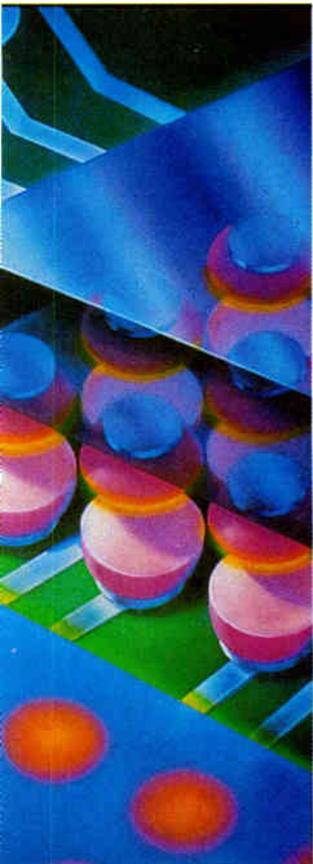
On the consumer side, digital video consists today of a hobby market worth \$40 million to \$60 million and comprising video-disc playback equipment, software, and ancillary gear, including embedded computers sold as part of a complete entertainment system. There are numerous add-in products being advertised, at an average selling price of \$750, in consumer video magazines for Commodore, IBM, and Apple computers that let users connect VCRs and camcorders into their PCs. Today's digital video market is not unlike the \$300 million PC market of 1979, when hobbyists and programmers, with no popular software available, were working on VisiCalc-type applications on a mere 370,000 PCs. Like the PC market then, the digital video market will skyrocket, garnering

a whopping \$3.17 billion in U.S. revenues by 1994, says Dataquest. And that doesn't include TV receivers or monitors, which may see a growth spurt under the impetus of this new technology.

As for teleconferencing and video phones, Dataquest estimates that



Commodore's "Multimedia Live" Amiga 3000 model





The multimedia-capable NeXT Computer System

*the U.S. market will hit \$716 million by 1994.*

*Already, professional producers of videos for broadcast and advertising are enhancing their creative skills with the new digital capabilities.*

*Dataquest anticipates that about a quarter of the 11,400 U.S. sites now en-*

*gaged in high-end production are using Level 2 digital video techniques.*

*By 1994, that will expand to between 50% and 75%. At Fortune 500 companies, Dataquest says, in-house groups are using digital video to produce highly effective management, sales, and training presentations.*

*Dataquest estimates that less than a tenth of these more than 18,000 U.S. "information-grade" sites currently use digital video technology; this will grow to 50% by 1994.*

**HERE COME THE 'EARLY ADOPTERS'**

*In the next wave, the technology will be picked up by so-called "early adopters"—sophisticated corporate users of desktop computers, employing video to publish documents or enhance in-house communications. Dataquest says less than 5% of the 464,000 sites with multiple PCs are now*

*using digital video; by the end of 1994 the penetration should be 28%. Finally, an explosion will take place when the technology begins to penetrate the market represented by the millions of general business users of PCs; sales here should exceed \$1 billion by 1994.*

*Digital video will rebound across a broad front of human endeavor. Through the use of libraries combining print, video, and sound, people can absorb or convey knowledge. Through video teleconferencing, they can collaborate from remote locations. Businesses will enhance communication, cut travel costs, and save time by adding the visual element to the telephone. Salespeople will get dramatic new promotion tools. Electronic mail will take on new meaning when video is added; and consumers will enjoy new forms of home entertainment.*



Digital F/X's desktop video production system

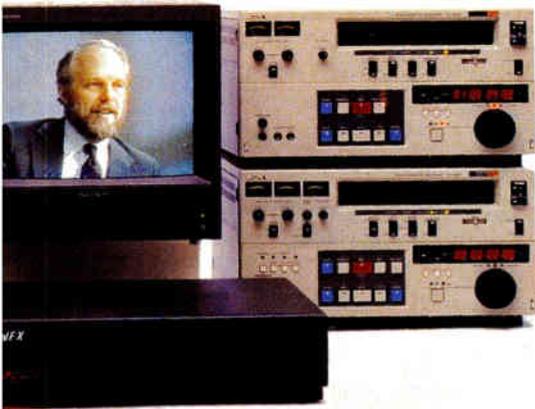
Fortune 500 companies are using digital video to create highly effective management and sales tools.

*A survey by Dataquest of a group of large and small companies marketing digital video products reveals intense development activity over a broad swath of applications. Ranking high on the list are desktop publishing; multimedia PCs; computer-aided design and engineering; medical, education, and training; travel and real estate; plus advertising, presentations, insurance, and entertainment. Teleconferencing and video phones figure in relatively few product plans, but they loom large for the future.*

*About half the respondents are designing products to the JPEG standards, 15% to MPEG, and the rest to proprietary and other standards. Most companies are designing for IBM and Macintosh platforms, fewer for workstations. The end-user price for most products ranges from \$500*

*to \$2,500, according to the survey.*

*Most of the respondents expect relatively few units to be shipped this year, with volume building into the hundreds of thousands by 1993. One unnamed company that anticipates it has a hot product on its hands projects sales in the millions beginning next year.*



### **THE BEST IS YET TO COME**

*It is obvious that digital video technology and its potential applications are still at the start of the learning curve. Thinking has not moved beyond the obvious, but as usually happens when a new technology appears, unimagined applications will soon appear and beget new ideas. Meanwhile, reliable hardware is here now; software lags but is rapidly being developed. The major problem is cost: to conform to the numbers forecast by Dataquest, chips and boards will need to become ubiquitous and cheap. Memory cost must come down as well, and mass-produced software will have to be priced within the reach of the average consumer. And above all, the perceived need for these products must be obvious and their operation simple. Nevertheless, the promise is already starting to be fulfilled. The digital video age has begun.*

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As usual when a  
new technology  
first appears,  
unimagined  
applications will  
arise and beget  
more new ideas.

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## DIGITAL VIDEO ARCHITECTURE FROM PHILIPS

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Signetics

Philips Semiconductors



# PHILIPS

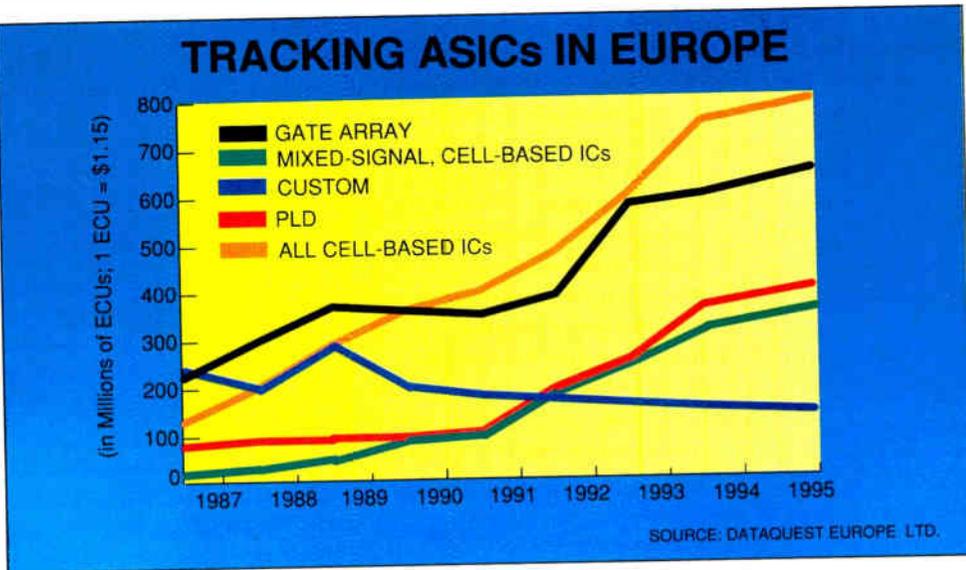
# AS ASIC SALES BOOM, ALLIANCES FORM

Application-specific ICs are selling in Europe like electric fans in August, especially mixed-signal types for the booming telecommunications equipment market.

But ASICs are design specific, so each chip maker tends to produce only a few. The upshot is that European companies are forming joint ventures to broaden their product range.

Two significant moves were made last month. One is a joint venture between binationals SGS-Thomson Microelectronics and GEC-Plessey Semiconductors. The other is an accord under which Philips Components of the Netherlands and French-based European Silicon Structures, known as ES2, will jointly develop a 0.7- $\mu$ m CMOS-logic technology for industrial use by both companies.

Last month the Italo-French SGS-Thomson and the English GEC-Plessey announced an agreement that said they would pool re-



sources for semicustom versions, claiming that the move will increase their combined share of the world market for ASICs. The agreement covers ASICs based on a standardized cell library and 0.7- $\mu$ m CMOS technology, which should greatly improve time to market for OEMs. "This is a crucial problem area for electronics manufacturers," says James Eastlake, a semi-

conductor industry analyst with Dataquest Europe Ltd. in London, "and it explains OEMs' lack of satisfaction with ASICs."

For Philips, the partnership with ES2 means a specialized, fast-turnaround source of prototypes for standard products and application-specific ICs. In turn, ES2 has, through Philips, a volume source for its prototypes. □

## SGS-THOMSON ENTERS 16-MBIT EPROM CLUB

SGS-Thomson Microelectronics is the first non-Asian producer to enter the exclusive club of companies that are manufacturing 16-Mbit erasable programmable read-only memories. The chip, a result of the Joint European Submicron Silicon Initiative program, better known as Jessi, is also the first of its kind to use European technologies only.

The company already produces the world's fastest 4-Mbit EPROM and, according to Dataquest Inc., commands nearly 11% of global EPROM sales. The San Jose, Calif., market research firm estimates that the market amounted to \$1.4 billion in 1990. SGS-Thomson's new device integrates more than 16 million transistors on a 129 mm<sup>2</sup> chip. It uses 0.6- $\mu$ m technology with advanced isolation and tungsten plug metalization techniques for the 8 million contacts made in each device. □

## ANOTHER IBM DEAL: MAKING 16-MBIT DRAMS WITH SIEMENS

IBM Corp., still a restless giant after its accords with Apple Computer Inc. and Wang Laboratories Inc. (see p. 27, has agreed to collaborate with Siemens AG of Munich to manufacture 16-Mbit dynamic random-access memories. The two had joined forces early last year to develop 64-Mbit versions.

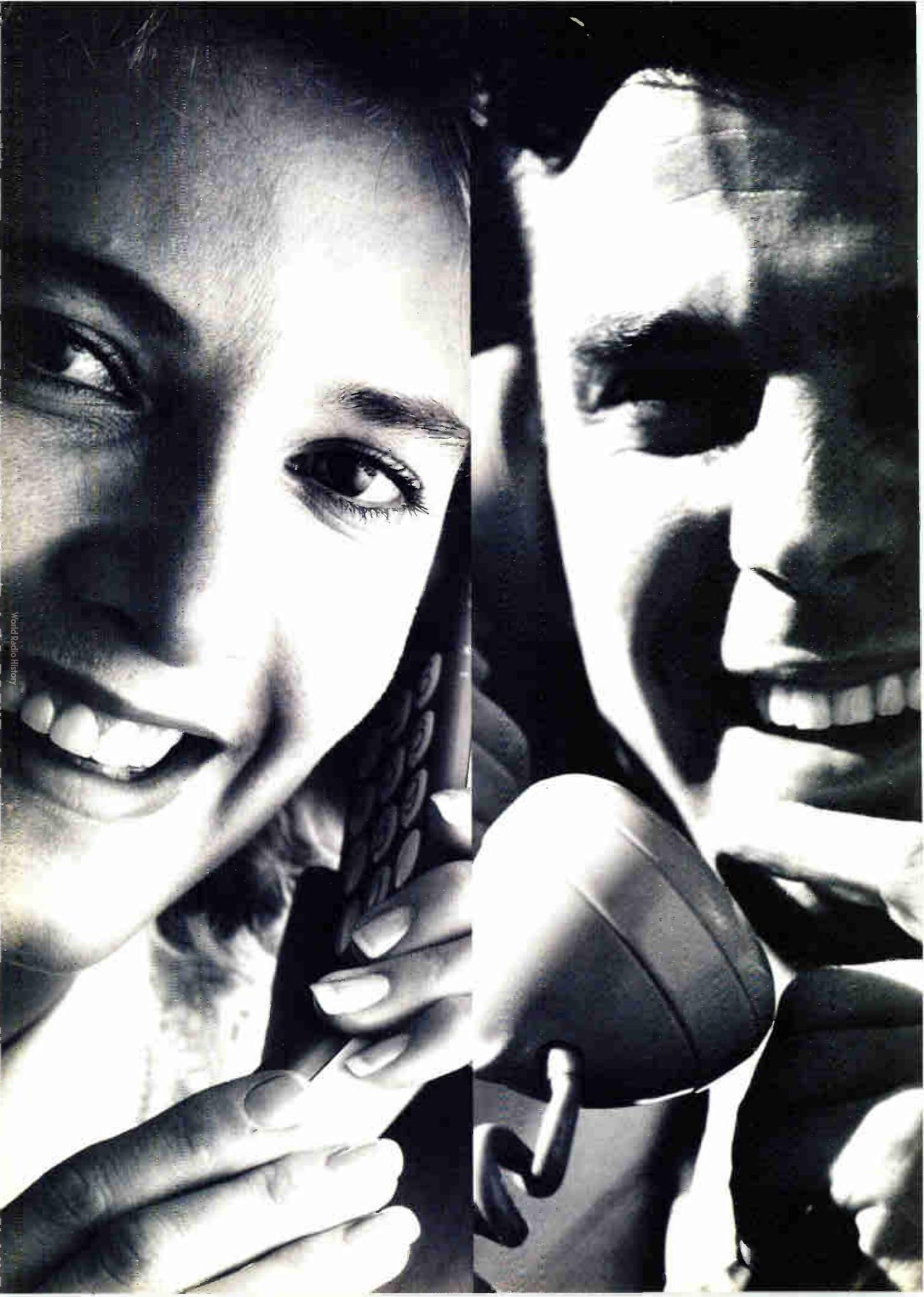
The chips will be produced at an IBM plant in Corbeil-Essonnes, near Paris, with both firms sharing the cost, which should come to several hundred million dollars. Other companies will participate if capacity is available.

Several factors provided impetus for the union. One is the enormous cost of starting up high-density memory production; the other is the risk involved in advanced technologies with new process steps. Also drawing the two together are the many years of expertise they have acquired in DRAMs on their own—both companies independently showed 16-Mbit samples last year—as well as the successful cooperation in 64-Mbit DRAM chips, which were manufactured at IBM's facilities at East Fishkill, N.Y.

For IBM, the agreement ties

in with its strategy of entering alliances in an effort to recover from its financial doldrums and regain markets that have been lost to Japanese and American competitors. For Siemens, the deal strengthens its technological base and guarantees its customers long-term availability of key components.

Following what IBM executives call a "very aggressive schedule," fabrication will begin at the end of this year. It is predicted that the first devices will come off the production lines around mid-1992. □



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## BRIEFING

## HP'S 95LX PALMTOP IS FRUIT OF A REMARKABLE ALLIANCE AMONG ERSTWHILE RIVALS

## ANATOMY OF 'COOPETITION'

BY SAMUEL WEBER

When Hewlett-Packard Co. introduced its 95LX palmtop computer in April, it not only celebrated the debut of a remarkable product, it also sent two significant signals to the global electronics community. First, by forming a unique alliance with four major corporate partners who often compete fiercely, HP established a paradigm for the way complex product development may be conducted in the future. The 95LX is a prime example of what one industry wag has dubbed "coopetition." Second, it showed that the U.S. still has the capability to out-innovate and one-up the Japanese in developing unique products.

HP's unprecedented alliance with software mavens Lotus and Microsoft, and hardware heavyweights Intel and Motorola, resulted in the 95LX moving to market just 15 months after it was defined. Lotus Development Corp. contributed its 1-2-3 spreadsheet and a suite of organizer tools, plus file-transfer and management utilities. Microsoft Corp. furnished a read-only-memory version of DOS 3.22 for the operating system. Intel Corp. provided a custom ASIC chip that handles all the PC-compatible peripheral functions, such as display and keyboard control, and special features like sound and low-battery-power detection. And Motorola Inc. added a new dimension to portable computing in the form of DataStream, its miniature data receiver and nationwide data-broadcasting service to be available in the fall. It will enable HP's palmtop to receive data messages anywhere in the continental U.S.

With the full functionality of a PC XT (but 2.5 times faster), the 11-oz palmtop

packs these extras plus advanced calculator functions and broad communications capabilities—all for less than \$700. With its built-in spreadsheet, appointment book, phone book, and memo editor, it has a big edge over such other personal organizers as Sharp Corp.'s Wiz-

## PARTNERSHIPS

Terpack holds. "In a world in which a whole host of elements have to come together—hardware, software, distribution, communications technology—it's extremely important to leverage other people's expertise and not try to duplicate that," he says. "None of us has unlimited resources and none of us can make the investment necessary to have the world-class capability that you can have if you choose world-class partners."

This sentiment is echoed by Jerry Erickson, 95LX R&D section manager. "It took us about 15 months to get from where we actually committed to the project and [when we] were able to start manufacturing and delivering it. This is remarkable when you consider that it was a brand-new architecture for our division, a new IC set, and a new software set," he says. The key, Erickson says, "was the ability to leverage industry expertise that existed."

In the world according to Intel, "It's almost an idea where you're supplanting the idea of partnerships with 'co-travelers,'" says Mike Eisele, Intel's program manager of subnotebook PC products in Chandler, Ariz. "Global markets require integration of multiple technologies. You combine where there is a mutual interest. In one area companies may compete, and in others cooperate. In terms of managing risk and especially time to market, this kind of cooperation will be more the pattern in the future."

The "coopetition" that went into the creation of the 95LX was to some degree a result of serendipity. Both HP and Lotus had developed similar concepts for such a product at about the same time. "I had been working on some ideas of getting Lotus into the consumer electronics business," says Leon Navickas, general manager of R&D at Lotus in Cambridge, Mass. "The people at HP instantly picked up on my proposal, as they had similar things going on in their lab." Lotus, says Navickas, wanted "to try and expand [its]

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[LL competition-, com-  
petitūs, pp. of com-  
(1605) 1: the act of  
competing:  
RIVALRY 2:  
a contest betw-

**co-op-er-a-tion** \kō-  
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**co-op-er-ate** \kō-ə-  
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co-operari to work-more at  
OPERATE] (1616) 1: to act or wo-  
with another or others; act together  
2: to associate with another or  
other for mutual benefit-  
co-op-er-a-tion \-,rā- shən\

**co-op-er-a-tion** \kō-ə-p-ə-'tish-ən\  
[cooperation-, competition] (1991)  
neologism to define the act of working  
with others toward a common goal  
with the intention of competing against  
those same others once the goal has  
been attained.

ard and Casio's Boss. And because it is built around DOS 3.22, it can interact with a desktop PC, which market research told HP was an important feature to prospective users.

The backing of the 95LX by such an imposing lineup of partners almost instantaneously legitimizes the palmtop in an emerging market characterized by disparate products with nonstandard operating systems and somewhat limited capabilities. Perhaps as important, it indicates a growing trend toward intra-industry cooperation, where mutual interests exist, to cut costs and time to market.

"In today's market you have to be very fast moving," says Dan Terpack, general manager of HP's Corvallis, Ore., Division, "and I don't think any one company can do it all by themselves, especially at the pace that it has to be done." To compete requires alliances.

market beyond traditional PCs. I set down specs of what was sort of the 95LX and took them on the road to the Far East and the West Coast. I spoke with about a half dozen leading consumer electronics companies to gauge their interest in partnering with Lotus," with the software giant's role defined as the licensing of embedded technology. Navickas likens the approach to the Dolby stereo business. "Every cassette deck has Dolby in it, an essential piece of functionality. We thought that Lotus 1-2-3 and our personal-organization tools could be the same kind of essential applications for palmtops."

**A**s far as prospective partners, Navickas says Lotus had "an embarrassment of choices" but felt the greatest kinship with HP. "A lot of light bulbs went off, and they recognized this was the right thing," he says. "For our part, we recognized immediately that they were the easiest people to work with, the best people in the world to partner with to establish this new category of computing instrument. They had the hardware-design know-how to build it and support it, and they had the sales and marketing infrastructure in consumer electronics and calculators to distribute the product. It was a win-win situation."

For HP, the product evolved out of a desire to expand the market for the Corvallis Division, whose mainstay products were handheld sophisticated calculators. In this mature business, says Terpack, "To get significant growth you have to take significant market share from other players—not the easiest thing to do when the market is that mature." But Corvallis managers had "seen things like personal organizers come to market and the expansion of functionality of handheld products," Terpack says. "We began to think about how we could put together something consistent with what we've done in that arena to come up with a highly functional, premium, best-in-class product."

To reach that apogee, it became obvious that communications were one essential ingredient and a link to the desktop in a PC with integrated applications another. From other companies' marketing plans, "We knew it was going to be an arena that represented an opportunity," Terpack says. "We wanted to be in with the first product that really began to establish this market and stake out a leadership position; that was

one of the things that drove us to form alliances." Lotus's arrival may have involved ESP: "They called us a week before we would have called them," Terpack says.

Upon Lotus's entry, says HP product manager Kent Henscheid, "we went out and did some research targeted at Lotus users showing a more specific rendition of the product concept, with a number of alternatives." They found enough interest to make the project a go, and then turned their attention to Motorola. The wireless-messaging capability that company had announced would be important to laptop users, HP believed. "We showed them what we were doing in handhelds," says Henscheid, "and they really jumped on that."

The next duck to line up in the row was Intel, which HP hoped would weigh in with the crucial ASIC. This device, along with a NEC Corp. V20 processor, forms the heart of the 95LX. "We have a lot of in-house IC expertise," Terpack says, "but what we don't have is standard cells and a PC architecture." With HP's concepts and the design savvy of Intel, "we jointly developed and implemented" the IC.

**I**ts creation was no walk in the park for the chip maker, says Intel's Eisele. Intel engineers had to create some new cells to accommodate HP's definition. "They were trying to achieve a very high level of integration to reach their power and size requirements," he says. "In parallel with the shared chip development, we had to define a custom cell that became part of the library used to execute the chip." Despite HP's aggressive schedule, he adds, "engineering samples of silicon were delivered within one day of the schedule." Intel has a vested interest in the 95LX because of its own stake in the portable computer market, says Eisele. "Up to now the focus has been notebook systems, but we're also trying to bring the benefits of the open DOS architecture with the appropriate standards that apply to palmtops. So we're

**"BY OFFERING  
A STANDARD  
SPREADSHEET  
AND OS,  
THE 95LX  
LEGITIMIZES  
THE MARKET."**

very pleased to support HP and cooperate in that standardization and market-development effort."

For a standard OS that would provide seamless interaction with desktop PCs, HP turned to Microsoft. The Redmond, Wash., company's role was supplying the ROM version of DOS 3.22, which it was already marketing in the Far East and in non-PC applications where a hard disk doesn't play a role, says Sergio

Pineda, product manager of the DOS group. Such applications include point-of-sale and data-collection terminals. Microsoft saw the 95LX as an opportunity to broaden its market, Pineda says.

He adds that the machine will offer some much-needed standardization in a palmtop market where each vendor has so far had its own proprietary operating system and very specific applications. "By offering a standard spreadsheet and operating system, and a shell that's compatible with every desktop PC, it legitimizes the market," Pineda says. Microsoft is already working on a ROM version of the recently introduced DOS 5.0 for this market, says Pineda.

So far this improbable roundelay of competitors cooperating on a proprietary product promises a happy ending for everyone. Intel's Eisele sums it up this way: "Motorola is the leader in communications technology and Intel is the leader in computing technology. It's not surprising that both [of them] benefit in the growth of the palmtop market, as opposed to fighting over it. We envision a huge market that really takes off once we have the ability to economically integrate computer and communication technology. So we view the HP project as a very cooperative synergistic effort."

From the software side, "There's no question that MS-DOS is the standard operating system, and having that available on the HP 95LX is a benefit to customers," says Lotus's Navickas. "We don't do operating systems, but there's no argument that we have the de facto standard in spreadsheets with Lotus 1-2-3. I don't see any threat from Microsoft in that area." □

Tools

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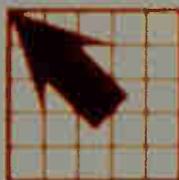
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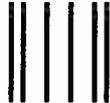
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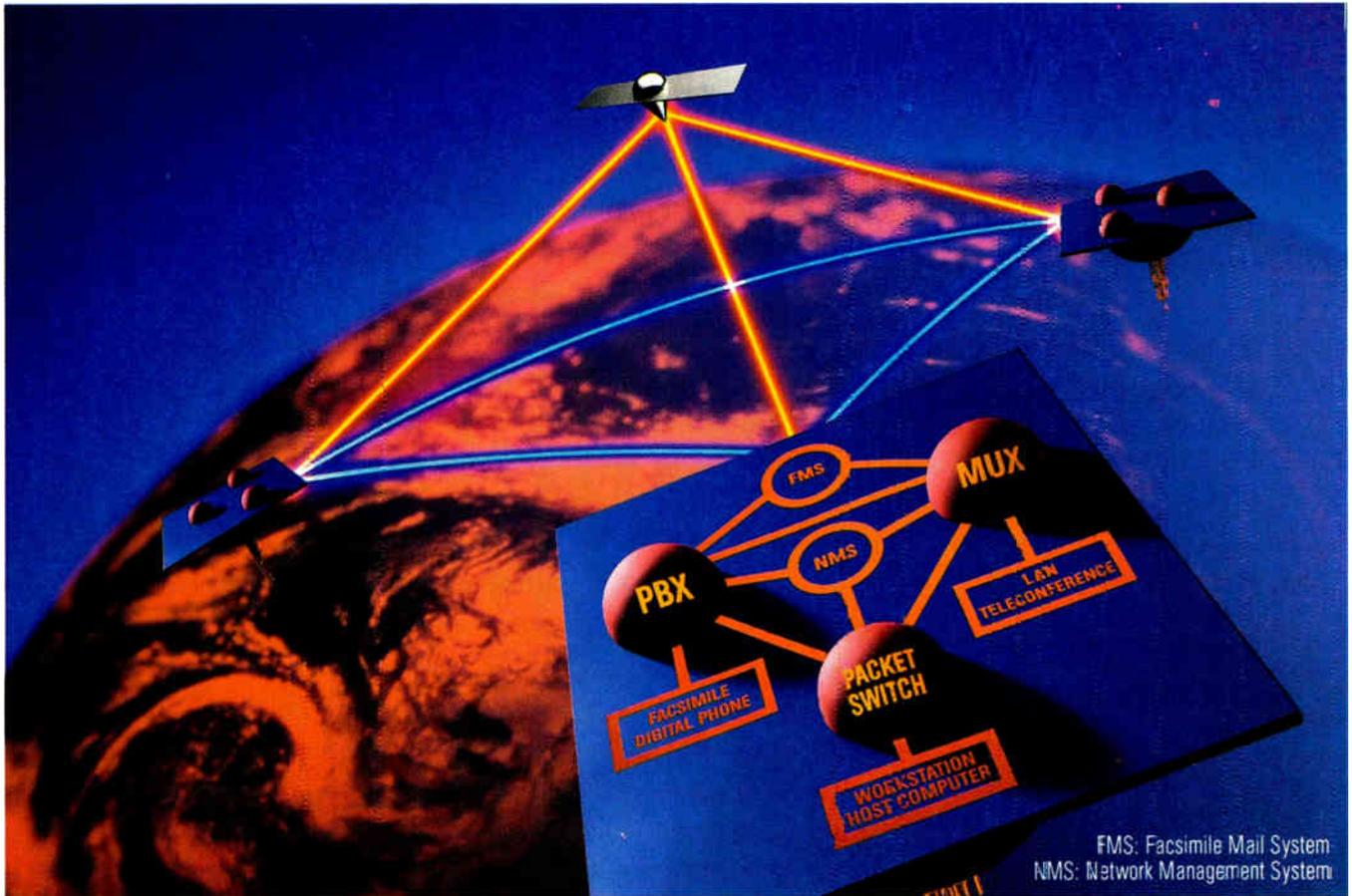
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# FRIEND OR FOE? LIFE ON THE

## TENSIONS MOUNT AS IBM AND MICROSOFT DRAW BATTLE LINES AND WOO INDEPENDENT SOFTWARE VENDORS

BY LAWRENCE CURRAN

**A** battle is raging between IBM and Microsoft for control of the desktop personal computer market, and the chief weapon is the operating system. For the moment, Microsoft Corp. has a huge lead, thanks to the runaway success of Windows 3.0. But IBM Corp. is pushing hard to jump-start its OS/2; a centerpiece of its strategy is recruitment of independent software vendors (ISVs) to port applications to the new OS/2 2.0.

So if you face a decision about which desktop OS to choose for the long term, be advised that Microsoft's MS-DOS/Windows 3.0 and its upgrades likely will maintain their lead for the next few years. But the first little cracks are developing in Windows, and it's never a good idea to dismiss IBM, especially when Big Blue makes a commitment to a product the way it has to OS/2 2.0.

The once-congenial relations between IBM and Microsoft have become sorely strained over the wrangling. The leak in June of an internal memo from Bill Gates, founder and chairman of the Redmond, Wash., software house, to his executive staff identifying IBM as a foe focused public attention on the long-rumored stress between the two giants in their fields. Until then, their battles had remained beneath the surface.

The announcement last month of an alliance between Apple Computer Inc. and IBM undoubtedly will widen this rift (see p. 27). Among other things, the two computer makers will codevelop an object-oriented operating system to run on both PCs and Macintoshes. It will be crafted by an independent company to be jointly owned by Apple, which is based in Cupertino, Calif., and IBM, headquartered in Armonk, N.Y. Since products won't be out for at least three years, most industry analysts don't expect this development to have any near-term market impact—which

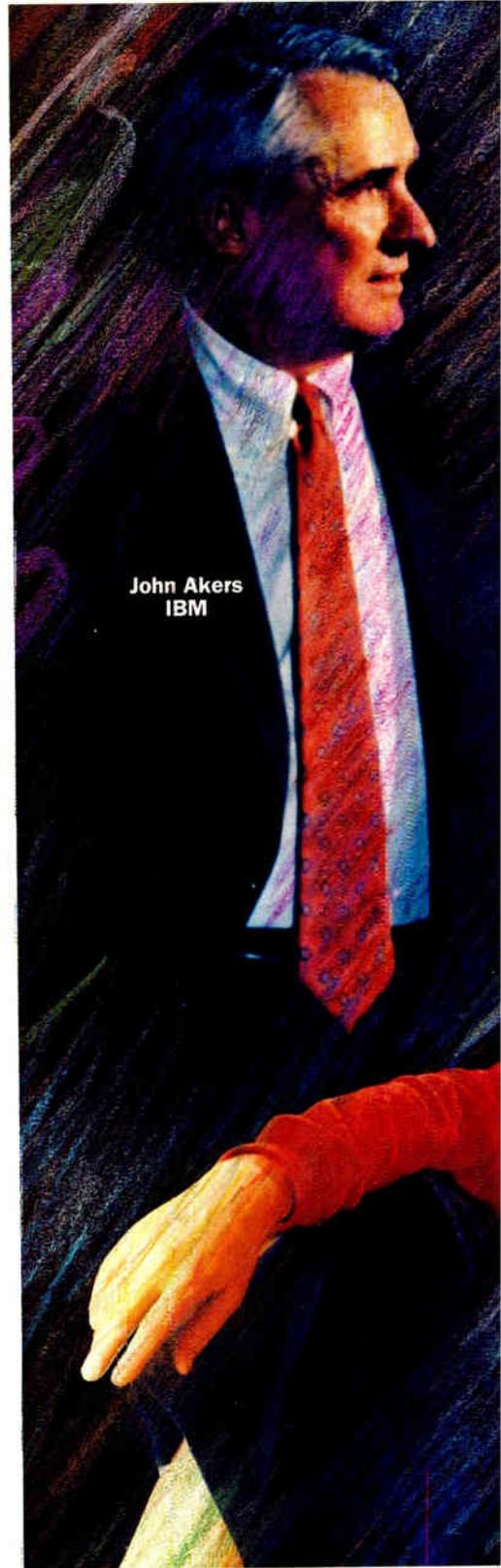
leaves IBM and Microsoft as the chief PC operating-system combatants until the mid-1990s.

Analysts vary in their operating-system projections for the period through 1995, but most expect MS-DOS/Windows 3.0 to be the leader by far on the desktop. Nevertheless, some chinks are beginning to show in Microsoft's armor, and IBM could upset the estimates if it does as good a job of implementing OS/2 2.0 as it is in promoting it. Version 2.0 is due out late this year.

While DOS with Windows will remain dominant, "OS/2 will make some gains by the mid-'90s," says Nancy McSharry, an analyst in market-research firm International Data Corp.'s Mountain View, Calif., office. In fact, McSharry says Microsoft may be vulnerable because of user disappointment over Windows, which can't handle some of the more complex functions that OS/2 can. For example, Windows is not good for networking, she points out.

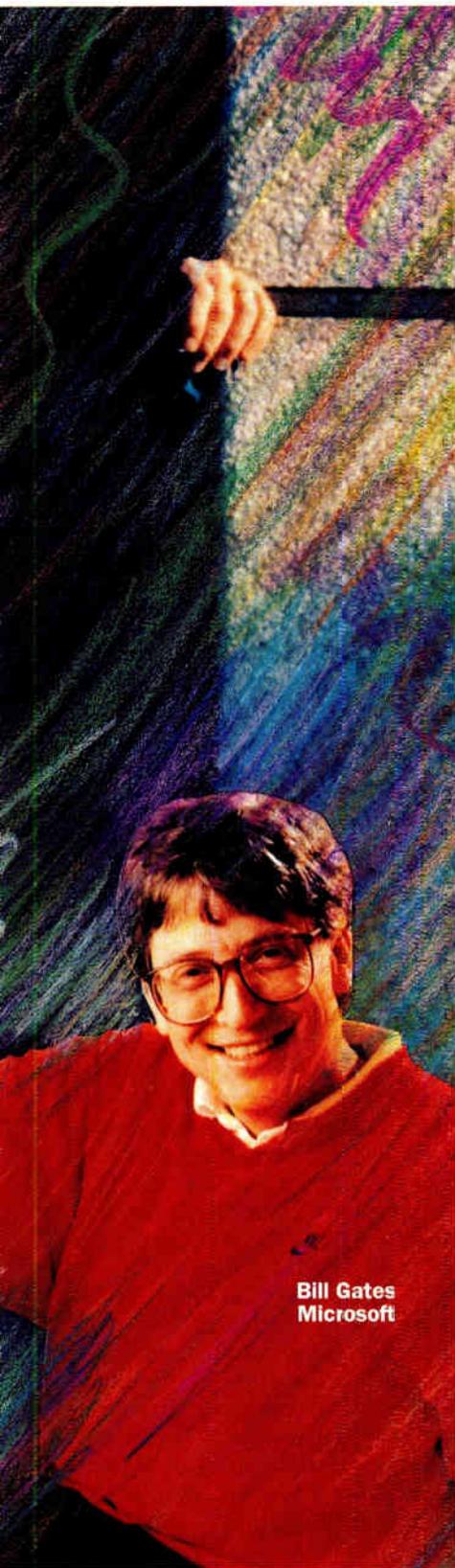
**"A** lot of people may feel they've been duped by Microsoft," McSharry says. "They thought [Windows] would be the be-all and end-all on the desktop, but you really need a systems integrator to make it work. So if OS/2 2.0 does what IBM says it does, a lot of ISVs could take another look at it." The result might be a desktop split, McSharry adds. "OS/2 may be used as an access front end for corporate data, with Windows 3.0 being used for personal productivity programs," such as word processing and spreadsheets. Such a take on the future is widely held in Europe (see p. 49).

The most important measure of a PC operating system's success is the number of application programs it can run, such as word processors, spreadsheets, and data bases. The wooing of ISVs that both IBM and Microsoft continual-



John Akers  
IBM

# FRONT LINES OF THE OS WAR



Bill Gates  
Microsoft

ly mount is to have them port those all-important applications to their respective operating systems.

IBM is working hard to court vendors; Big Blue expects to have more than 24,000 programs to show for the 32-bit operating system by the time it is delivered. Microsoft is quick to point out, however, that 22,000 of those are existing DOS applications that already run under Windows 3.0. Further, Jonathan Lazarus, Microsoft's general manager of system software marketing, says another 1,300 new applications were specifically written for Windows, a number that could reach 2,000 soon.

The days of cooperation and fraternal competition between the two firms are over. IBM and Microsoft worked together to develop OS/2-Presentation Manager, IBM's graphical user interface. But OS/2 2.0 is primarily IBM's development, and Big Blue finds a rival in Microsoft's own version, OS/2 3.0. This advanced operating system, due out in 1992, will roll DOS, Windows, and OS/2 into a single environment but won't be compatible with 2.0.

The Gates memo paints IBM as an archrival. Among other things, Gates wrote that "making sure Windows is the winning [PC] OS is our highest priority. Eventually, we need to have at least a neutral relationship with IBM. For the next 24 months, it may be fairly cold." IBM's response to the memo's publication in industry journals has been typically subdued. John Soyring, director of OS/2 software developer programs based mainly in Austin, Texas, remarks laconically: "It's interesting reading, and a lot of inquiring minds will want to know about it."

Microsoft's Lazarus acknowledges in the wake of this infamous document that "the relationship [with IBM] is strained. We're on very different courses. There have been arguments in the past, but they were always 'under the covers.' This one is out in the open."

Whether the IBM-Microsoft relationship is running hot or cold, "DOS will be a leading PC operating system well into the '90s," according to IDC analyst McSharry. "DOS is aided by the predominant strength of Windows 3.0,

which is predicated on DOS, and also by the fact that OS/2 had its troubles in its formative years," McSharry says. "There was no clear migration path for OS/2. ISVs had to learn how to write new applications while learning a new operating system." McSharry projects that while the installed base of non-Windows DOS will grow at a compound annual rate of just 17% between 1990 and 1995, MS-DOS/Windows 3.0 will hit 41% over the same period. IDC estimates that the growth rate for all versions of OS/2 will be even higher, but from a much smaller base.

**D**espite such bearish projections for OS/2, some of the key ISVs have a different view of the battle. "We think OS/2 is a lot stronger than many people think right now," says Matt Miller, director of technical marketing for the Desktop Group at Oracle Corp. in Redwood Shores, Calif. Miller, whose group provides data-base application software and related software tools, looks for DOS/Windows to increase in market share, but because of an OS/2 surge "not as much as many were saying a few months ago. We ported everything we had to both DOS and OS/2 [IBM's version], but OS/2 applications sold much less until a few months ago. People went to Windows for a while," says Miller, then found it wasn't the best OS for all applications. "Now they're all back asking about OS/2."

For example, Miller says that in a network where a data base resides on a server, "it's not acceptable to boot data bases from the server to the desktop client a couple of times a day to run under Windows," a logistical headache that is now required. This limitation and others like it will combine with IBM's aggressive OS/2 2.0 push to boost that operating system to a 25% to 30% market share in the next five years, Miller predicts. Non-Windows DOS will have about 25%, while MS-DOS/Windows 3.0 will have most of the remainder.

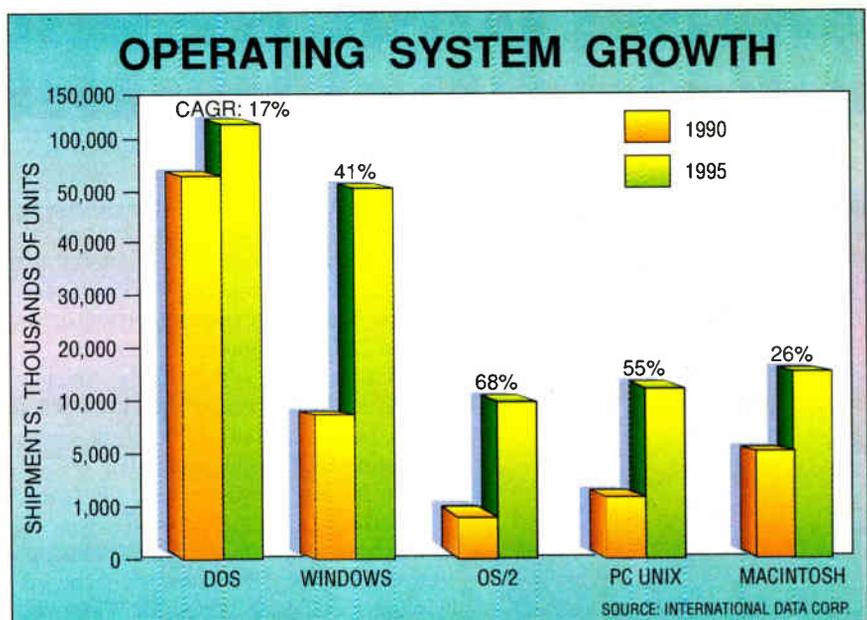
Another believer is James Neiser, director of data-base product management at Ashton-Tate, a Torrance, Calif., supplier of data bases. "A lot of [application] vendors know they have to devel-

op programs for Windows first, then ask 'what can we do for [IBM's] OS/2?' after that," Neiser says. For his part, Paul McNulty, director of marketing for the 1-2-3 spreadsheet at Lotus Development Corp., Cambridge, Mass., says, "I hear good things about OS/2 2.0. Eighteen months ago, OS/2-Presentation Manager was said to be dead. Now I hear from customers that they see the benefits of a graphical user interface such as Windows, but OS/2 2.0 could be a longer-term answer for multitasking."

**M**eanwhile, IBM is nothing if not bullish on OS/2. The company won't release its sales projections, but it has thrown all of its considerable weight behind making the operating system a major market force. Although OS/2-Presentation Manager was widely seen as near-moribund not long ago, IBM breathed new life into it with version 1.3. Now it's promoting 2.0 as only IBM can. For example, Soyering says that at \$150, IBM has priced version 1.3 some \$15 below the list price of the new DOS 5.0, Microsoft's update of the venerable PC operating system. Big Blue is offering customers a free upgrade to OS/2 2.0 if they buy 1.3 before the end of this year, when 2.0 is to be ready.

"We want to establish OS/2 as the 32-bit operating system of choice," Soyering says. Some of the moves to reach that goal involve marketing deals, a five-day OS/2 2.0 demonstration earlier this year, and marketing support for ISVs. The ISV relationships include an accord with Borland International Inc. to develop its ObjectVision visual programming tool for OS/2 2.0 and one with Lotus that lets IBM sell Lotus Notes and cc:Mail, both of which will be ported to 2.0. What's more, LAN leader Novell Inc. of Provo, Utah, is developing network-server software for OS/2, and Micrografx Inc. of Richardson, Texas, will provide a program that lets OS/2 run Windows programs from Presentation Manager.

All of this will help IBM overcome OS/2's current key limitation—the lack of a large body of application programs. Soyering estimates that of the 24,000 programs that will run under OS/2 2.0, more than 20,000 will be existing 16-bit-DOS programs. Of the rest, some 2,600 will be proprietary programs from corporate developers and—importantly—some 1,300 will be Windows programs that will run without rebooting.



But if sheer numbers tell the tale, Microsoft can crow loudly about the onrush of Windows 3.0. Lazarus cites figures from the Software Publishers Association in Washington showing first-quarter Windows sales at \$205 million, with DOS at \$725 million and OS/2-Presentation Manager at just \$25 million. "We're forecasting a 1991 run rate of 4.5 million to 5 million units," says Lazarus. "We've simply seen no parallel to the success of Windows." Windows 3.1 is in beta testing now in preparation for release this year, he says.

**A**s for recruiting ISVs, rumors have surfaced that IBM is paying them to port programs to OS/2, which Soyering denies. "There's always competition for the budget resources of applications producers, but the biggest motivating factor is their view of the market opportunity," he says. "We've shared our views of the future of OS/2 2.0 and are seeing a significant shift" in ISV direction, he says. IBM offers ISVs 10% rebates on IBM hardware, discounts on software-development tools of up to 40%, and marketing support. "A lot of ISVs view a relationship with IBM as a strong plus," Soyering says.

Microsoft's Lazarus says he's heard the rumors about IBM paying ISVs "from reliable sources, and we're operating on the basis that they're true. IBM has done it before, but we haven't. We don't have to pay people to write applications" for DOS and Windows. "Our message to ISVs is simple: write a Windows applica-

tion and it will run on OS/2, too. We'll make sure we move you forward to Windows 3.1 and beyond."

Ashton-Tate's Neiser says it's becoming fairly common for vendors of PC hardware and operating systems to court ISVs with financial support. "Several companies have come to us and offered to help support development," he says. While he won't name them, "they're all major vendors." But Oracle's Miller says he is unaware of payment offers. "I've never heard of that," he says, although "they'll wine and dine you when a new version of an operating system is coming."

Miller does, however, sense mounting stress between IBM and Microsoft. "The Gates memo declares war on IBM, and IBM has tacitly declared war on Microsoft. There's a huge amount of tension between the two, and Microsoft seems paranoid" about IBM, he says. "Their partnership has never worked well, and now Microsoft has to shoot down OS/2 2.0 in order to sell OS/2 3.0." He points out that Microsoft continues to emphasize OS/2 3.0, "which is not a direct lineal descendant from 2.0."

IDC analyst McSharry also cites the incompatibility of 2.0 and 3.0 as a source of stress. "They're two different operating systems. The 3.0 nomenclature implies that it's an upgrade of 2.0, and it really isn't. The two aren't source-code compatible, and the specs for 3.0 make it sound like a Unix variant more than anything else," she says. "It may get Microsoft into the workstation market." □

# B

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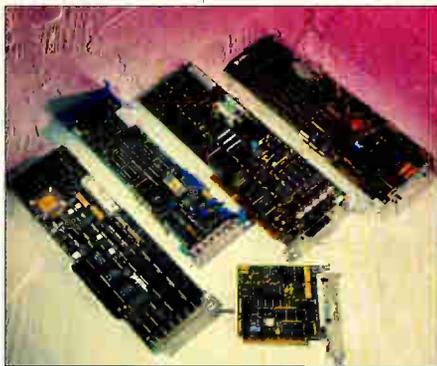


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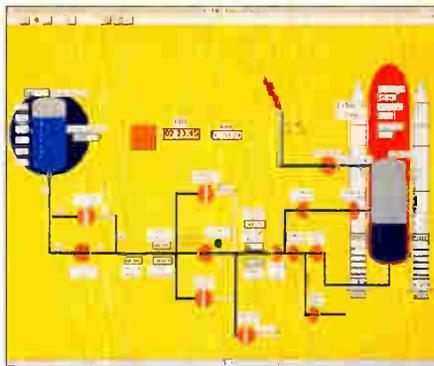
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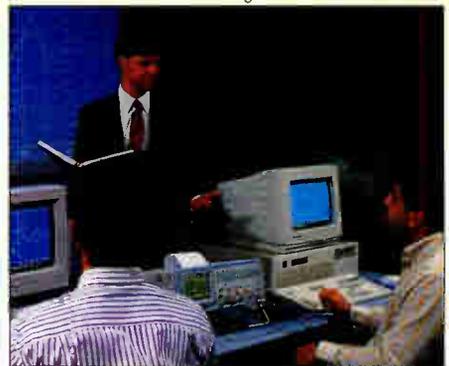
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**CIRCLE 178**  
World Radio History

# DOS LEADS, BUT OS/2 IS GAINING

## EUROPEAN PC MAKERS ARE HOPING THE TWO SYSTEMS WILL ONE DAY MERGE **BY JOHN GOSCH**

The battle between MS-DOS/Windows 3.0 and OS/2 1.3 (see p. 44) has made its mark on Europe's PC industry. Clearly dominating the market at present is MS-DOS, and predictions from the San Jose, Calif., market-research firm Dataquest Inc. are that it will continue to do so in the years ahead, although OS/2 may come to narrow the DOS lead somewhat.

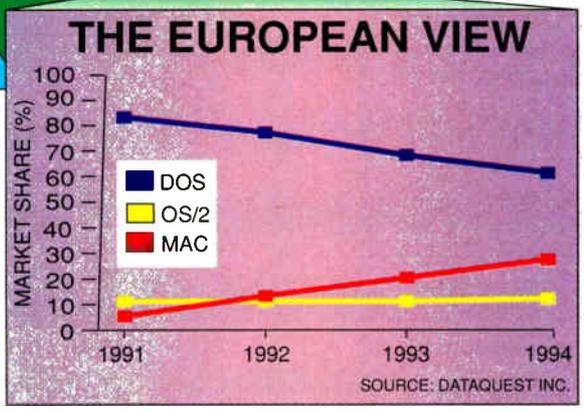
While the two systems are in competition, "I would not call this a battle, nor a serious confrontation," says Joachim Feldmann, senior director at Siemens Nixdorf Informationssysteme AG (SNI) in Munich. In fact, Feldmann believes the two will one day merge, with successors to Windows 3.0 from Microsoft Corp., Redmond, Wash., ever more closely meshing with IBM Corp.'s version of OS/2-Presentation Manager.

Perhaps as soon as the mid-1990s, Feldmann says, there will be just one user interface. "A merging of the competing systems is in everybody's interest, as that would spur PC sales," he says. "A fragmentation of the OS market will only hurt the industry."

As in Germany, PC operating systems in France, Spain, and Italy are largely the domain of Microsoft, says Martin Milautzki, an analyst at International Data Corp. in Kronberg, Germany: "The installed base of PCs in these countries is 80% MS-DOS. Mi-

crosoft got in early and has remained strong." About 250,000 copies of Windows have been sold in France, 120,000 in Italy, and 90,000 in Spain, Milautzki says. But Presentation Manager is beginning to win converts in banking and finance, he notes. Companies like France's Groupe Bull and Italy's Ing. C. Olivetti & Co. offer it. In this regard the Continent is ahead of Britain. "In the UK, OS/2 is nowhere," says Keith Wharton, head of Wharton Information Services Ltd., London, who claims OS/2 market penetration is "certainly less than 1%."

Although IBM is said to be pushing its system hard, there are several reasons why OS/2 sales



lag. For one thing, OS/2-based PCs require more memory capacity than DOS machines. For another, there isn't enough software available to lure users to such PCs. Finally, the 1.1, 1.2, and 1.3 versions of OS/2 do not fully exploit the capabilities that Intel Corp.'s 386 and 486 CPUs offer. However, IBM's upcoming OS/2 2.0 has an edge over DOS in that it offers such features as

multitasking, memory protection, and virtual addressing. So in the near term, "unless Microsoft succeeds in eliminating MS-DOS's weak spots, OS/2 will gain in acceptance and market share," SNI's Feldmann predicts.

But Feldmann does not expect a complete reversal of the DOS-to-OS/2 ratio any time soon. One indicator is that European software houses are spending far more money developing and porting applications to MS-DOS/Windows than to OS/2, he says. Much in the news in Europe these days is MS-DOS 5.0, the OS Microsoft announced in June. The firm's German subsidiary expects steady 15% annual growth in German-speaking areas alone for the next few years. Microsoft will also offer an update package enabling many of the world's more than 60 million DOS users to upgrade their computers.

Independent software vendors are few and far between in Europe, and active mainly in niche markets. Because U.S. ISVs of the likes of Borland International, Lotus, and Microsoft operate globally and hence command volume, they can easily exert their influence on European markets. PC users in Europe mostly depend on U.S. shrink-wrapped applications sold with the equipment.

"But Europeans have a good chance to get active in the software supply market," says SNI's Feldmann; and his company is a good example. For its PCs SNI offers what it calls Comfo Products, a Windows 3.0-based program that includes editors, queries for data bases, and gateways for networking. To date Comfo Products has won several major financial and industrial contracts.

Standing apart from the DOS-OS/2 joust is Apple Computer Inc., which is doing particularly well in the UK. Indeed, Wharton analysts expect that when figures for May are released, they will show that the Macintosh has ousted market leaders Compaq Computer Corp. and IBM out of the top-supplier spot for the month.

Though IBM and Compaq watched their UK shipments drop dramatically in the first quarter, Apple itself is more modest about its fortunes. "We are certainly in the top three now and very close to both IBM and Compaq," says spokeswoman Judith Coley. She says Apple's share is around 15%, compared with about 20% each for IBM and Compaq. □

With additional reporting by Peter Fletcher and Andrew Rosenbaum

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CIRCLE 173

World Radio History

# PC OS WAR WILL SPUR A LAN SHOWDOWN

## THE DESKTOP WINNER COULD IMPACT NETWORK OPERATING SYSTEMS, BUT DON'T TELL THAT TO NOVELL **BY JACK SHANDLE**

**T**he battle for control of the desktop might just be spilling over into the local-area network. The big, unanswered question is to what extent the desktop winner—which at this point seems to be Microsoft Corp.'s DOS 5.0 with Windows—will have on determining market share among network operating systems. Microsoft thinks desktop and network operating systems are going to be based on a single OS kernel. If that is the scenario, the desktop winner will matter a great deal. Novell Inc.—with 70% of installed nodes, the leader in the network OS (NOS) market—thinks the crowning of the desktop king will not matter one whit. The company holds that the desktop world is too heterogeneous for a monolithic networking solution.

At the heart of the debate are contrary perceptions of the future computing environment. A distributed-processing model, in which tasks are spread evenly across the network irrespective of which desk they originate on, will require tighter and tighter coupling between the microcomputer's operating system and the network's. This is Microsoft's view, and if true it could mean that the Windows vs. IBM OS/2 duel (see p. 44) will have an impact on NOS market share. But if most processing remains on the desktop where the task originated, then there is no need for a homogeneous OS and the network can concentrate on providing connectivity. That is Novell's belief.

Two things seem certain. First, the NOS shakeout will continue with Novell Netware, Microsoft's LAN Manager, and Banyan Systems Inc.'s Vines all but excluding the other NOS players. These also-rans include IBM Corp.'s LAN Server and Digital Equipment Corp.'s Pathways. Second, this technology consolidation will spur even more partnerships between system vendors and NOS companies. One such alliance that made a big splash this year is IBM's agreement with Novell to sell and service Netware.

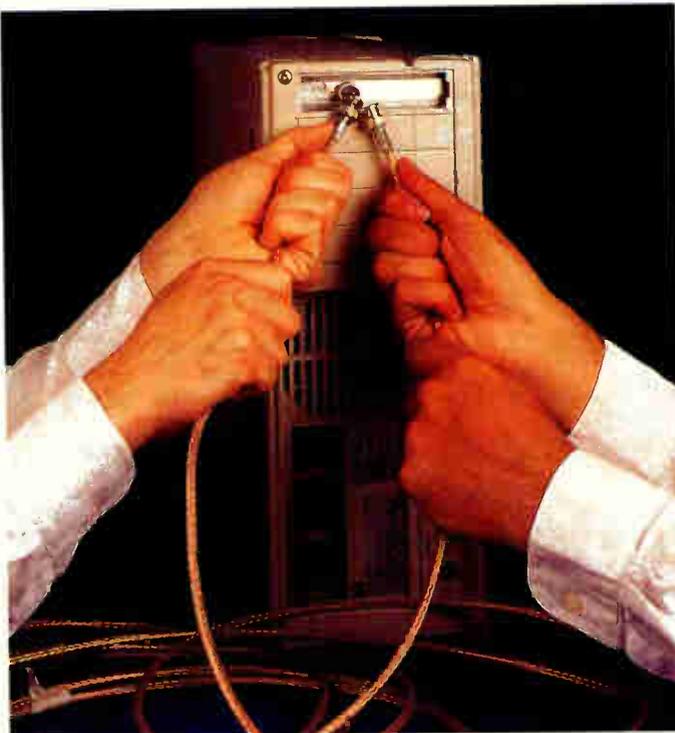
Besides underscoring IBM's shift from dependence on Microsoft, the accord opens the door for Novell to gain

### **NETWORKING**

Fortune 500 accounts the Provo, Utah, company had not been able to crack on its own, says Bill Redman, vice president of the Gartner Group, a Stamford, Conn., market-research company. In late June, Novell followed up with an international announcement: it had begun shipping a Japanese version of Netware supported by Fujitsu, NEC, Sony, and Toshiba.

In Redman's view, the contest for market share will depend as much on strategic partnerships of this sort as it does on superior technology. "System vendors will increasingly take on the role of NOS value-added reseller," he says. Companies like IBM and Hewlett-Packard Co. "will be offering several seemingly competitive products to obtain the desired systems or hardware sale."

Microsoft, based in Redmond, Wash., has already licensed LAN Manager to 24 original-equipment manufacturers, says LAN product manager Rich Barth. And Banyan, in Westboro, Mass., scored a coup late last year by signing a joint integration agreement with Compaq Computer Corp. But even with the help of the Houston hardware giant, most observers think Banyan needs more marketing clout. "Banyan has the best NOS technology of any of the three vendors," says Frank Costa, president of Protocols Inc., a Beaverton, Ore., developer of integration software. "No one outside Novell and Microsoft is likely to challenge that. But this is not about technology. It is about market



### **PLUGGING IN**

*The Big Three—Novell, Microsoft, and Banyan—are jousting for sockets in the networks of the '90s.*

muscle and partners." All three companies—Novell, Microsoft, and Banyan—share some basic strategies. Each is busy signing up independent software vendors to support its products. And all three have to give the best possible support to application-program interfaces (APIs) for both Microsoft's Windows and IBM's OS/2 PC operating systems.

The Gartner Group is one of the leading proponents of the distributed-processing view of the world. It has forecast that the uses of networked PCs will change radically in the next five years. Monolithic applications, in which all processing is done on a desktop, will drop from 70% to 35% of total PC use by 1995, Gartner says. Distributed functions—such as having a compute server do the calculations and return an answer to the desktop—will increase from 5% in 1990 to 21% in 1995, predicts the firm.

This can only be accomplished if the NOS products enhance their functionality. When LANs did little more than transport files from one computer to another, tight coupling between the PC's operating system and the NOS was a low priority. But the NOS of the future will have to be closely coupled with the desktop OS, in the world

according to Gartner, as multiple applications begin running on a single compute server, electronic mail is widely used, and security becomes a priority. Advanced NOS functions will include expanded directory services, network management, resource allocation, synchronization, remote procedure calls, security, and accounting, says analyst Redman.

Directory services, for example, are required to locate distributed resources. If properly implemented, they should shield applications developers, users, and administrators from geography and network topology. Management services integrate and oversee the physical and logical network. Resource allocation gives the NOS the ability to allocate such system resources as file and application servers and communications according to peak demand or priority. Syn-

chronization services provide a mechanism for consistent timekeeping for data-file integrity. Standardized remote procedure calls allow portable distributed applications development. Security services provide, as near as possible, the security level available on a mainframe network. Accounting services show an administrator which users are taking advantage of which resources.

The enhanced NOS functionalities are a tall order, and how they will be implemented between the NOS and the

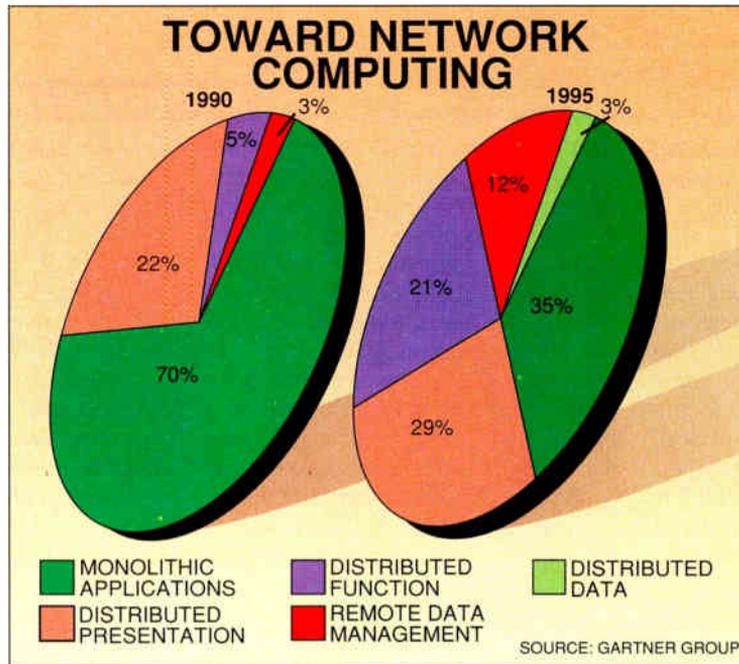
perservers, it will also run on MIPS Computer Systems Inc.'s R4000 reduced-instruction-set-computer platform, which was selected by the Advanced Computing Environment consortium as a processing highway to the future. Eventually, says Barth, the NT kernel will support other RISC processors and will someday have a Posix-compliant subsystem.

The first step toward NT is not far off. Microsoft plans to release its WIN 32 development kit of 32-bit programming interfaces to software developers later this year. With 2 Gbytes of addressable memory, it will support programs with 16-bit Windows APIs plus the upcoming 32-bit Windows applications. Although Microsoft is betting the ranch on Windows, NT will also accommodate rival OS/2. "WIN 32's APIs are structurally very similar to OS/2's APIs," says Barth. "So you should be able to convert all your OS/2 applications to run under NT."

From Barth's perspective, Novell has a much more difficult task in front of it. "Novell has said it will implement Netware as an OS/2 server," he says, "but it has not said when. LAN Manager was built on OS/2 and already

does that, which illustrates the fundamental difference between Novell and Microsoft." Barth believes Netware must pay a price in the 1990s for the success it enjoyed in the 1980s, when file sharing was the dominant NOS function. "It dedicates huge resources to file sharing, so Netware is very fast," he says. "But Novell's architecture is not conducive to migration to a multitasking, multiprocessing operating system. We are going beyond file sharing to enhanced services."

Novell's view of its own future is quite different. "From our perspective, we cannot be aligned with any particular desktop," says Kanwal Rekhi, Novell's executive vice president for product development. "We think the desktops will adapt to the network rather than vice-versa." Novell's technology thrust is toward greater connectivity, reliability,



*Some observers say the use of desktop computers linked to networks will change dramatically by 1995.*

desktop will be the primary differentiator for NOS vendors. Microsoft is in the unique position of having control of both the OS and the NOS. "The priority is to extend Windows and support OS/2," says Barth. The bridge between Windows and the upcoming heir to LAN Manager—Microsoft will not give it a name—is a 32-bit OS kernel that Microsoft calls NT, for New Technology. In short, the same NT kernel will reside on the desktop and in the NOS.

"A huge portion of the desktop market is heading toward Windows," Barth says, "because it is matched to today's hardware. NT will take existing applications and go the next step forward. It is a logical extension of Windows." The NT kernel will run on the traditional Intel Corp. 80x86 microprocessor platforms. But of particular interest to makers of computers used as network su-

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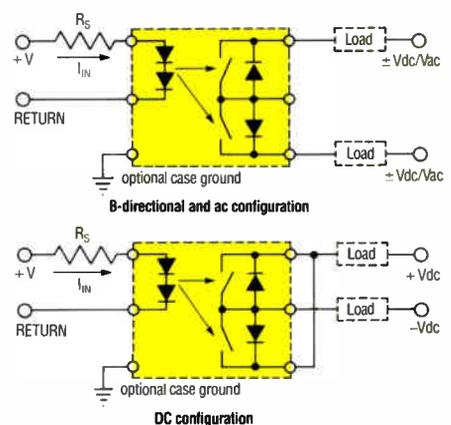
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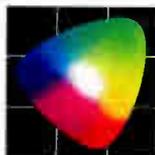
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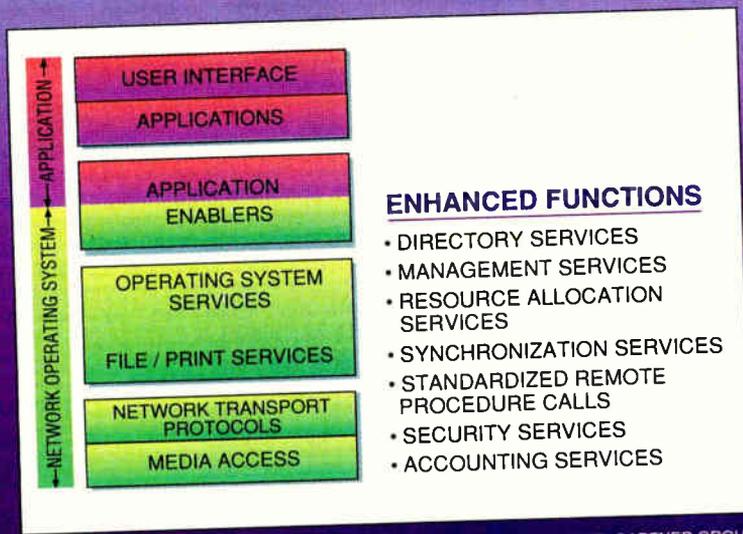
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*Changes in the corporate computing model will dictate the need for enhanced services for network operating systems.*

robustness, and performance, he says.

Unlike Microsoft, Novell does not have a grand unifying plan. It sees the need to connect computers running DOS, OS/2, Unix, and Macintosh System 7 as the major challenge for NOS vendors. Such a heterogeneous world brings with it a great deal of complexity, and Novell believes the best place to deal with that complexity is in the network server—not in the PC. But this does not mean Novell is uninterested in consolidation, particularly in the Unix environment. It bought a major stake in Unix System Laboratories and is actively promoting that company's flavor of Unix, although Netware will support other versions as well.

The third member of the NOS trika, Banyan, shares Microsoft's vision of distributed processing but lacks its rival's access to the desktop. Its architecture accommodates desktop systems rather than trying to re-create them. By consistently promoting a "top-down," strategic-implementation scenario of a corporation-wide computing environment, says Gartner's Redman, Banyan has taken a share of the Fortune 500 accounts that were willing to break away from IBM. Because of its advanced technology, he says, the company will have a chance to double its market share to 20% in coming years. But to do so, Banyan must break out of its self-de-

defined role as a niche player, he adds.

Although the consolidation of the NOS market will be the major dynamic driving the LAN industry during the 1990s, it is overly simplistic to conclude that it will lead to a relatively homogeneous environment. Companies that were built on stitching together heterogeneous networks—such as Cisco Systems Inc., Menlo Park, Calif., and Protocols—will have plenty of work to do. "Over the next five years, I do not see consolidations affecting us much at all," says Protocols' Costa. "Our customers have a large installed base, and there is no move afoot to rip the old networks out."

Consolidation will actually help companies like Cisco, which specializes in bridge and router hardware and software, says Doug Tsui, marketing manager. As a wide-area-networking company, Cisco connects LANs and keeps track of what is going on among them. "Consolidation means we can focus on more advanced support for a smaller number of network types," Tsui says. Cisco's software will soon be able to handle security functions as well as going into much greater detail on network statistics than is now possible.

Consolidation on the DOS side of the desktop is also important because it leaves more room to support Apple Computer Inc.'s AppleTalk. "People don't talk very much about AppleTalk," Tsui says, "but it is very important. We

see 10% to 20% Macintoshes in our networks." Protocols' Costa agrees: Apple "is not a dynamic—it is a given," he says. "Apple is going to be an 8% to 10% player, but it will be on the short list of the four or five NOS we have to support." Unix will play a somewhat similar role, he says, by cutting into the total size of the NOS market—but only when the various versions become binary-compatible, which will lead to shrink-wrapped software. "We'll support [Unix] in the same paradigm we support DOS and OS/2," he says, "as a relatively low-cost, shrink-wrapped business."

Some see Unix as a competing NOS that might well be added to the list of Netware, LAN Manager, and Vines. It has the advantage of being a computer operating system and a NOS rolled into one. It also has the advantage of being portable—the same Unix that runs on a PC can run on a mainframe or minicomputer. But Novell's Rekhi points out that Unix networking is based on a peer-to-peer model that was common for mainframes and minis. The client-server model dominates PC LANs.

"In our view," he says, "the peer-to-peer model does not work in the PC environment because every individual controls his desktop, not sharing its resources with others." If Unix has any ambition to be on the desktop, "it will have to give up the peer-to-peer model."

It is probably an understatement to say that the future direction of the networking world is uncertain. But it is safe to say that with consolidation under way, a complex mosaic of corporate interests is now forming. Backing up Novell, Microsoft, and Banyan are the traditional NOS value-added resellers along with a new crowd of systems integrators and platform vendors, such as DEC, HP, and IBM. Many of these ancillary players have their own NOS; as recently as a few years ago, offering a competing NOS would have been unthinkable.

Further out on the fringe are big PC companies like Acer, AST, Compaq, Dell, and Tandy. With no NOS of their own, they do not want to be left at a disadvantage as the IBMs, DECs, and HPs become more deeply enmeshed with NOS vendors. Floating above the scene are interoperability consortia such as ACE, which aim to broaden the reach of work-group computing into RISC platforms. By 1995, networking will be the name of the game in business arrangements no less than in technology. □

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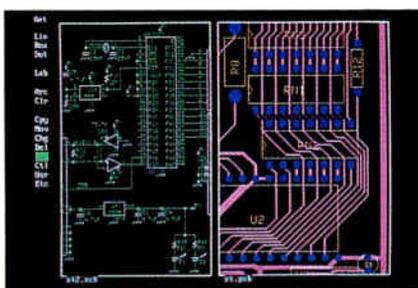
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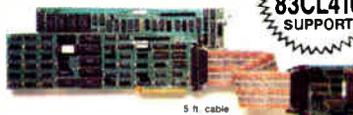
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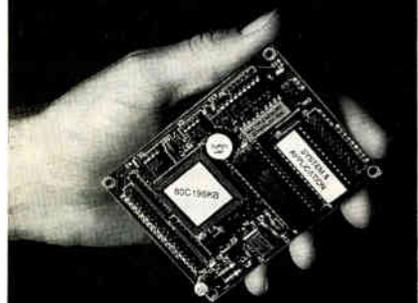
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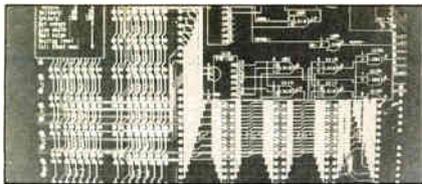
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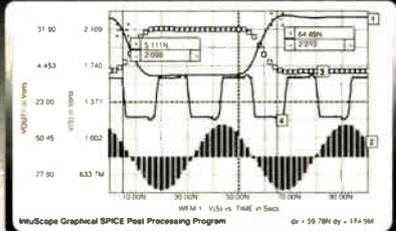
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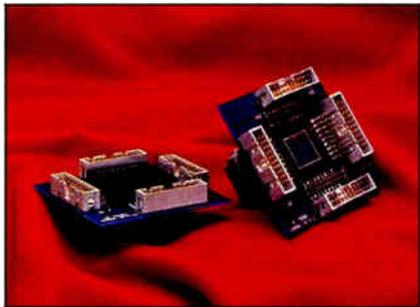
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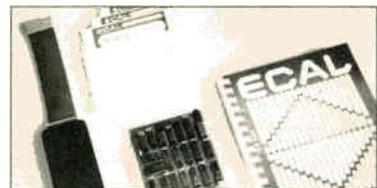
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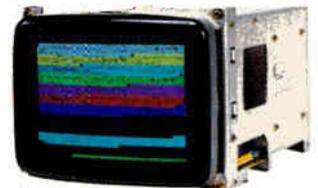
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# INDUSTRY AWAITS A COMEBACK AFTER A VOLATILE YEAR

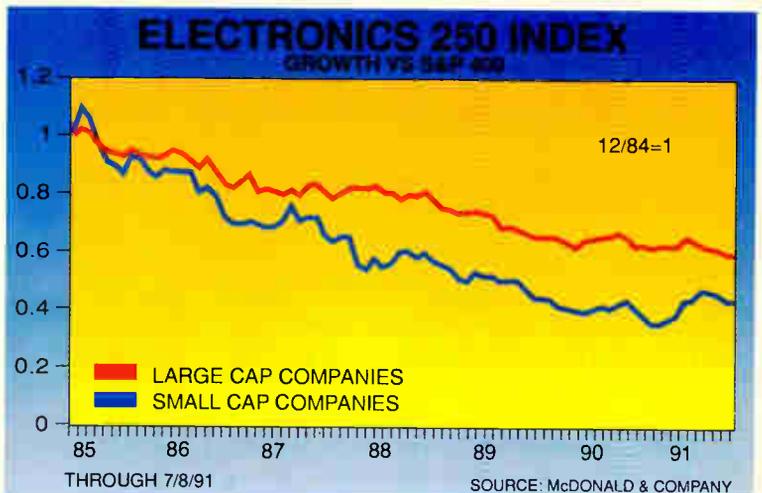
**E**conomic news is increasingly positive, and there appears to be little doubt at this point that the economy will return to an expansionary mode before the end of this year. Auto and housing demand are increasing, indicating that the consumer has returned to the marketplace. The industrial sector is still lagging, but trends should improve by the fourth quarter.

The electronics industry has suffered greater than usual volatility this year. The end of the war in the Middle East, the general economic slowdown, PC price wars, and microprocessor and memory product transitions have all contributed to this trend. The summer doldrums arrived one month earlier than usual, as the semiconductor book-to-bill ratio peaked in April. The normal fall pickup for component demand could arrive early if further PC price cuts stimulate unit volume growth.

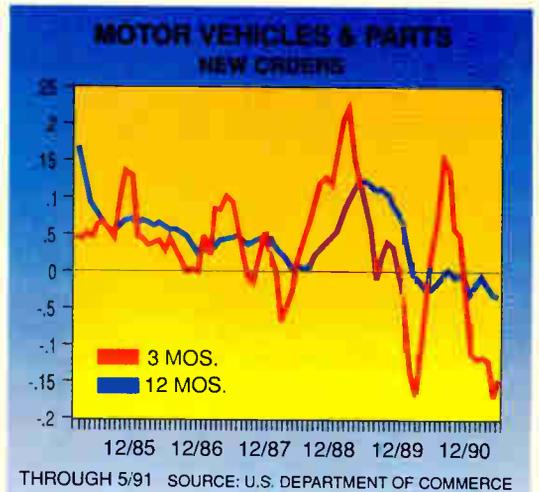
Industry-wide order patterns in May and June suggested continuing recession. Computer-related orders worsened in May compared with April, but inventory trends remain surprisingly positive. However, there has been some evidence of inventory building in June, particularly at Apple Computer Inc. This could further intensify industry pricing pressure. Component orders continued to show modest improvement through May, but June trends at the distribution level were characterized as weak. Early July patterns suggest a continuation of this trend thus far.

After showing some signs of recovery in April and May, communications equipment orders weakened again in May. Electrical and electronic capital-equipment trends also deteriorated slightly in May from April. Indications regarding June activity suggest more weakness, particularly in industrial-related end markets. □

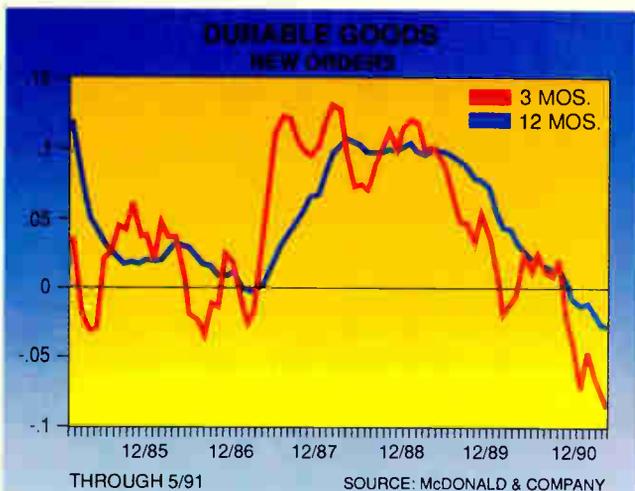
By Mark L. Parr, McDonald Securities Inc., Cleveland (216-443-2379)



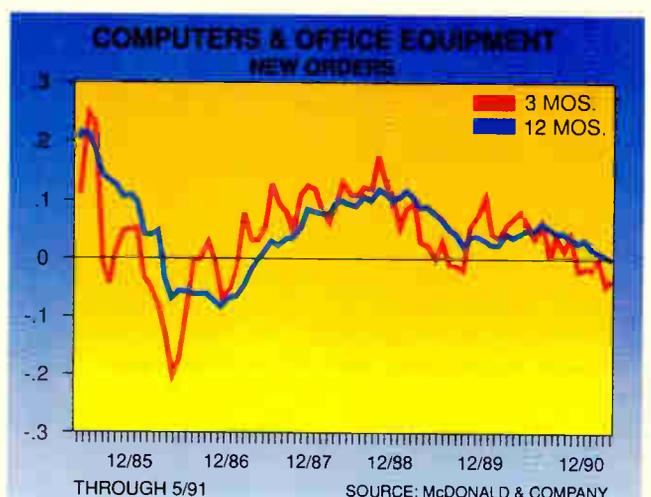
**Overall, order patterns in May and June pointed to a continuation of the recession. However, the economy has taken a turn upward.**



**Auto demand is increasing, which could result in a good summer for electronics suppliers.**



**Durable goods activity stayed depressed through May, but a pickup in housing and automotive sales should help.**



**Computer-related orders were down in May from the April level, but inventory trends are encouraging.**

# LAST WORD

## THE COMING INTEREST-RATE ENIGMA

In mid-June, the yield spread between long- and short-term interest rates approached 3%, near its record-high level. Perhaps it may seem that a statistic as arcane as the yield spread might not be of compelling interest, but in fact this development holds the key to predicting where both short-term and long-term rates—and hence the economy itself—will be heading over the next few quarters. The unusually large rise in the yield spread, which was slightly negative as recently as mid-1989, is due to the following:

1. Realization that the recovery will be more robust than the previous consensus outlook.
2. Fear of higher inflation in the months ahead.
3. Awareness that the "silent partner," the huge government deficit, will present increasing demands on financial markets for the rest of this year and in 1992.
4. The likelihood that (1) and (3) will cause the Fed to tighten significantly, although probably not until next year.

Over the past 40 years, the yield spread has averaged about 1%; hence it is now about 2% above normal. Currently the real short-term rate is about 1% *below* its long-term average, while the real long-term rate is *above* its long-term average.

It is possible that the spread could remain at 3% indefinitely; it did from 1983 through early 1988. However, that was a highly unusual period, since it represented an unprecedented—and probably unrepeatable—attempt by Paul Volcker to bring inflation to its knees. Also, the Federal budget deficit was much larger then as a percentage of gross national product, reaching 6%, compared to about 3% now (excluding the Resolution Trust Corp. payments).

Thus, it is virtually a foregone conclusion that the yield spread will narrow somewhat in the coming quarters. However, there is no consensus at all about which way rates will move.

If our overall forecast is correct—3% real growth for the next four quarters, accompanied by an increase in the inflation rate to the 5.5%-to-6% range—real short-term rates are far too low relative to their historical average. Even if inflation stabilizes at 5% and does not rise to the 5.5%-to-6% range, short-term rates will rise at least 1% once the recovery is well established.

If inflation does rise to our predicted levels, that would send short-term rates up 2%. Only if inflation were to decline to 4% could the current level of short-term rates be justified in a nonrecessionary environment. True, that is the consensus forecast, but until release of the latest batch of economic statistics, the consensus also believed that

the recovery would not start until well into the second half of the year.

However, the fact that short-term rates must rise does not answer the question of where long-term rates are heading. There is no reason whatsoever to believe that long-term real rates will move below their long-term historical average of 3%. In other words, if inflation does rise to 5.5% to 6%, the equilibrium bond yield would be 8.5% to 9%—i.e., where bond yields are currently. Apparently, bond traders are not fooled into believing the consensus forecast that inflation will be only 4% this year.

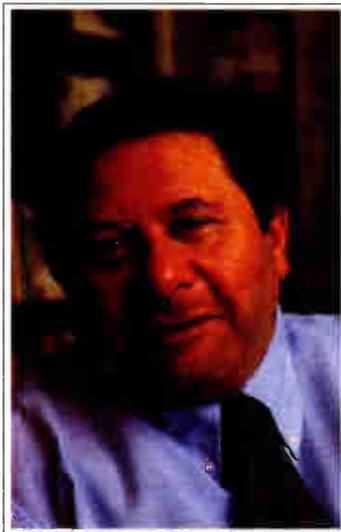
Since current bond yields now reflect 5.5% inflation, that could mean that if the Fed were to tighten rates, long rates would not rise at all. However, the situation is probably more lugubrious than that. Given the size of the budget deficit, long-term rates are likely to remain above their average historical levels. Thus, our forecast calls for at least another

0.5% rise in bond yields, or a minimum of 9% for Treasuries and 9.5% for Aaa corporate rates, with the possibility of 9.5% and 10% levels being reached by late next year.

In sum, the yield spread is so wide because Fed policy is currently too easy. Bond traders realize inflation will rise, and have priced the long end of the market accordingly. The Fed, on the other hand, is still smarting from the criticism of having failed to ease quickly enough—an unwarranted claim that nonetheless had chairman Alan Greenspan worried about his job. However, he was reappointed in July. As a result, current short-term rates are barely above what we predict will be the inflation rate later this year.

In the past, whenever real short-term interest rates have turned zero or negative, the result has always been substantially higher inflation. No exceptions to this rule. Thus we are fairly sure interest rates will have to move higher some time in the next year. The Fed can either move now to head off the next round of inflation, or it can wait until higher prices are already a reality, and then react after the fact. Either way, interest rates will be substantially above current levels a year from now—and the economy, though still moving forward, will be struggling. □

*MICHAEL K. EVANS is president of Evans Economics Inc. and Evans Investment Advisers in Washington. His views will appear regularly on this page.*

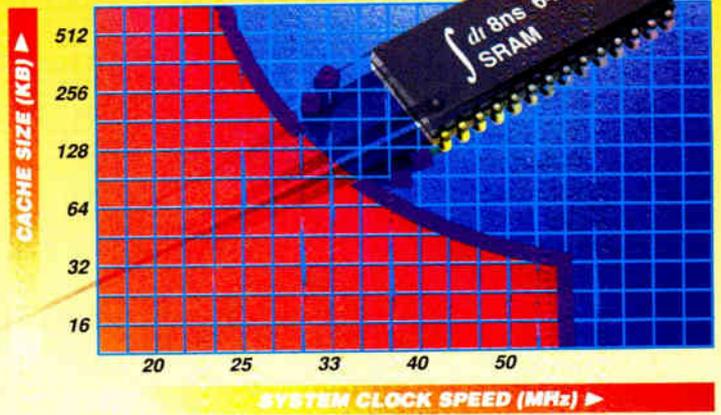


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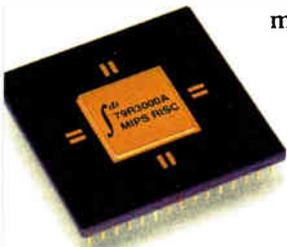
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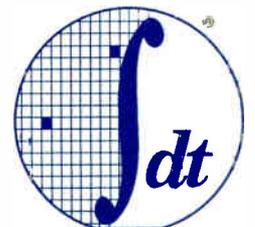
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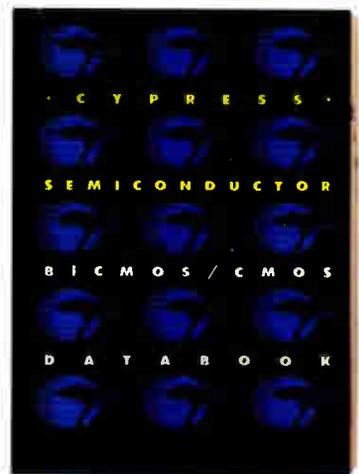
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