DATAMATION 85®
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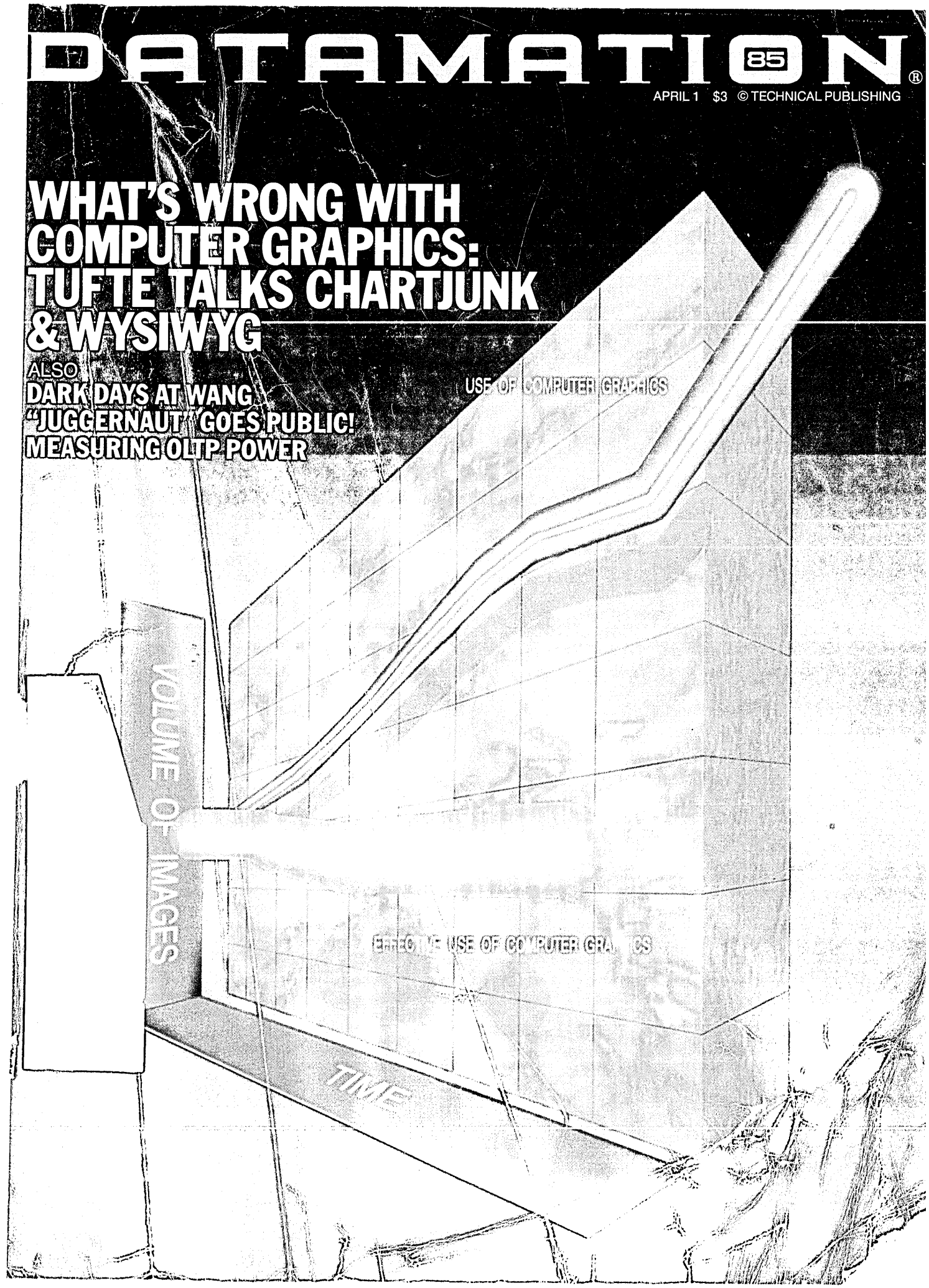
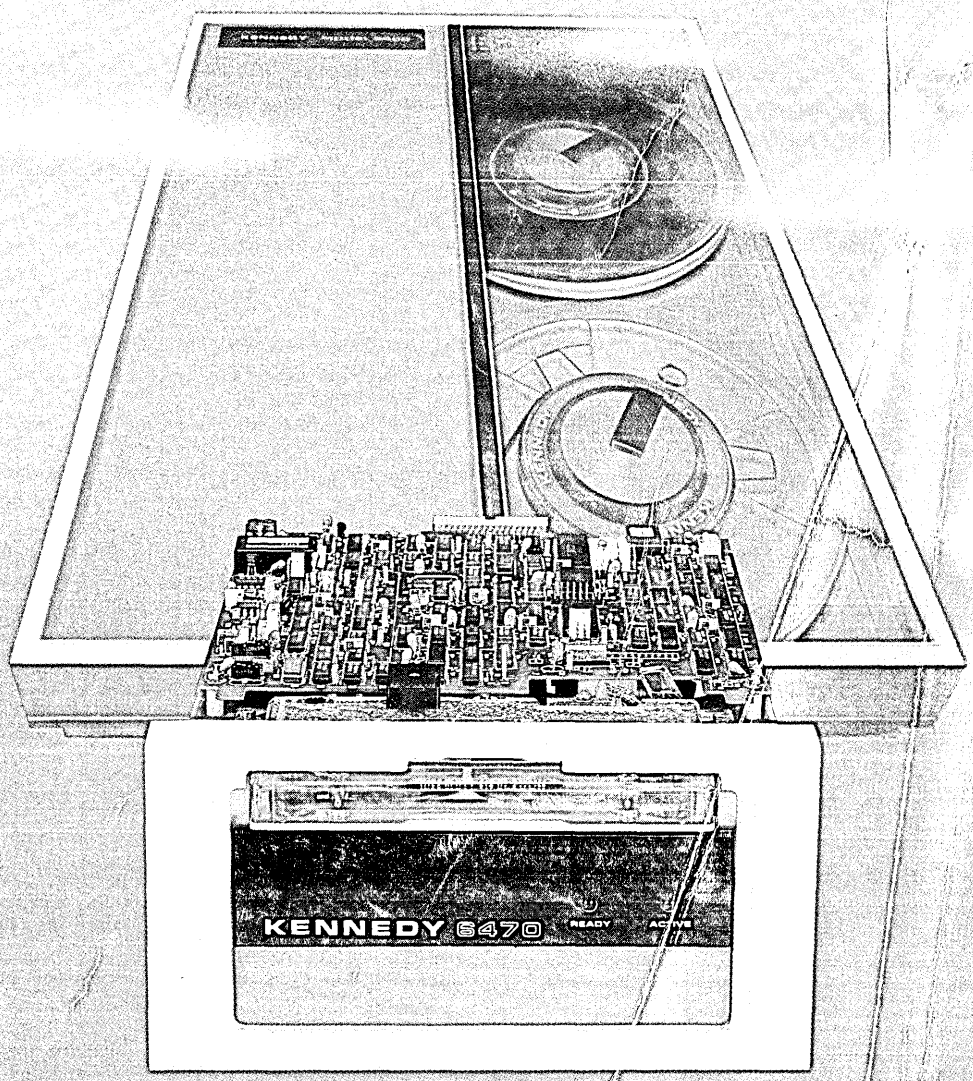
WHAT'S WRONG WITH COMPUTER GRAPHICS: TUFTE TALKS CHARTJUNK & WYSIWYG

ALSO
DARK DAYS AT WANG
"JUGGERNAUT" GOES PUBLIC!
MEASURING OLTP POWER





Model 6470 Cartridge Tape System

Thinking Big — really big!

And why not? Kennedy's Model 6470 ¼" cartridge tape drive has every reason to think that it's big — it behaves as if it were a ½" tape drive.

Examples:

- Model 6470 uses standard ½" tape interface.
- It has the same functions as a larger ½" tape drive.
- The cost is 1/3 less than ½" tape drives.
- It's 1/10 the size of ½" drives.
- It packs more data per reel than P.E. drives (54 MBYTES).
- Finally, Model 6470 operates on the same tape handlers as ½" drives.

Model 6470 is a start/stop device with the capability of streaming data at 37.5 IPS, providing much greater flexibility than in comparable drives.

Other features include low power consumption, consuming total power of under 50 watts; diagnostic and fault isolation, with On-Line Self Test and Off-Line Self Test Routines.

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Micro900/2 Multidrop Concentrators
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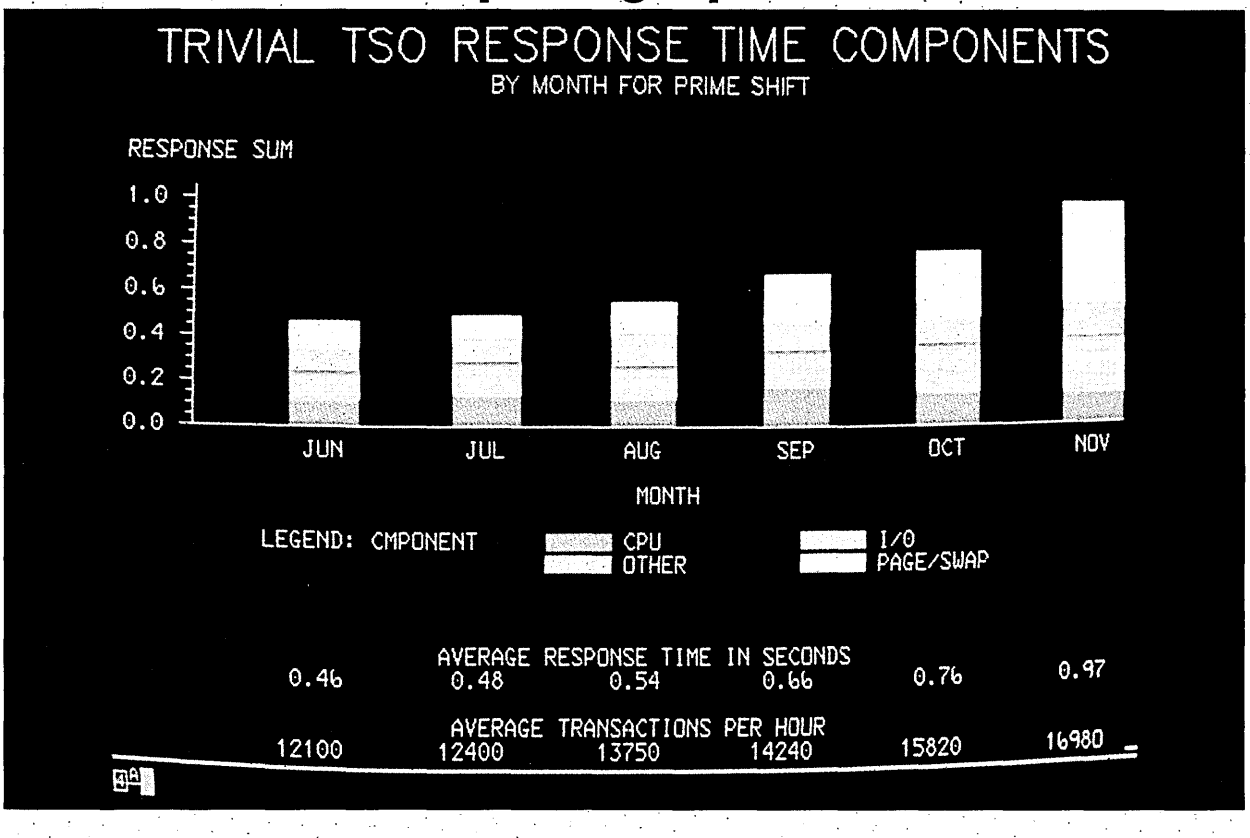
CIRCLE 4 ON READER CARD

Candle Announces:

PRO/MVS

The Performance Reporting Option™ for EPILOG®/MVS



Candle Corporation is proud to announce a major new option for its EPILOG/MVS Installation Performance System: PRO/MVS – The Performance Reporting Option for MVS. This option allows you to access EPILOG degradation and resource data via SAS®[1] and SAS/GRAPH™.[2]

The Performance Reporting Option (PRO) extends the use of degradation analysis data by providing reports in pie chart, bar chart, line graph, and tabular formats showing the impact of the various wait reasons on system performance. These reports are available online via TSO or in hardcopy form through a batch facility. The graphs not only describe batch and TSO performance trends, they tell management *why* the system is degraded.

Candle will supply a starter set of ready-to-run reports, which you can also use as examples to create your own standard and ad hoc SAS reports that meet your specific needs.

Degradation data is supplied by EPILOG's Degradation Analysis, the unique Candle-developed methodology. Degradation Analysis takes the total elapsed time of an application and breaks it down into its component parts. In particular, it shows both the resource profile of the transaction and the reasons the application is waiting for service. Such a technique is useful to help you reduce the application's elapsed time. It allows you to identify where you are spending the most nonproductive time and estimate the maximum improvement you can attain by eliminating time spent in a nonproductive state. For example, if your service level objective for TSO response time is two seconds or less and TSO response time is averaging five seconds, you need to know why. Degradation Analysis tells you, very specifically, that paging accounts for 60% of that time. Now you can direct the performance analyst to concentrate his tuning efforts on paging since, in this case, it is the primary component of response time.

PRO – working together with EPILOG and SAS to help you *manage* your system easily and efficiently – is available now. For more information, please complete the coupon or contact your nearest Candle representative.

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2 SAS/GRAPH is the trademark of SAS Institute, Inc.

CIRCLE 5 ON READER CARD

DATAMATION

APRIL 1, 1985/$3.00 U.S.A.
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This issue, 192,215 copies

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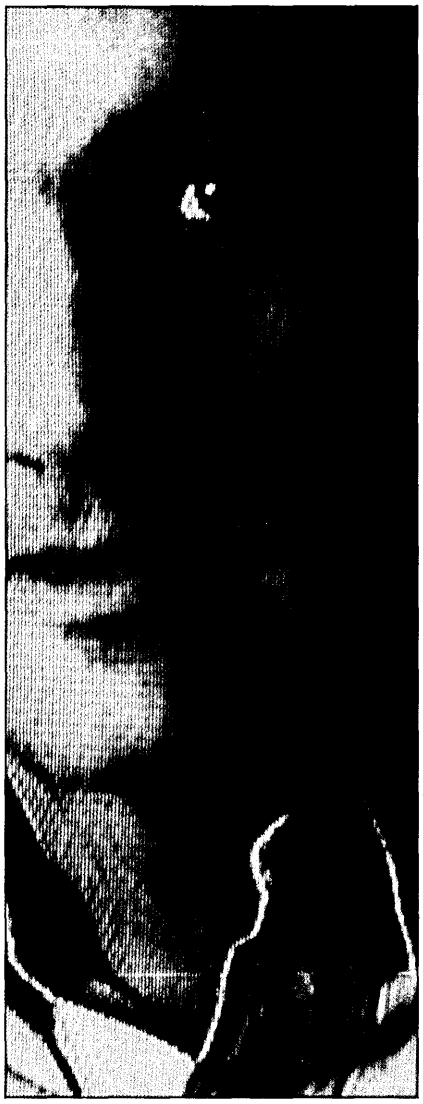

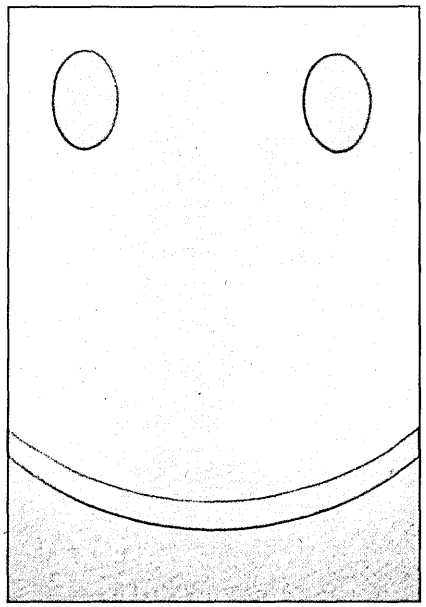

NEWS IN PERSPECTIVE

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INTERNATIONAL 84-1

COVER COMPUTER-GENERATED ILLUSTRATION BY NATALE

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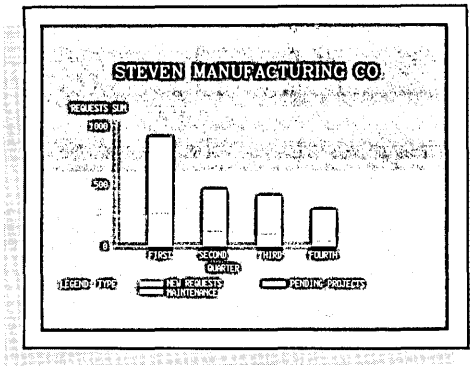

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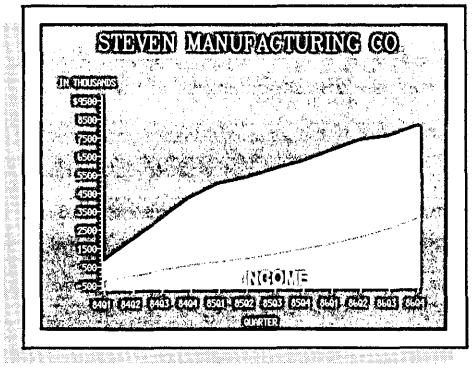

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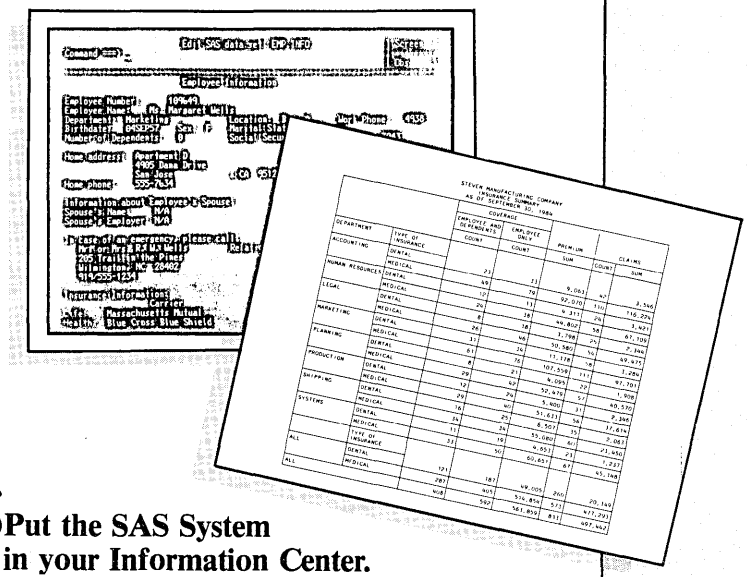

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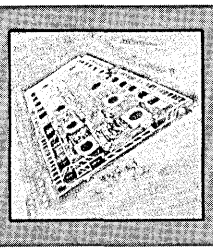
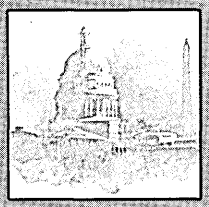


1970
Four-Phase announces the industry's first all-LSI Central Processing Unit to give you increased performance in a smaller computer system.



1973
Four-Phase wins the largest-ever contract with the Federal Government for a data entry system.

Motorola/Four-Phase introduces The 6000 Series–a new milestone.

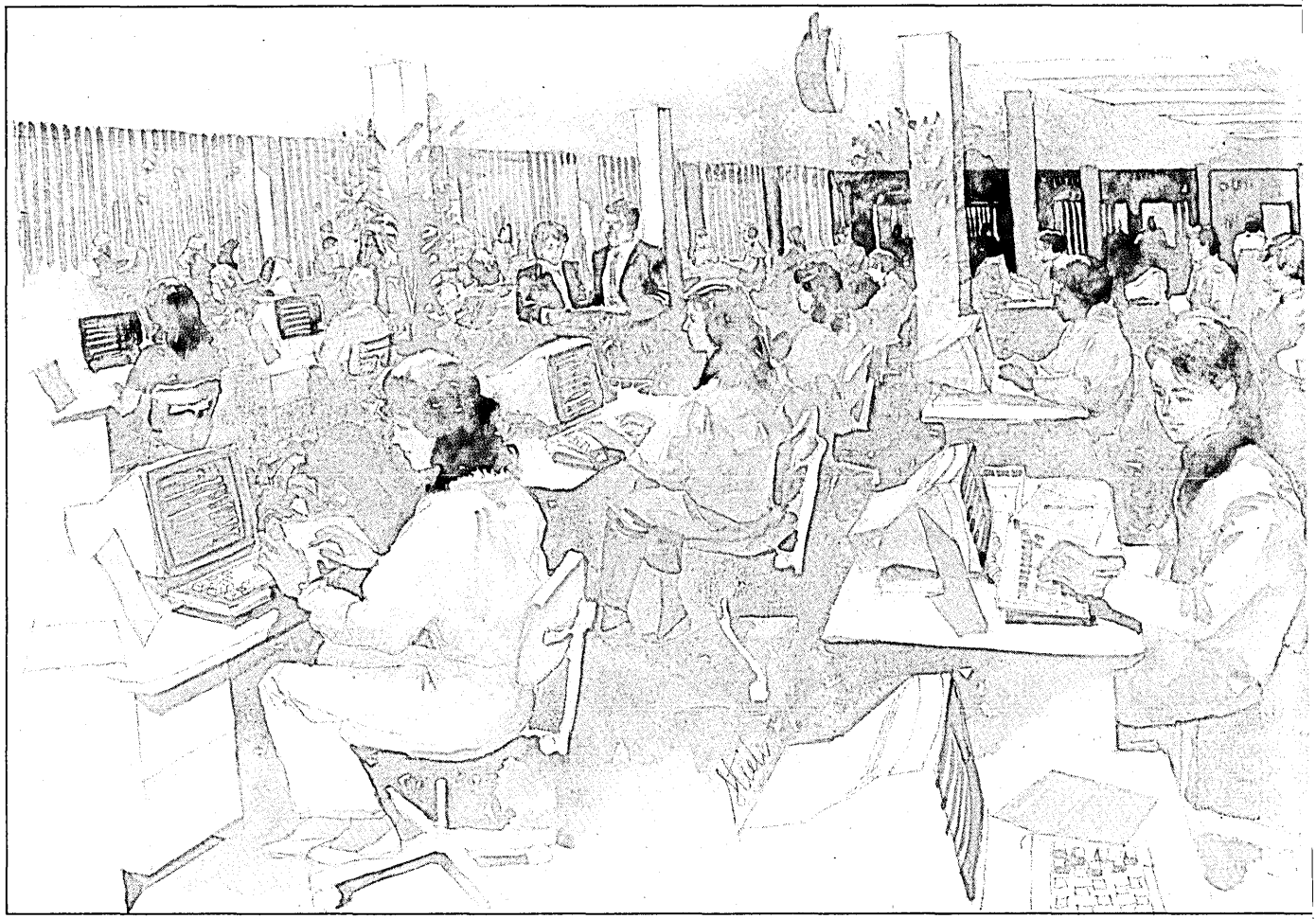
A milestone for new standards in office information systems from the company that started it all.

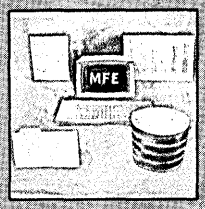
From the moment Four-Phase introduced the world's first all-LSI computer in 1970, we have consistently presented the industry with innovative hardware and software products to help make business more profitable and productive.

Today, as a member of the Motorola Information Systems Group, Four-Phase once again unveils another milestone in information processing—the new 6000 family of office information systems. Compact, powerful processing units and flexible, capable software have been fused together into a family of systems that deliver maximum results today, with substantial expansion capabilities for tomorrow.

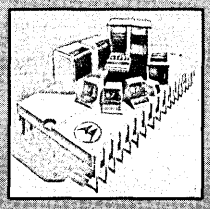
Technology for the real world.

Motorola/Four-Phase systems are tough enough and smart enough to deal with the real world—where speed, power, and reliability in a multi-user environment are prime considerations. The new 6000 systems feature the high-performance 32-bit Motorola 68010 CPU and an operating system derived from UNIX* System V under license from AT&T. We created





1978
Four-Phase announces The MULTIFUNCTION EXECUTIVE* (MFE), the first DDP operating system to allow multiple applications to run concurrently and independently.



1982
Four-Phase is acquired by Motorola Inc., combining our information processing expertise with one of the world's leading manufacturers of semiconductors and electronic equipment.

integrated system software that combines these two industry standards into a powerful, multi-user, multitasking environment that can stand up to practically any application.

There are two systems in the 6000 family. The 6300 supports 1-8 users, making it perfect for the smaller user or a remote office. The 6600 is a high-performance system designed to support up to 128 users. Both systems offer complete and integrated solutions—whether they're working in an operations-oriented environment where efficiency and precision are needed, or a results-oriented environment where flexibility and quality are key.

Service and support to match our technology.

At Motorola/Four-Phase, our commitment to you goes beyond providing quality, high-performance hardware and software. Support is just as important. Our award-winning Customer Support Operation is staffed with over 1,400 customer support specialists in over 175 cities across the nation. One phone call to our Operations Center will ensure prompt response from the nearest available specialist. And you can call the Center 24 hours a day, 365 days a year.

If you're a DP/MIS manager or OEM, find out what the latest milestone in office systems can mean to you. Contact Motorola/Four-Phase today at 1-800-528-6050, ext. 1599. In Arizona, call 1-800-352-0458, ext. 1599. Or write us at 10700 North De Anza Blvd., M/S 52-3B1, Dept. S., Cupertino, CA 95014.

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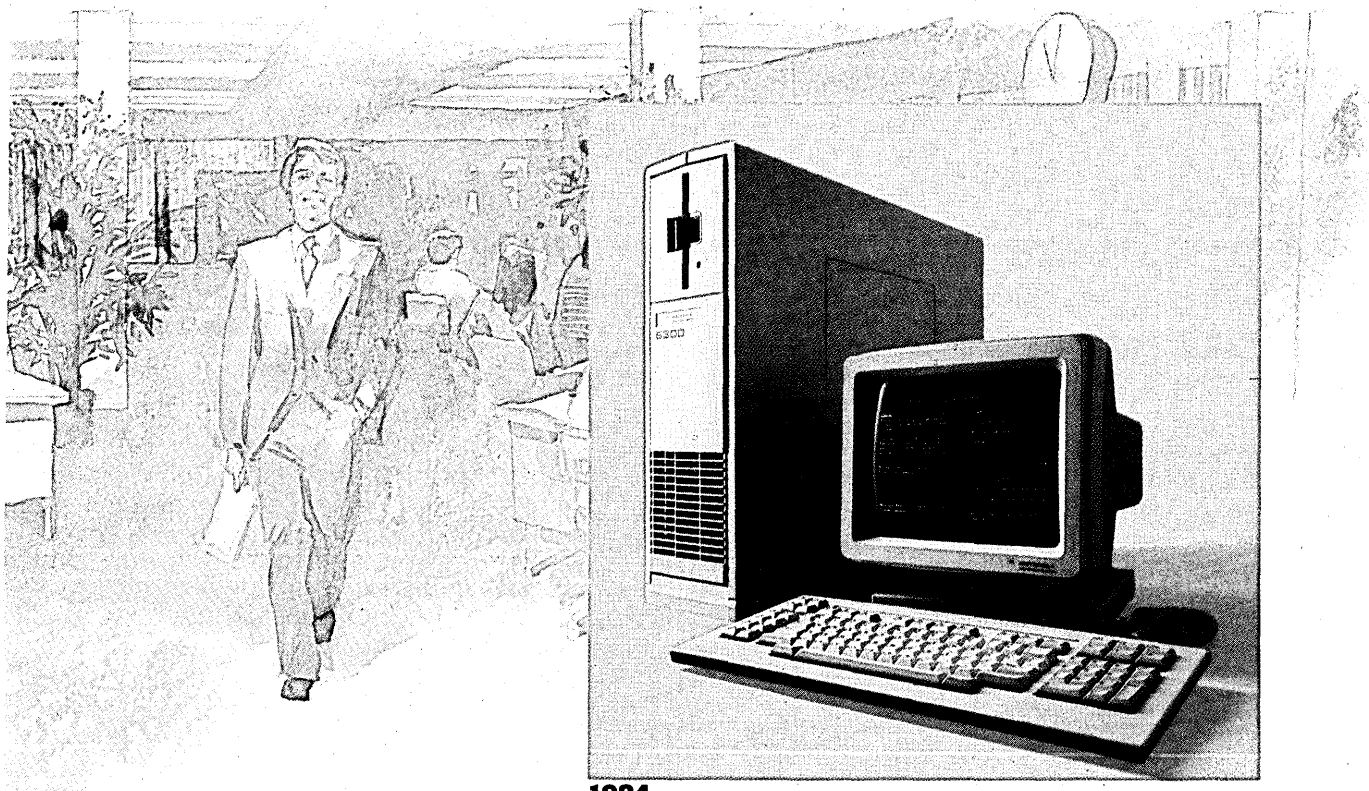
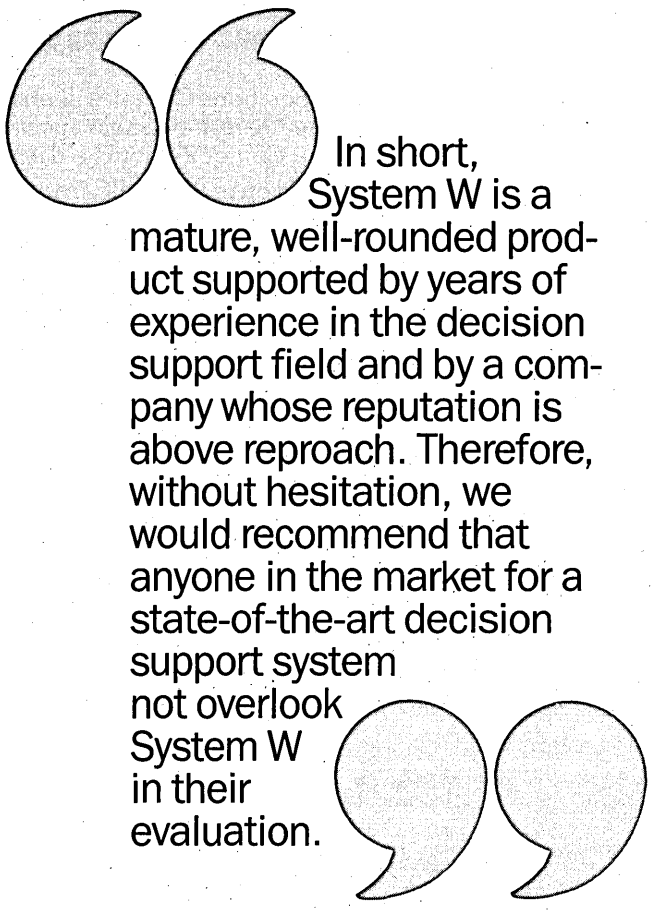
Four-Phase Systems



1984
Motorola/Four-Phase announces The 6000 Series—a milestone in productivity that delivers information processing performance today, and expansion capabilities for tomorrow.



— Data Decisions, Cherry Hill, New Jersey, September, 1984.

More than 100 top corporations chose Comshare's System W decision support software in the last 18 months. Teamed with IBM mainframes, System W untangles the information management challenges that face business professionals. Especially the big payoff ones like performance reconciliations, problem analysis, forecasting and electronic management reporting.

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CIRCLE 13 ON READER CARD

LOOK AHEAD

OSI, SNA HOOKS ON UNIX V.3	Sometime next year AT&T is scheduled to release a new version of Unix System V, and this latest update, sources say, will not only include hooks into the increasingly popular Open Systems Interconnection data communications protocol, but also into IBM's de facto worldwide standard, SNA.
MAP PARADE GETS CROWDED...	General Motors is playing kingmaker in the data communications business these days, choosing which LAN vendors will be included in its important Manufacturing Automation Protocol demo this November in Detroit at the AutoFact show. While 27 vendors tried to get their products into the demo, only 17 are receiving the coveted invitations: DEC, Gould, Honeywell, IBM, Industrial Networks Inc., Intel, NCR, Northern Telecom, Motorola, AT&T, ASEA, Charles River Data Systems, Concord Data Systems, Allen Bradley, Hewlett-Packard, Siemens, and Advanced Computer Communications. The losers include several key players in the dp biz: Westinghouse, Tandem, Stratus, Machine Vision, American Robot, 3M, and Rolm.
. . . AS GE JUMPS ON THE BANDWAGON	Add another heretic to the growing fold of MAP believers. General Electric, once a stubborn holdout, is now driving down the MAP road at breakneck speed. GE's joint venture with LAN vendor Ungermann Bass., Industrial Networks Inc., has an interface card that makes any device MAP compatible; beta testing on three IBM PCs has been successfully completed, says a source. "The PCs passed data at 10MB for more than a month." Look for the INI card and GE demo of a full MAP installation in a few months.
IS PC II A PC AT JR.?	IBM's delayed PC II may look very different from earlier expectations. Initially, it was to be based on Intel's 80186 microprocessor. We hear, however, that Boca Raton now views the AT as the core of its future PC product line. The current plan is for a smaller version of the AT, and its 80286 micro, to appear as the PC II, carrying a 3½-inch disk drive in a footprint half the size of the PC's.
IBM TO MEXICO: MANAÑA	IBM's new pitch to the Mexican government to get a PC assembly plant south of the border, we hear, now includes an offer to build an Intel microchip plant. The earlier rejected bid had only 80 jobs for locals and a minimal technology transfer. Tipsters whisper that the new offer includes substantially more employment.

LOOK AHEAD

BACKUP TAPE FOR THE PC

IBM favorite Tecmar, Cleveland, has signed a major oem contract with computer and socks retailer Sears, Roebuck for its newest peripheral line, streaming tape backup units developed by Colorado Memory Systems, Loveland, Colo. Sources say that Tecmar is also negotiating another major oem deal for the drives with "a major computer manufacturer." Could it be Big Blue?

APPLE ATTENDING IBM CLASSES

Apple Computer is finally teaching its salespersons about the facts of life. The facts of life with IBM, that is. Apple has contracted with Ferrin Corp., a San Francisco-based personal computer consulting firm, to train some 500 marketers about the ins and outs of the IBM PC and the strategies IBM uses to sell micros. Says a source at Ferrin, "We're going to present the IBM sales approach and arm the Apple reps with how the IBM sales rep is approaching prospects." Better late than never?

RUMORS AND RAW RANDOM DATA

NEC Information Systems will soon introduce a low-end laser printer with specs similar to the Canon machine, but for $3,000. Expect an intro this summer of a unit using a LED as the light source. . . . Wang Laboratories decided not to become a Macintosh oem, after Apple promised to include the VS Document Format protocols in its upcoming file server. . . . Markline Co., Belmont, Mass., catalog has a $39.95 electronic toaster featuring a "microchip" for uniform slices of toast. . . . Wall Street sources say TeleVideo's sales picture is darkening considerably. Furthermore, neither its PC clones nor its terminals are making much of a profit for the once high-flying company. . . . Honeywell is about to introduce a new line of products for the corporate videotex market. . . . British Telecom will soon unveil a videotex plug-in card for IBM PCs. . . . For the first time in recent memory, booth space is going begging at the July National Computer Conference. . . . Watch for an MVS version of Inference Corp.'s ART, a Lisp-based tool for building expert systems. . . Stromberg Carlson is working closely with its British parent, Plessey, to create a hybrid switch based on its Digital Central Office machine and Plessey's System X, now being developed for British Telecom. . . . IBM has quietly upgraded its Information Network, based in Tampa, Fla., to permit large customers to interconnect their disparate SNA networks, connect them with application programs running on IBM's network hosts, and connect them with the networks and terminals of other customers.

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When it comes to noise in the workplace, less is better.

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And we designed the P-Series XQ accordingly. At less than 55 DBA, it will be seen and not heard.

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Nor will we ask you to give up options. For IBM 3270 compatibility, add the PI-3287 option. Or add the Intelligent Graphics Processor, an effective way to create, store, and print forms and labels in one pass.

The P-Series XQ gives you even more. Select data processing, compressed printing, and high speed draft printing. Compressed printing puts a 132 character line report on 11-inch paper, at full rated speed. And high-speed draft printing increases throughput by more than 33%, up to 800 lines per minute with the P600XQ.

Now we realize noise has its appropriate moments.

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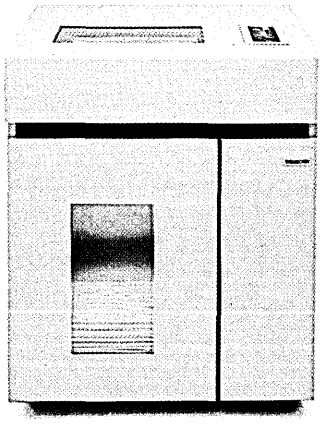

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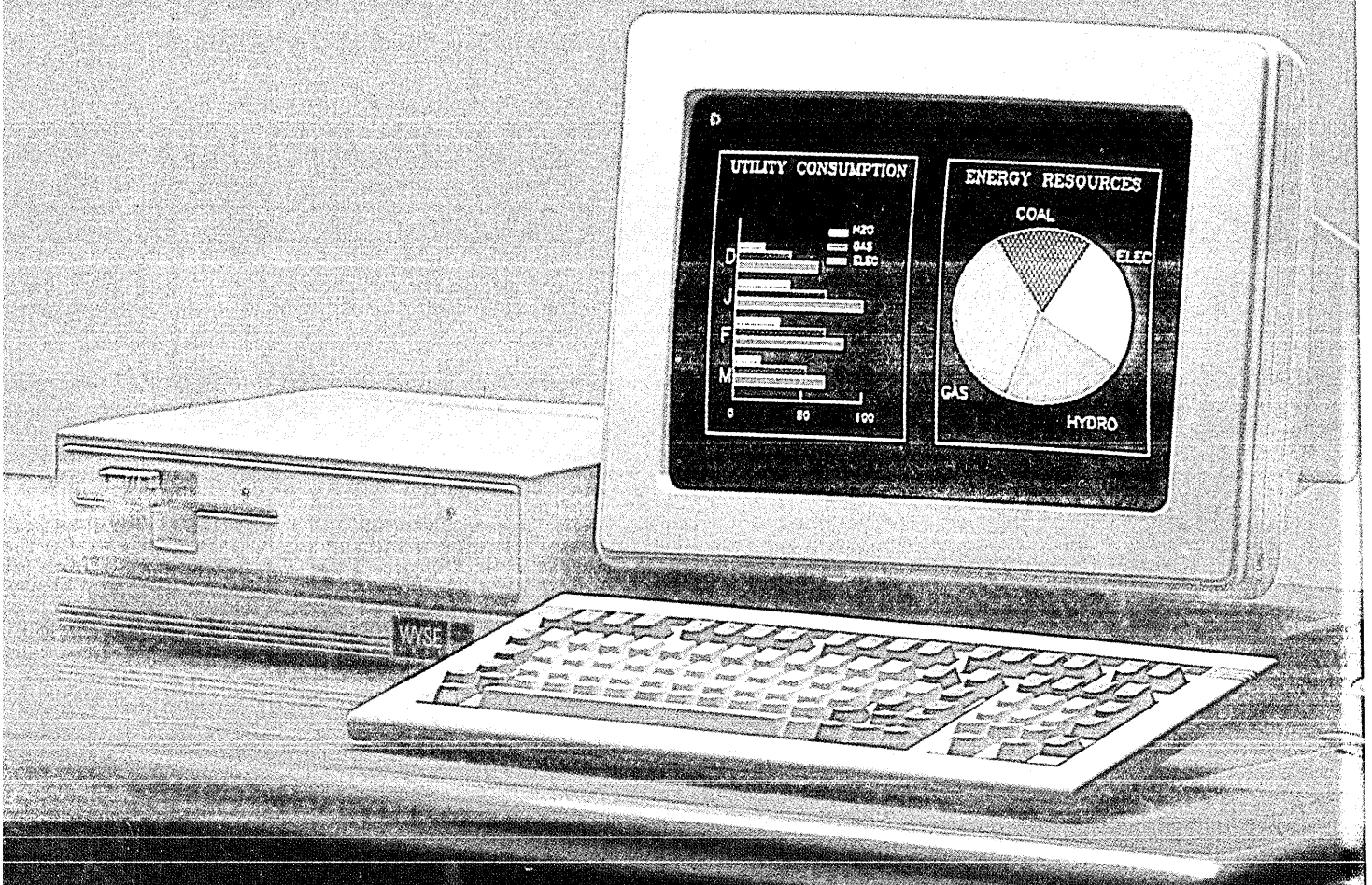

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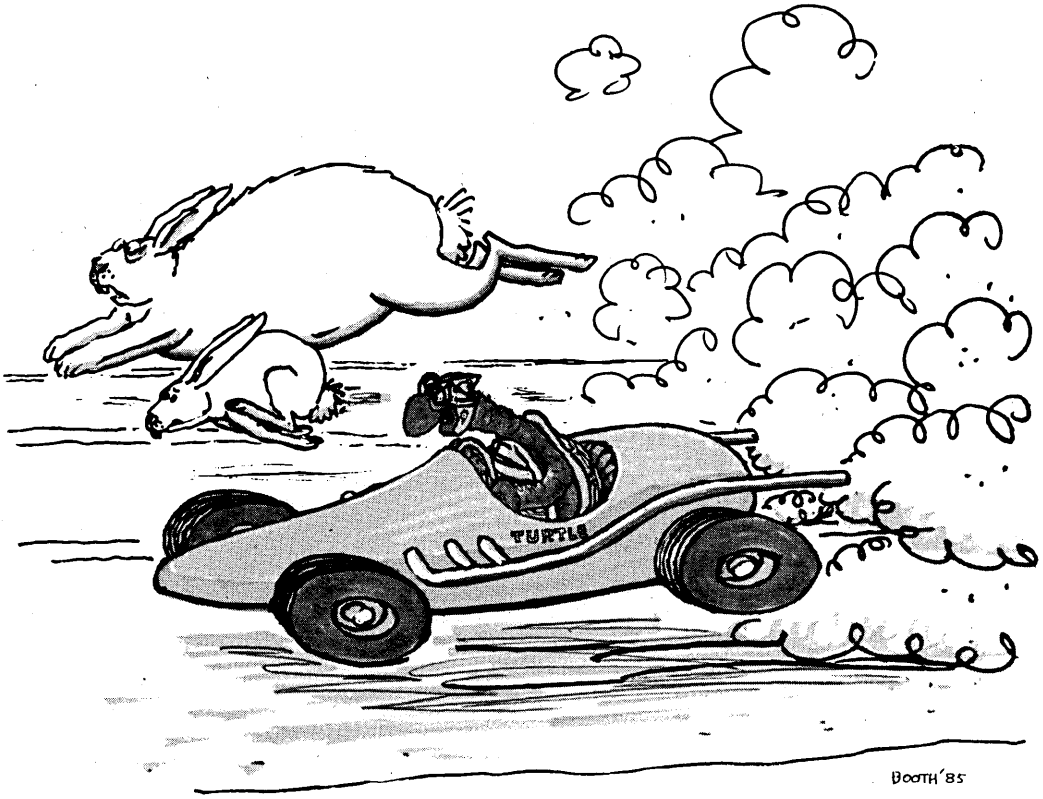

According to a recent independent survey of IBM mainframe sites, conducted by the International Data Corporation,* ADR/DATACOM/DB® was chosen by 18.7% of the companies planning to purchase data base management system (DBMS) software during 1984. That tied us with IBM's DL/1 and Cullinet's IDMS as the DBMS of choice.

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DM4/1/85

*IBM Software Environment/CICS Marketplace Study, September 1984.

CIRCLE 12 ON READER CARD

LETTERS

CODE READ

"Speaking in Codes" (Dec. 1, p. 40) was interesting but somewhat misleading. It provided a cogent and, I suspect, reasonable assessment of vendor and banking response to the new Treasury directive on electronic funds transfer security, but it appeared to miss the mark entirely in two critical areas—one technical and one legal.

The technical issue is a significant one. The Treasury directive on EFT security requires that federal funds that are electronically transferred be *authenticated* using procedures that conform to ANSI Standard X9.9 or to an equivalent *authentication* technique. Although ANSI X9.9 utilizes the data encryption standard (DES) algorithm, this does *not* mean that the message is encrypted. In fact, while authenticated messages can be encrypted, they are almost always sent "in the clear."

Second, and equally important from our perspective, is the legal issue: the Treasury Department has *not* "ordered all banks to use DES in electronic transfers with the government." The directive is *internal*, not regulatory, stating clearly that it "applies to the Office of the Secretary and all bureaus" within the Treasury Department. Realistically, we have substantial *internal* financial communications traffic to secure and a great deal to learn before we approach the private sector.

It *is* true that Treasury, as one of the nation's primary EFT users, is taking a large step toward improved *federal* EFT security, and that our recent actions may eventually induce others to follow our lead. We do not intend, however, (and never have) that the directive be perceived as "mandating" anything to private financial institutions. (The phrase "or equivalent authentication technology" in the directive should indicate that we are even flexible with regard to the methodology our own bureaus use, as long as their choice meets a minimum security standard.)

We do envision that EFT authentication will one day become just another product offering for many institutions—an offering that we, and other major clients, will probably choose to purchase. It is a simple fact that the Treasury Department must continue to ensure adequate communications security for the billions in public funds for which it is liable. Banks, and other institutions that move large sums electronically, have a similar need. There is knowledge to share.

Treasury's new EFT security directive has broadly defined the department's *internal* minimum security standard. We are now working closely with the financial community through the Federal Reserve System and other federal financial regulatory agencies to assess the impact that our implementation may eventually have on the private sector. We recognize that communication in this area is, of necessity, a two-way street.

WILLIAM H. DIRLAM
Department of the Treasury
Washington, D.C.

The text of Edith Myers' report was essentially correct, but Dirlam's letter corrects a misimpression given by a blurb added during the editing process.—Ed.

BILKO'S PENSÉES

In regard to Philip Dorn's "Learning from Lemons" (Jan. 15, p. 72), Sergeant Bilko's remark comes to mind: "The race goes not always to the swift, nor the battle to the strong, but that's the way to bet."

MIKE KUTCHER
Woodstock, New York

THE HONEYWELL VIEW

In "Learning from Lemons," Philip Dorn interpreted our recent agreement with NEC as Honeywell "throwing in the towel" and becoming a "marketing wing" for NEC.

Last year's agreement with NEC, with whom we have had a relationship for many years, will result in additional products that extend the top end of our large-scale computer line. We also acquire or jointly develop technology and products from other industry sources as a way to leverage our own extensive R&D investments, offer a wider range of computer systems, and best meet our customer needs.

Within our compatible large-scale computer line we utilize four distinct technology families. Only one of these is being sourced from NEC. All of our DPS 6 small computers are based on internal Honeywell technology. Our medium-scale DPS 7 systems are supplied by Bull Systems, a long-time French affiliate.

Today computer systems incorporate multiple data processing and communications technologies. Our strategy is to select the best available technologies, including those from other companies, for integration into Honeywell computer systems.

We believe that this strategy is timely and appropriate for current and future markets and does not warrant the casual dismissal received in your article. More accurate, factual information about Honeywell would lead your readers to a much different conclusion about Honeywell and our commitment to our worldwide base of computer customers.

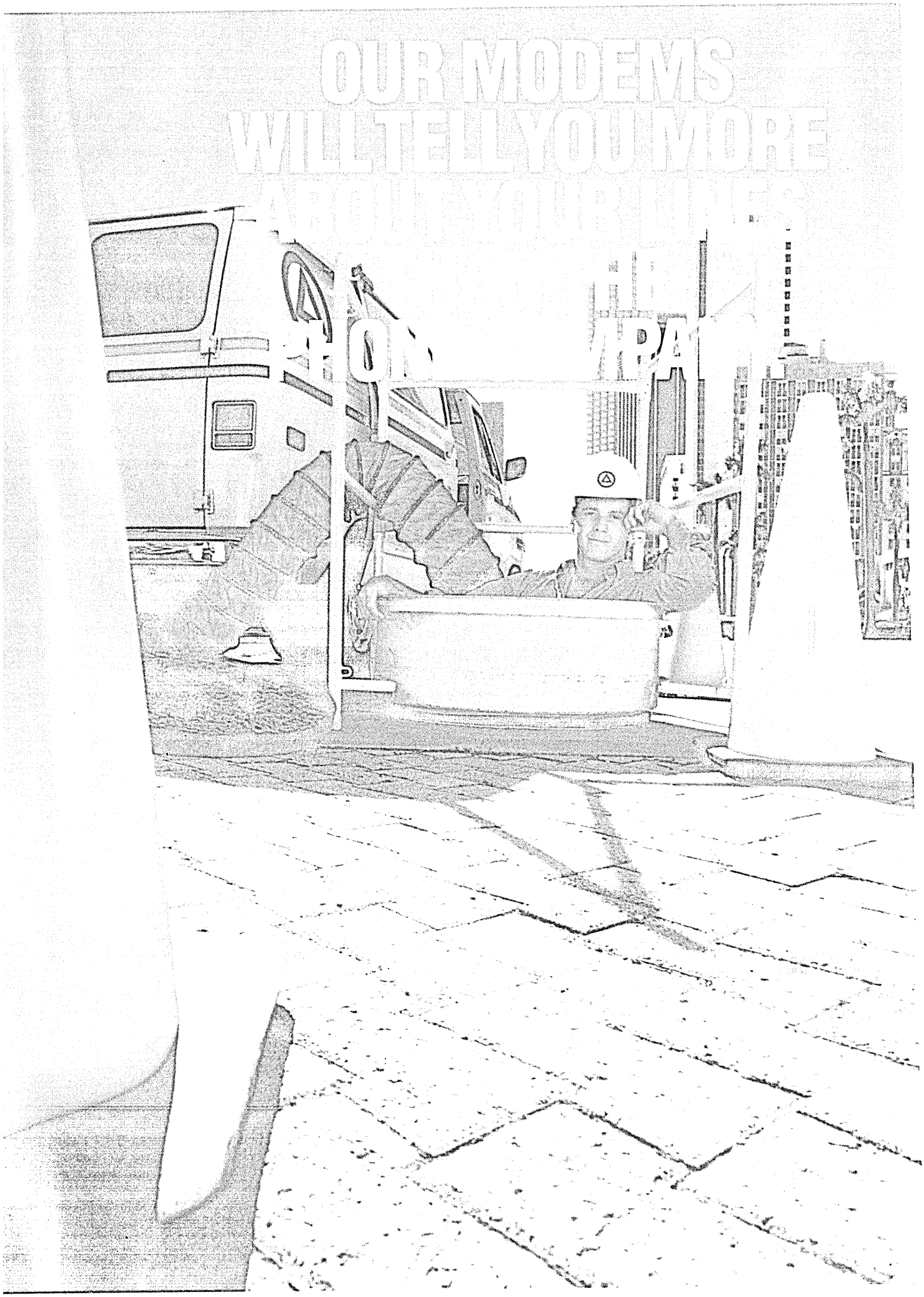
R.C. HESSER
Vice President
Large Computer Marketing Operations
Honeywell Information Systems
Phoenix, Arizona

Dorn replies that while Honeywell's strategy may suit market realities, his characterization was not casual at all, but quite deliberate.—Ed.

FOOTNOTE

In "The Computer Expert's Guide to Life" (Jan. 15, p. 101), Charles Bassine defines hardware as "the parts of a computer system that can be kicked." Please note that much software can be booted.

PHIL BANCROFT
DEC
Stowe, Massachusetts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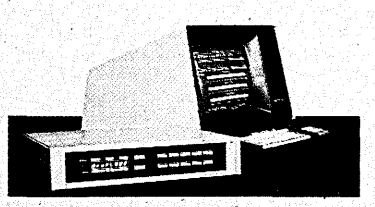

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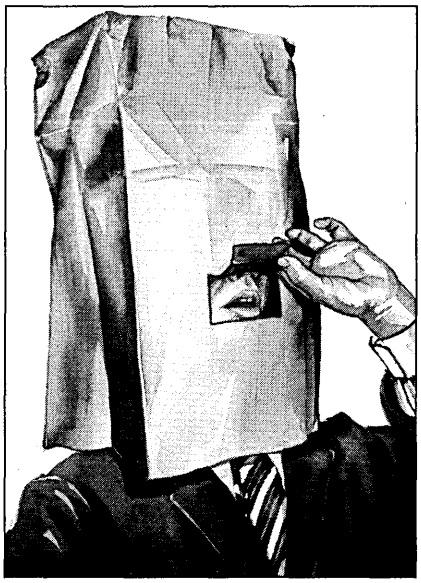
CIRCLE 14 ON READER CARD

Rebecca S. Barna, Editor

EDITORIAL

SHOOTING FROM THE LIP



How frustrating it is to get into a good, juicy story only to find that the juiciest of quotes are attributed to that well-known "knowledgeable source." It's only a bit better to find the attribution is to "an MIS executive at a Big Eight accounting firm located in the Midwest." Whether you spend your time trying to guess the source's identity or leapfrogging over all unattributed quotes, what appeared to be a juicy story often begins to dry up.

It's an unfortunate truth that many MIS executives are reluctant to speak critically about a vendor unless they speak off the record. It turns out that some of them have learned their lesson the hard way.

Outspoken but unidentified MIS execs tell of their fear of losing favorable pricing arrangements. Vendors "get even" with their vocal critics through delays in service and support. Disloyal customers—for that's what these tattlers are now dubbed—are no longer invited to the next closed door briefing on future product announcements. We've even heard tales of intimidation where vendors conduct follow-up "interviews" with those traitorous MIS managers. Worse yet, jobs hang in the balance. A "reliable source" tells of the time "a major vendor" tried to get him fired for his public beratement of the company.

Vendors, in their helter-skelter zealousness to protect booming businesses and egos, all too often forget an important aspect of their business lives. Their dynamic growth into what is collectively one of the largest industries in the world has tilted the balance against the very customers who have made them the powerhouses they are today.

It's naive to assume that users can always speak up. As one of our "most reliable sources" tells it, "There are three situations in which I'll never speak for attribution. I won't go on record saying the product I bought was a lemon, 'cause I don't want my boss to know I buy lemons. Second, I won't blast my most favored vendor in print, because I have to do business with him again tomorrow. And third, I won't jeopardize my company by pointing out its internal problems. But when my comments, offered anonymously, can contribute to the public good, I'll offer them in that fashion."

Thus, there are some valid justifications for MIS execs to speak off the record. And there are times when our "sources" must go nameless. That doesn't make the story less important. Take, for instance, our story on p. 32, "Dark Days at Wang," by Boston bureau manager R. Emmett Carlyle. While users—albeit unidentified—cite a litany of complaints against the company, at the top of their list of grievances is unresponsiveness. They say their concerns have been laid out to the company, and no response has been forthcoming. Yet they refused to speak openly if it was for attribution.

Their desired dialog is on the way. Carlyle visited Wang, saw the new systems operate, and confronted senior executives with the users' challenges. Under his prodding, Wang officials revealed some of the company's plans to alleviate customer complaints—that Wang will offer this year a compact version of IBM's DISOSS and support for PROFS and DIA/DCA. Full Wang Office support for the IBM PC will soon be announced as well, we were told.

The forthright attitude of Wang officials, to open their doors to DATAMATION and responsibly address the legitimate concerns of their customers, is appreciated—by us, by Wang's users, and by our readers.

We all need prodding from time to time, whether it comes from customers or competitors. We think computer users could—no, must—provide more of that prodding, and be able to do so without fear of retribution from vendors, no matter how large and well-entrenched those vendors may be.

And what if the customer is wrong? Well, as retail execs have known forever, that just can't happen. ◉

ILLUSTRATION BY DORIS ETTLINGER

"DIGITAL NETWORKS GIVE US THE KIND OF RESULTS POLAROID IS FAMOUS FOR—INSTANT."

Albert Hyland
Director, Worldwide Systems
and Telecommunications Division
Polaroid Corporation.

Polaroid's success is easy to understand: by demanding the most from technology they've demanded the least from consumers. Their products capture moments as quickly as you can create them.

Today, Polaroid's lead in instant photographic technology depends on the state of their networking technology.

Al Hyland explains, "How well our people communicate by computer increasingly affects the quality of our products."

Increasingly, Polaroid is coming to Digital for networking solutions.

"TECHNICALLY, DIGITAL NETWORKS ARE THE BEST."

According to Al Hyland, Digital networks are the best because flexibility is built in.

"There's always a next step to take in networking," he says. "Take the wrong first steps and you'll eventually end up redoing everything."

Technically, Al Hyland demands a lot. A range of reliable products to pick from. Conformity to recognized standards. Ease of use. And, not surprisingly, a good measure of technical savvy.

"Digital's products not only communicate with each other well," he says, "they reconfigure easily without changing the user interface. Digital has given us a comprehensive networking strategy that we can implement today without worrying about being boxed in tomorrow. I'm not aware of another vendor who can say that."

"DIGITAL IS OUT FRONT WITH ETHERNET."

"We've grown up with computer technology the way most corporations our size have," says Al Hyland, "that is, a mainframe database and a variety of technical divisions serviced by minicomputers. Digital's networking strategy fits this pattern."

At the company's film negative production facility, for example, an Ethernet-based process control network enables technicians to see, quite literally, in the dark. Polaroid is linking such facilities via DECnet™ networking software, typically using VAX™ computers as nodes. Digital's SNA™ gateway then provides access to the corporate database.

"Digital's general style of com-

puting has been popular with our technical people for years," Al Hyland remarks. "Their Ethernet products have reinforced this. It's very comforting now to see Digital offering compatible solutions for corporate-wide problems like information management. I guess our engineers were right all along."

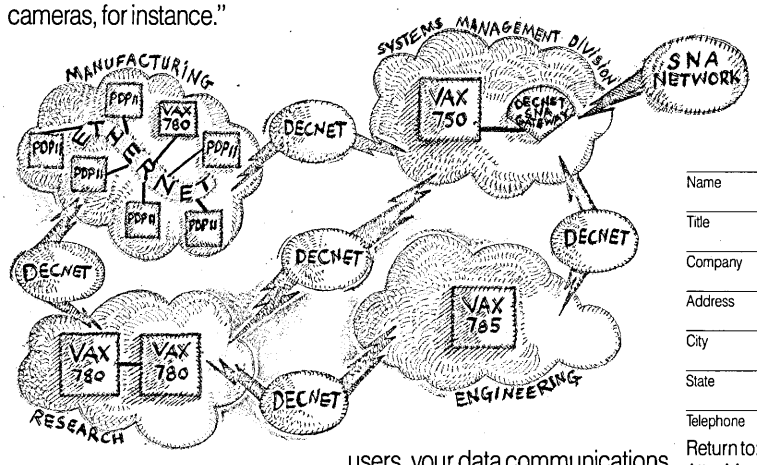
"DIGITAL UNDERSTANDS THAT RESPONSIVENESS IS KEY."

Personal computing is growing rapidly at Polaroid, fueling the demand for networks. Al Hyland sees networking as the next major plateau in computer technology.

"Our goal," he says, "is a single network. One that will allow us to run the whole enterprise in a more intelligent manner. One that will help assure our products will always be fun to use."

Al Hyland predicts that one day every Polaroid employee will be able to sit down at a computer and access the information they need without worrying about where it's stored, how it's routed, or even if it's accurate. It will all happen automatically and quickly. He sees Digital's networking technology playing a large role in making it happen.

"Technology is at its best when the user isn't even aware of it," Al Hyland observes. "Take our cameras, for instance."



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STEEL YIELDS IN PA.

The spiritual home of the smokestack is converting: last year there were more high-tech workers than steelworkers in Pittsburgh.

by Jonathan Lansner

Two small statistics tied to the economic past and future of the Pittsburgh region quietly crossed paths in 1984. The number of people working in the steelmaking mills that built Western Pennsylvania's reputation fell below the total employment at new technology firms and their suppliers.

"Pittsburgh has changed—it had to change," says Gar Golding, who coordinates recruitment and incubation of high-technology firms for Penn's Southwest Association, a local business recruitment firm financed by the town's big businesses.

In a region where eight out of 10 residents are natives, Pittsburghers have now spent three decades watching the city and the region undergo—as they call them in Pittsburgh—"renaissances." Gone is the smoke-filled "midnight at midday" environment of the 1940s and 1950s, when businessmen brought two shirts to work because the first one would be too filthy to wear by noon. In its place is "The City with a Smile," as the local visitors bureau markets the town. Downtown has half a dozen new office towers and a new subway on the way, and the regional economy is slowly and painfully turning from heavy industry to high technology.

As of June 1984, the last figures available, there were 148 high-technology firms in the area, employing 14,496 people and 190 supply and support firms employing 20,194, according to Penn's Southwest. Those firms averaged a 22% annual sales growth rate and 20% employment growth rate.

"That bad reputation of Pittsburgh works in our favor," says William Wulf, chairman and chief executive officer of Tartan Laboratories, a Pittsburgh manufacturer of compilers. "When you first contact people about coming to work for you, their mental image of Pittsburgh is so bad that when they come to see it their reactions are very positive."

The biggest sales pitch in recent Pittsburgh history landed the Pentagon's Software Engineering Institute (SEI) at Carnegie-Mellon University. The Pittsburgh corporate community—a sizable one that comprises 15 Fortune 500 firms—along with Pennsylvania's Congressional delegation, state and local politicians, and a major effort by the school itself won the five-year, $103 million contract.

The deal with the Department of Defense will bring 250 people together on the Carnegie-Mellon campus to study and improve techniques of manufacturing and software. The goal of the institute is "to get the best research out of the lab and into the marketplace," says Mario Barbacci, SEI's associate director of project engineering.

The institute will do a number of government-requested projects each year (the first year's work includes a study of software licensing and evaluations of software packages the government has under contract for its Ada language), but the bulk of its work will be original, unclassified research. The institute will also work on developing better education processes for teaching software. It will help pass along its acquired know-how through affiliate programs, bringing in people from industry and from other colleges for hands-on experience with the institute's work.

"The Pittsburgh high-tech community would be a success without SEI," says Jack Thorn, chief executive officer of the Enterprise Corp. of Pittsburgh, a firm that aids startup companies. "But SEI put Pittsburgh on the national map."

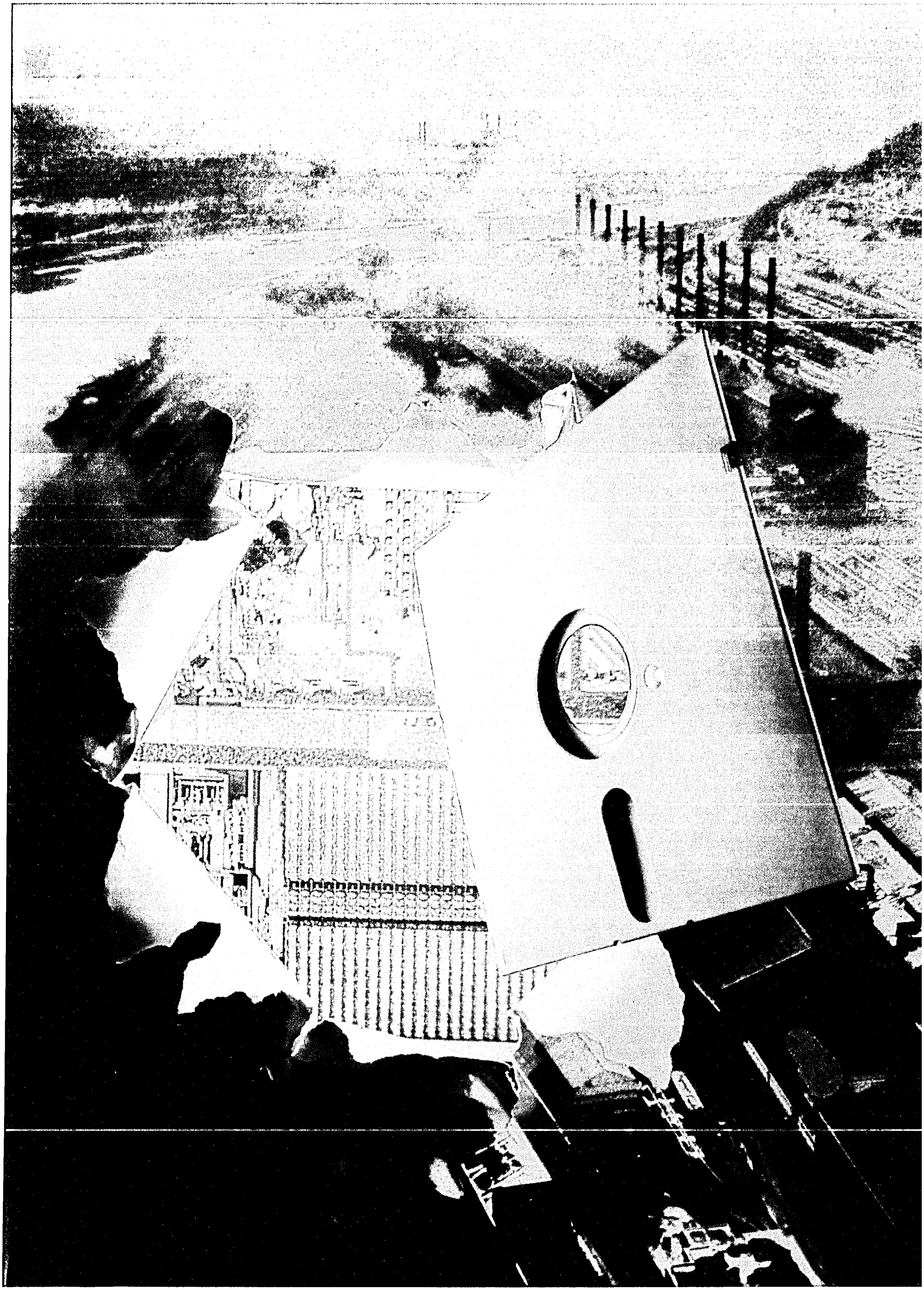
Just to be sure that no one missed the significance of the Software Institute's arrival, Penn's Southwest took out a full page ad in the *Wall Street Journal* to cele-

Pittsburghers have now spent three decades watching the city and the region undergo—as they call them in Pittsburgh—"renaissances."

brate the contract, an agreement that many in town see as the catalyst to further high-tech development. "It won't happen overnight," says Dennis Moyles, chief executive officer of Inspiration Systems Inc., a software firm located in Sewickley, a western suburb. "But neither did Silicon Valley."

The linchpin of high technology in Pittsburgh is undoubtedly Carnegie-Mellon. Considered a leading center of computer software and robotics technology, the school has helped nurture a number of ideas that have then been exploited by fledgling companies; its partnerships with industry go along with the school's philosophy of doing research that is practical for the marketplace.

PHOTO BY STEVE COOPER; PHOTO OF PITTSBURGH BY WOODFIN CAMP/BURK UZZLE; PHOTOMACROGRAPH COURTESY WESTERN ELECTRIC/PHILLIP HARRINGTON



MOYLES OF INSPIRATION SYSTEMS: "It won't happen overnight, but neither did Silicon Valley."

Larry Geisel, Carnegie Group president, says of local high-tech growth, "So far, almost everything has come from the university."

Just a few blocks down Fifth Avenue in the city's Oakland district, the University of Pittsburgh makes its mark in material sciences, the biomedical field, and in artifical intelligence. The University also sponsors the Advanced Technology Enterpreneurial Center, a group that assists high-tech businesses in obtaining a number of state and federally funded research grants and provides help in basic business skills like marketing, planning, and financing.

Tartan Laboratories is one of many Pittsburgh software firms with Carnegie-Mellon roots. Its name is even derived from the school's nickname for its athletic teams, the Tartans.

In September 1981, three members of Carnegie-Mellon's computer science staff—Wulf, Anita Jones, and John Nestor—started the firm with what they considered a novel concept: automating the construction of software.

"Software is still a craft industry," Wulf says. "Although the people involved are highly educated and certainly talented, every time software is written by a person, or a collection of people, it is written from scratch."

While spending a good part of 1984 doing advanced research and development for a number of major clients including the federal government, Tartan Labs has prepared three compiler products for 1985 shipping.

"We are the only people seriously in this field," says Wulf. "Usually, there's not much to distinguish one software company from the next."

While much of Pittsburgh's software industry growth has come in the last three years, older firms are also part of Pittsburgh's technology scene. For example, Duquesne Systems Inc. has for 15 years quietly toiled its way to profitability.

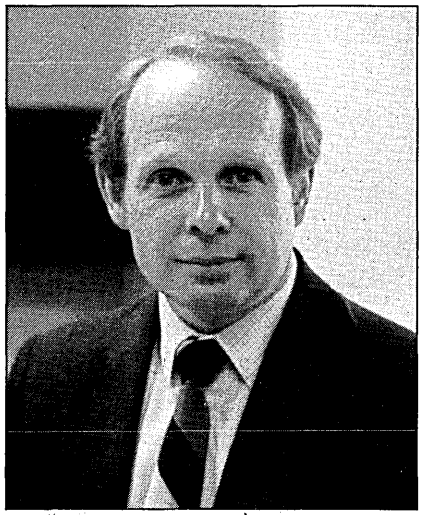
The firm, which sells operations software for IBM mainframe computers, typifies the low-profile approach taken by many Pittsburgh high-tech firms. Offices are sparsely decorated and cramped for space in a building on Pittsburgh's North Side. Employee dress at the office more closely resembles Wall Street than Northern Californian. A public offering in January was handled without a peep to the media.

"I guess I'm conservative," says Glen Chatfield, president, cofounder, and something of a rarity in Pittsburgh's high-tech community—he has a degree from Pennsylvania State University, not Carnegie-Mellon.

The firm began in October 1970 as a three-man team trying to cash in on the unbundling of IBM's software from its hardware.

"Back then there was nothing," Chatfield replies when asked to describe the local support system for startup firms. "But we were so small that it wasn't really a problem." Once the mainfame business had shaken out in the mid-1970s, Duquesne Systems was ready to blossom. The firm has grown to 75 employees and earned $1.5 million on sales of $7.5 million in 1984.

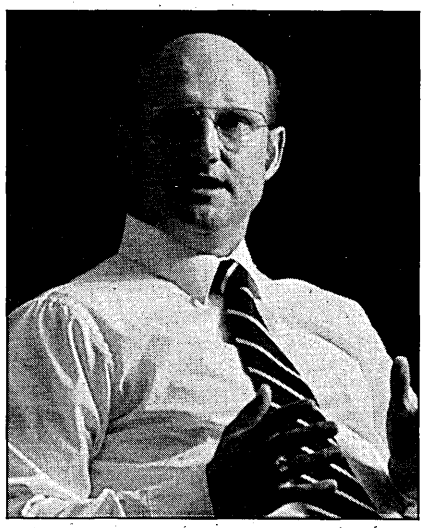
Although software came to the Pittsburgh technology scene because of Carnegie-Mellon, the region's other high-tech strength—the factory of the future—is a reflection of its economic past. Here, again, is the Carnegie-Mellon connection. Its Robotics Institute is an interdepartmental research unit working on projects including artifical intelligence and industrial robots. The four-year-old institute is an example of the school's close relationship with industry—its funds come from Digital Equipment Corp., Pittsburgh-based Westinghouse Electric Corp., and the U.S. Department of Defense.



GEISEL OF THE CARNEGIE GROUP: "So far, almost everything has come from the university."

American Robot Corp., founded in 1979, moved from North Carolina to Pittsburgh in 1981 mainly to take advantage of the local robotics expertise. "We're not just robot manufacturers anymore," says Kathy McMinn, the firm's marketing coordinator. "Factory automation is heading more towards software-intensive approaches." American Robot, which lists more than 40 Fortune 100 firms as well as several Japanese firms as clients, recently acquired Dynamac Inc., a 26-year-old Boston company. Dynamac will help American Robot expand into automation of the electronics industry.

Contraves Goerz Corp., a subsidiary of a Swiss firm, started as a telescope manufacturer in 1964 and grew into a maker of automated controls for optical measurement. The firm, which employs 1,000 people—800 locally—has inspired more than 20 spin-offs, employing another 1,000 people.



CHATFIELD OF DUQUESNE SYSTEMS: "Back then there was nothing, but we were so small that it wasn't really a problem."

"This is as good a place as any to be located," company president James Colker says when asked why his firm is in Pittsburgh and not Southern California where the majority of its clients are to be found.

In the technology community, one major gripe is that the support system for startup companies is lacking. "The support system here is still rather informal," says Colker, who is also president of the Pittsburgh High Technology Council. "We have to convince people what can

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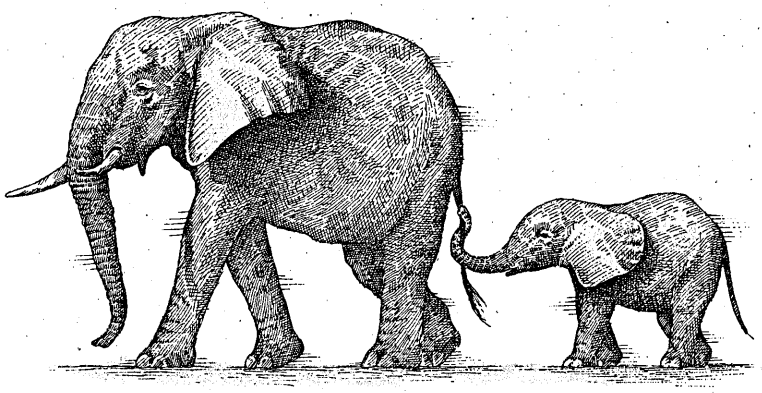

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IN FOCUS

THE CLIMATE IN PITTSBURGH

If two words were to describe Pittsburgh's high-technology community, quiet and congenial might be the best choices.

While public relations activities have become a regular part of the routine in other technology hotbeds, most of Pittsburgh's technology firms have chosen to grow up and prosper with barely a whisper of press coverage.

Media events are rarely held. Marketing programs are done quietly and out of town. Public relations are commonly handled by the marketing staff, and little effort is made to contact the Pittsburgh media. When PR efforts are made, firms usually direct them at trade publications.

"A lot of the firms are run by technicians who are hard-sell people, survival artists, who haven't staffed for PR," says Jack Thorn, chief executive officer of the Enterprise Corp. of Pittsburgh, a firm that helps startup companies. "These guys obviously don't think that public relations is worth the cost."

Marketing, some observers say, is not a strength of the Pittsburgh high-tech community. Dennis Moyles, chairman of Inspiraton Systems Inc., said at a press conference—a rarity for the Pittsburgh technology scene—"Since this is a young community, obviously we are lacking in marketing experience. That's why ISI and others will have to go outside to get that talent."

Most of the Pittsburgh firms have stayed out of the public eye by remaining privately owned. But even software firms that go public—like Duquesne Systems Inc. and Sulcus Computer Co.—have managed to complete the action with little fanfare.

As quiet as the firms have remained in public, they make up for their reticence with the frequency of communication amongst themselves.

"It is a friendly atmosphere, " says Duquesne Systems Inc. president Glen Chatfield. "But when we all grow up and come to a situation where there are many competitors in town, I'm sure the relationships may become more formal—let's say, cold."

Both the Enterprise Corp. and the High Technology Council regularly hold luncheons, dinners, and briefings on a variety of topics to bring the technology community and entrepreneurs up to date.

"People around here seem to like to talk to each other a lot," says Jim Colker, president of Contraves Gorez Co. and of the High Technology Council. "It's a group that likes to stick together. There's much more willingness to be friendly, to be cooperative, than in many other high-tech communities."

Duquesne Systems, for example, is a test site for a financial planning software package designed by PAC Systems, a local firm. "We can give them feedback," Chatfield says, "and it's so valuable to have the access to the creative talent behind the product."

Silicon Valley ad man Regis McKenna, who grew up in Pittsburgh, says the region "has that quality of a small town. . . . It's a small, confined area that makes it easy for the technology people in town to get together. It's the type of town where planned redevelopment has worked before. But the question is, can you plan an entrepreneurial environment like Silicon Valley?"

The technology community has picked up on one of the habits of Pittsburgh's corporate old guard, the "conference" concept.

"It's an old Pittsburgh tradition," says Dan Dye, a native who runs the Pittsburgh office of Security Pacific Corp.'s venture capital group. David Lawrence, perhaps Pittsburgh's most notable mayor, and the man who started the town's first renaissance in the 1950s, was the force behind the Allegheny Conference, a group of businessmen who were to plan out the city's future.

"There's certainly more getting together here than there is in other places," says Dye. "But if Pittsburgh becomes the metallurgical center of the world or the robotics center of the world is not going to be determined by any council. It's going to be who's good and who's lucky and who's doing what somewhere else."

happen here."

When Thorn, a native of Pittsburgh, returned to his hometown in 1972 after a 20-year stay on the West Coast, he was shocked at how "high-tech illiterate" the business community was. "There was

Gone is the smoke-filled environment of the 1940s and 1950s, when businessmen brought two shirts to work because the first one would be too filthy to wear by noon.

no understanding of high technology. Banks didn't know the first thing about venture capital. There were no lawyers who could handle a high-tech job."

Although most people in Pittsburgh's technology community acknowledge that major improvements have been made, many say there is need for more improvement in the basic support system. The local banks, known for their conservative approach, draw the most scorn. Getting a loan or a line of credit or help with a leasing arrangement is extremely difficult, industry leaders say.

Carnegie Group's Geisel says that local banks haven't shown that much interest in doing business with his firm. Meanwhile, he points out, First Bank of Boston "has been falling over us to get our business." Local expertise on legal, accounting, and tax matters for startup firms could also stand improvement, technology executives say.

"Carnegie-Mellon's reputation is not going to be enough," says Regis McKenna, a Pittsburgh native who now runs his own marketing firm for high-tech companies in Silicon Valley. "They have to develop that support mechanism."

Local venture capital gets poor grades from some observers, but Golding says those problems are overstated today. Five years ago, there were only two venture capital firms in Pittsburgh, but at least nine groups are now in the area.

"The experience isn't here to evaluate the high-tech firm," says Moyles of Inspiration Systems. Moyles had to go to entrepreneurs as far away as Florida to raise his second round of venture capital. After raising only $500,000 locally the first time, he was able to raise $4 million and turn away another $1 million from the national audience. "Pittsburgh money is tag-along. They wait until they know a situations's good."

"Sure the venture capital situation in Pittsburgh doesn't compare to Silicon Valley, but on the whole, it compares favorably on a national scale," says Dan Dye of Security Pacific Corp.'s venture capital group, which manages a $150 million portfolio. "There's certainly more in Pittsburgh than, say, Atlanta."

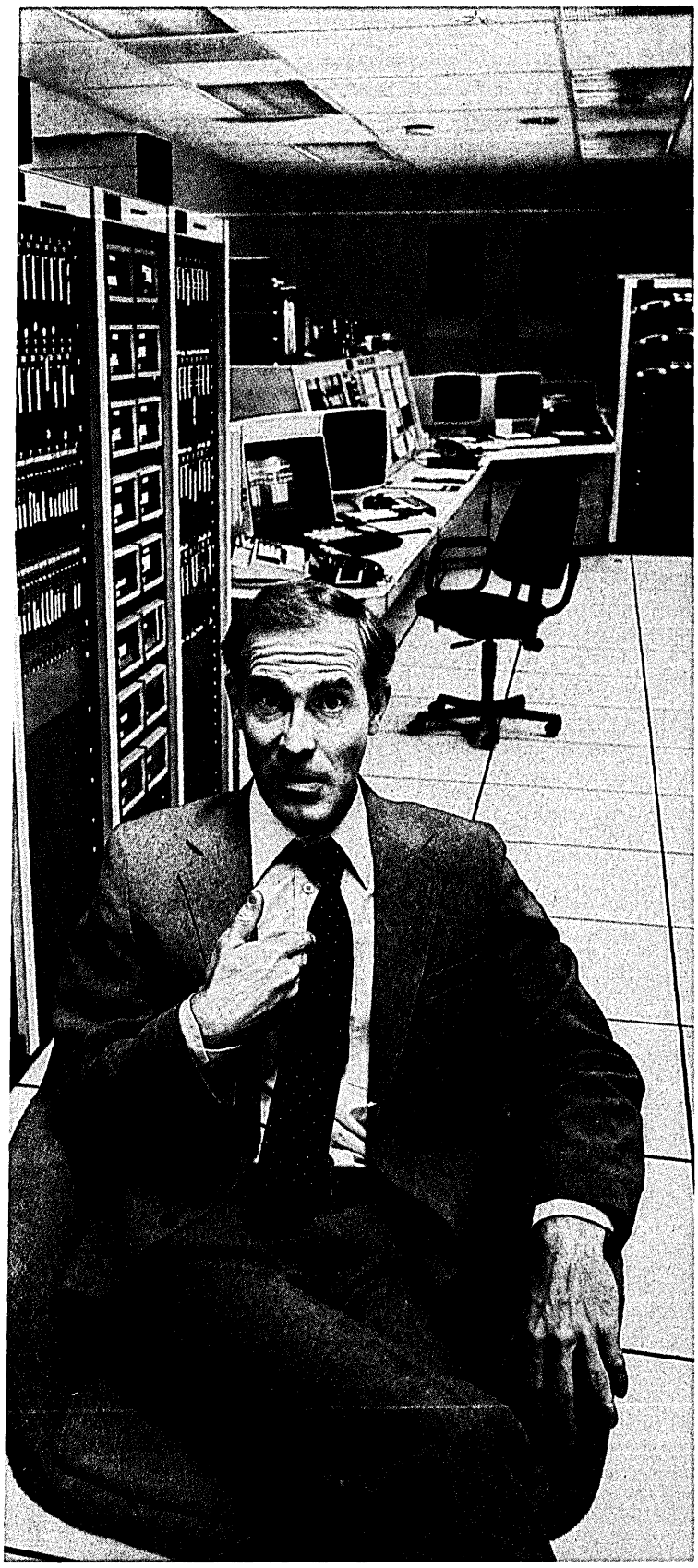
Carnegie Group has stayed away from conventional venture capital, choosing to raise money by establishing partial ownership relationships with key business partners who have signed long-term contracts. The firm, which expects $7.8 million in revenues in 1985 and has 56 employees and 15 consultants, landed

"The Pittsburgh high-tech community would be a success without SEI, but SEI put Pittsburgh on the national map," says the ceo of a firm that aids startup companies."

three major contracts that included equity investments in 1984: DEC, French firm GSI, and Boeing Co.

Some of Pittsburgh's older industrial firms have also begun to get into new technology businesses. Westinghouse has trimmed its interests in heavy machinery, such as industrial turbines, while strengthening its postion in software, in-

When this D.P. Manager asked for a Computer Environmental Data Acquisition System, we told him to build it himself.



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IN FOCUS

PITTSBURGH'S TROUBLESOME IMAGE

Conversation with Pittsburgh technology executives inevitably touches upon the problem of getting qualified people to move to Pittsburgh. The local colleges provide enough young talent, they say, but when it comes to buying experience, hiring can become a chore.

Raul Pupo, president of Genix, a wholly owned software unit of Fortune 500 member National Intergroup Inc., observes that "in the long term, hiring is really, really crucial."

When Larry Geisel, the president of Carnegie Group Inc., recalls the company's initial attempts to recruit him to Pittsburgh from Corvallis, Oregon, he can see how tough a sell the town can be. At the time, he was chief executive of Summit Information Systems, a 100-person, $15-million firm that provided computer systems to the banking industry.

"I had no grand incentive to come to Pittsburgh," recalls the Carnegie Group president, who adds that he actually missed the plane the first time he was scheduled to go to Pittsburgh for an interview. "I had to be convinced that this was the place to go."

At software house Inspiration Systems Inc., chairman Dennis Moyles routinely limits his hunting to some of the northeastern U.S.'s industrial cities. "Pittsburgh looks inviting if you're working in Cleveland or Buffalo or Rochester," says Moyles. But when Moyles needed top-flight marketing help, it took him six months to lure Ramesh K. Mehta, a former Digital Equipment Corp. executive who was running his own small firm in the Boston area, to become Inspiration's president.

There are some salient sales pitches to be made to prospective employees considering a transfer to Pittsburgh—the low cost of living being on top of the list. "The West Coast housing problem," says Gary Golding of Penn's Southwest Association, a local industry-supported recruiter of companies, "is one of our biggest selling points." A prime neighborhood, three-bedroom house that costs $175,000 in San Jose and $159,000 in Boston, runs $89,000 in Pittsburgh, according to the Nationwide Relocation Service.

Employee turnover rate is low in Pittsburgh, technology executives say. As for the employee raids so rampant in other high-tech centers, nobody's seen one in Pittsburgh yet.

"Pittsburghers see their firm almost as a family," says James Colker, president of Contraves Goerz Corp. Colker is one of many executives to laud the area's positive work ethic. "I don't think you'll ever really see here the company-hopping of the West Coast. And that's a real positive thing. We have to reinforce that. It could be a real advantage."

Still, technology executives have had difficulty convincing corporate headhunters of the promise of the Pittsburgh technology community. When Pupo, whose parent firm owns National Steel Corp., launched a nationwide search for an executive recently, the headhunter he was working with did not know how to approach it.

"He said, 'This used to be National Steel and now you're telling me you're in the computer business?' " Pupo recalls, "I first had to educate the search guy, and then he in turn had to go out and educate potential candidates. It was awful hard. The problem was really getting people to move. When the search guy said 'Pittsburgh,' it was a turnoff."

dustrial controls, robotics, and nuclear power station controls. Rockwell International Corp. recently acquired Allen-Bradley Co., a Wisconsin firm that makes automated factory controls. Koppers Co., an engineering and construction firm, has established its own venture capital group with a $30 million portfolio.

"This is as good a place as any to be located," says one company president when asked why his firm is in Pittsburgh and not Southern California, where most of its clients are found.

National Intergroup Inc., parent of National Steel, has established its own software subsidiary, Genix. "We'd like to acquire a stable of high-tech firms," says Genix president Raul Pupo, whose firm has roots in the July 1984 acquisition of an 80% stake in Starcom, a local software firm. Genix, which projects 1985 sales of $20 million (20% coming from outside the parent firm), provides remote computer services, and telecommunications and process control consulting. It is also trying to get into software sales. "We want to become a major high-tech player in town," explains Pupo.

Ramesh Mehta, a former DEC executive and now president of Inspiration Systems, drew parallels between today's Pittsburgh economic climate and one that existed a century before. "This area can be an economic and financial powerhouse. Pittsburgh did it once before, back in the days of the steel moguls. The area has the conviction and the talent to do it—in another industry—once again." ◉

Jonathan Lansner is business news editor of the *Pittsburgh Press*.

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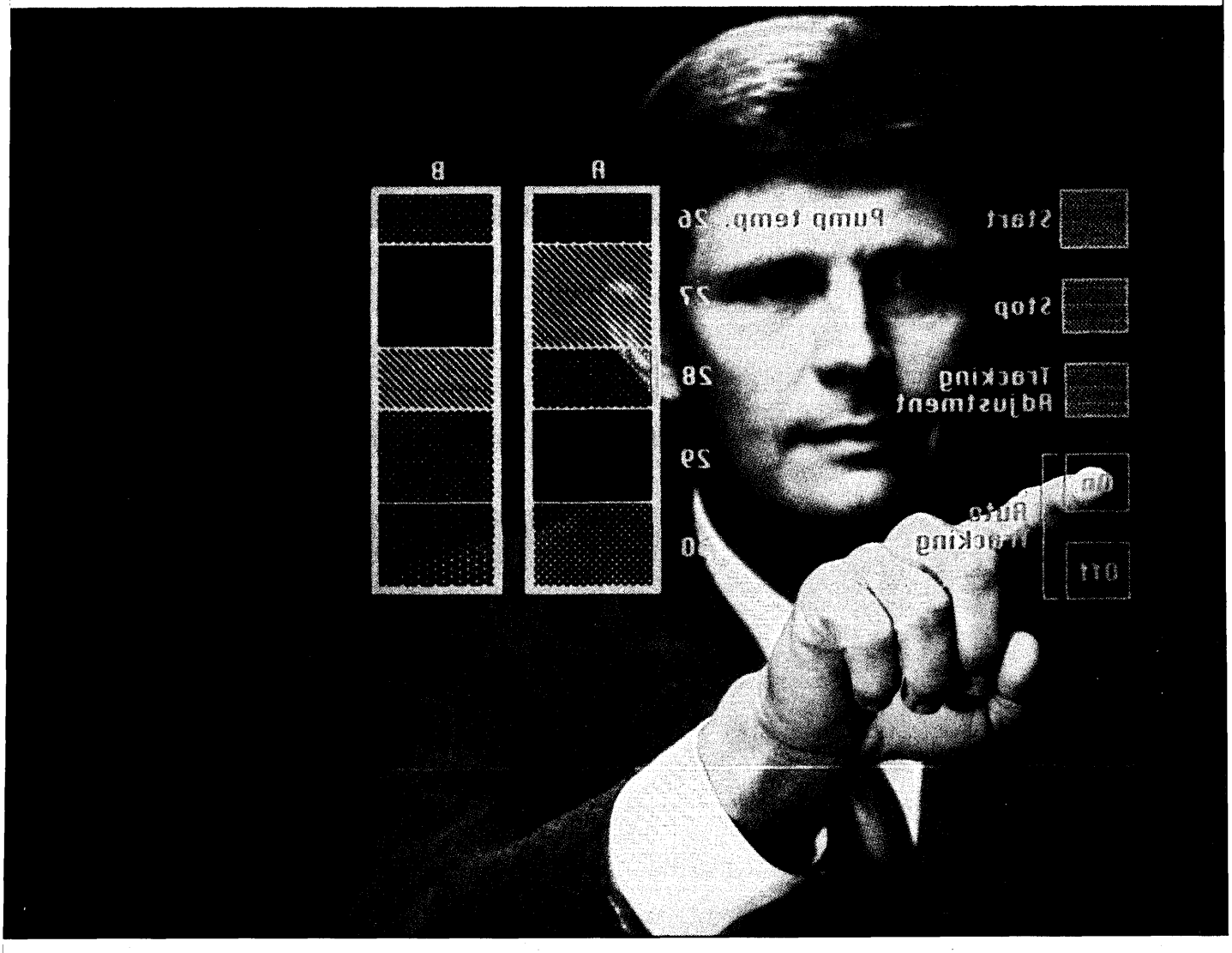

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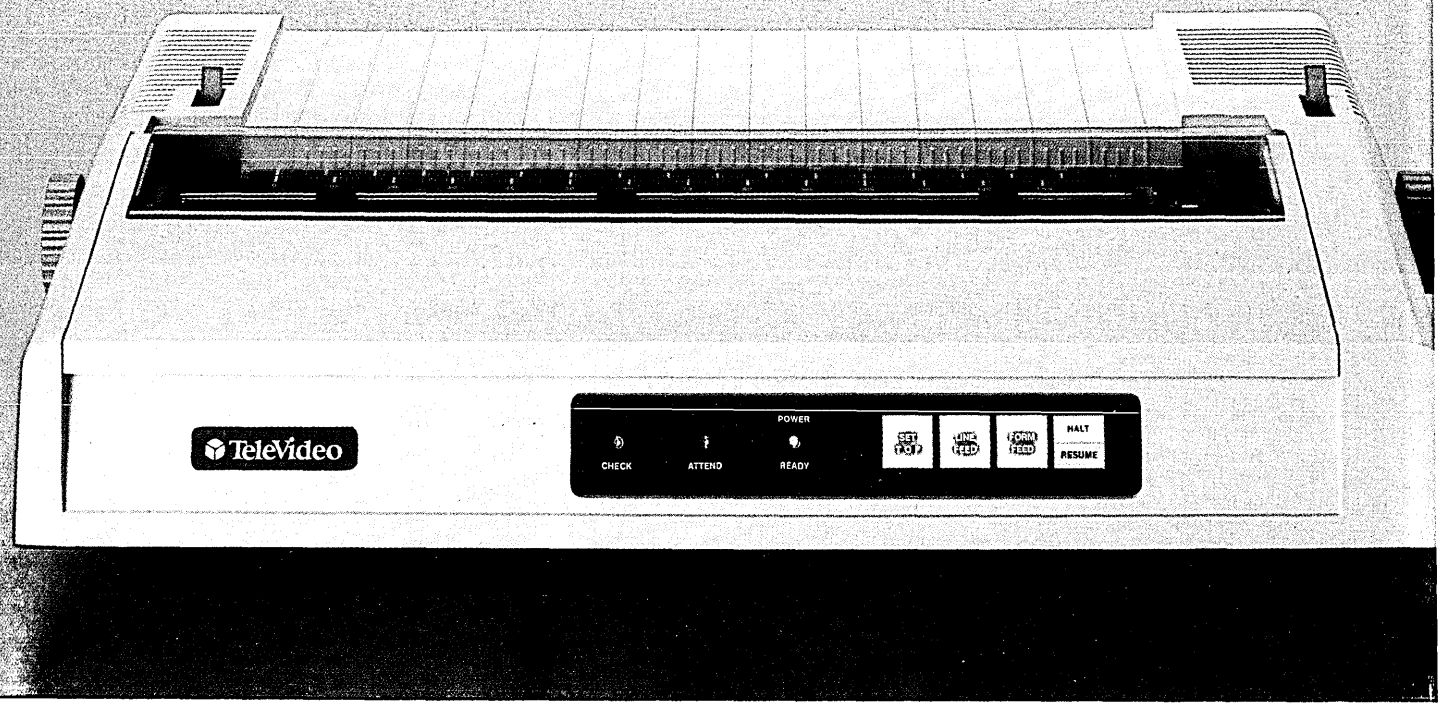
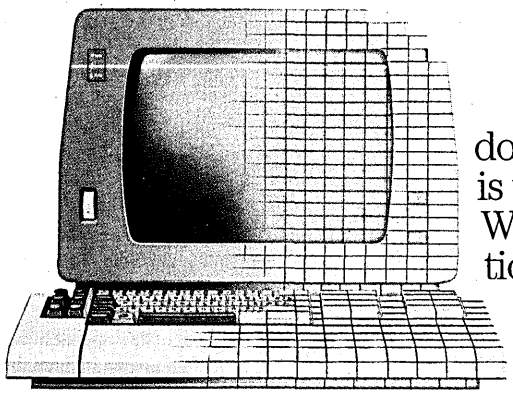


The nicest thing about IDMS/R on a 4300 is how easy it is to build with.



It's a rare data processing department that doesn't have a backlog of applications, and nowhere is the problem more acute than among 4300 users. With fewer people typically to develop applications, fewer applications typically have gotten developed.

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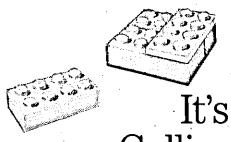

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NEWS IN PERSPECTIVE

OFFICE SYSTEMS

DARK DAYS AT WANG

The company's future as a dp supplier hangs in the balance as users weigh its promised offerings against its past failings.

by R. Emmett Carlyle

After a nine-year joyride during which it became one of the legendary success stories of American industry, high-flying Wang Laboratories Inc. may be coming back to earth with a resounding thud.

Discussions with several of its largest users reveal a growing disenchantment with the company, a malaise that could spread to undermine the very foundation of Wang's office automation business. A number of senior dp executives at Fortune 500 companies voice their concerns anonymously. "We still have to get the best deal we can out of Wang," explains the vice president of technology at a large insurance company, and one of Wang's biggest customers.

The consensus among these customers is that Wang, in the words of one, "is not where we would wish it to be," falling down particularly on the "three Cs: coexistence, compatibility, and communication with IBM."

"Wang is habitually late with products we do need, and quick to announce products we don't need—though they do demo well," says the senior dp executive at a large manufacturing company in the Midwest.

This growing skepticism comes in the wake of a number of products announced by Wang over the past few years that have either failed to live up to expectations (its Digital Voice Exchange voice mail system, micro-based Professional Image Computer, and Alliance mini) or are shipping late due to Wang's internal problems (the WangNet local network, VS 300 supermini, and WP-Plus and Wang Office software). "They've traveled a long way with their word processing equipment," says one Wang customer near Cleveland, "but now that the office automation marketplace is moving away from wp to dp, the company is in a quandary."

Wang concedes that some customers have reacted negatively to its tardiness in getting key products out the door. "But we're shipping now and we'll soon lay those doubts to rest," predicts Sam Gagliano, Wang's vice president of product planning and management.

Gagliano claims that his company is now shipping seven to 10 Wang Office systems a week. "The product was late because we did it right. Other offerings, such as Data General's CEO, haven't integrated OA and dp; you're either in one mode or the other at any one time. We offer one consistent directory across all environments: documents, data files, images, and voice. When users realize this, we believe they'll desert CEO, [Digital Equipment's] All-in-One, and the others for our product."

Wang has clearly hoped to use its huge word processing base of OIS systems as the primary building block for larger OA systems, but the reality is that IBM is driving the OA market in the direction of direct access to large databases controlled most often by a mainframe.

"Wang isn't yet comfortable with DBMS and mainframe communication issues," says the large insurance customer, "and the outcome of its entry into major league dp must be uncertain at best."

Wang and IBM have many Fortune 500 customers in common, and these large sites are now emerging from pilot programs ready to make substantial commitments to office automation—on the order of tens of millions of dollars. Wang is hoping to gain account control of these configurations by supplying the super-mini-class departmental database machines, as well as the integrated office software, workstations, and terminals.

"It'll be a tough uphill battle," says a former Wang saleswoman in the Midwest. "My old customers are resisting the [3.2MIPS] VS 300 because they would have to create a whole new dp systems support team. Unlike earlier VS models, the machine can't be learned in three weeks by secretaries." She says that users already have their IBM systems support staff and seem loath to complicate their lives by creating another group for Wang.

Other Wang users confirm this reluctance, and add that all their OIS systems and most of their VS models are used solely for word processing. "Our wp field engineers can't even fix our VS computers when they are used for dp as it is," one customer in the automotive sector adds.

Former Wang employees are quick to point out that the company needs MIS executives who will go to bat for them to have any real chance against IBM. "This won't be easy," a former Wang executive says. "The MIS center has been miffed for years by Wang's championing of the end-user cause against their authority. Now that the office manager is giving way to the dp and MIS manager as OA buyer, there may be a day of reckoning for Wang."

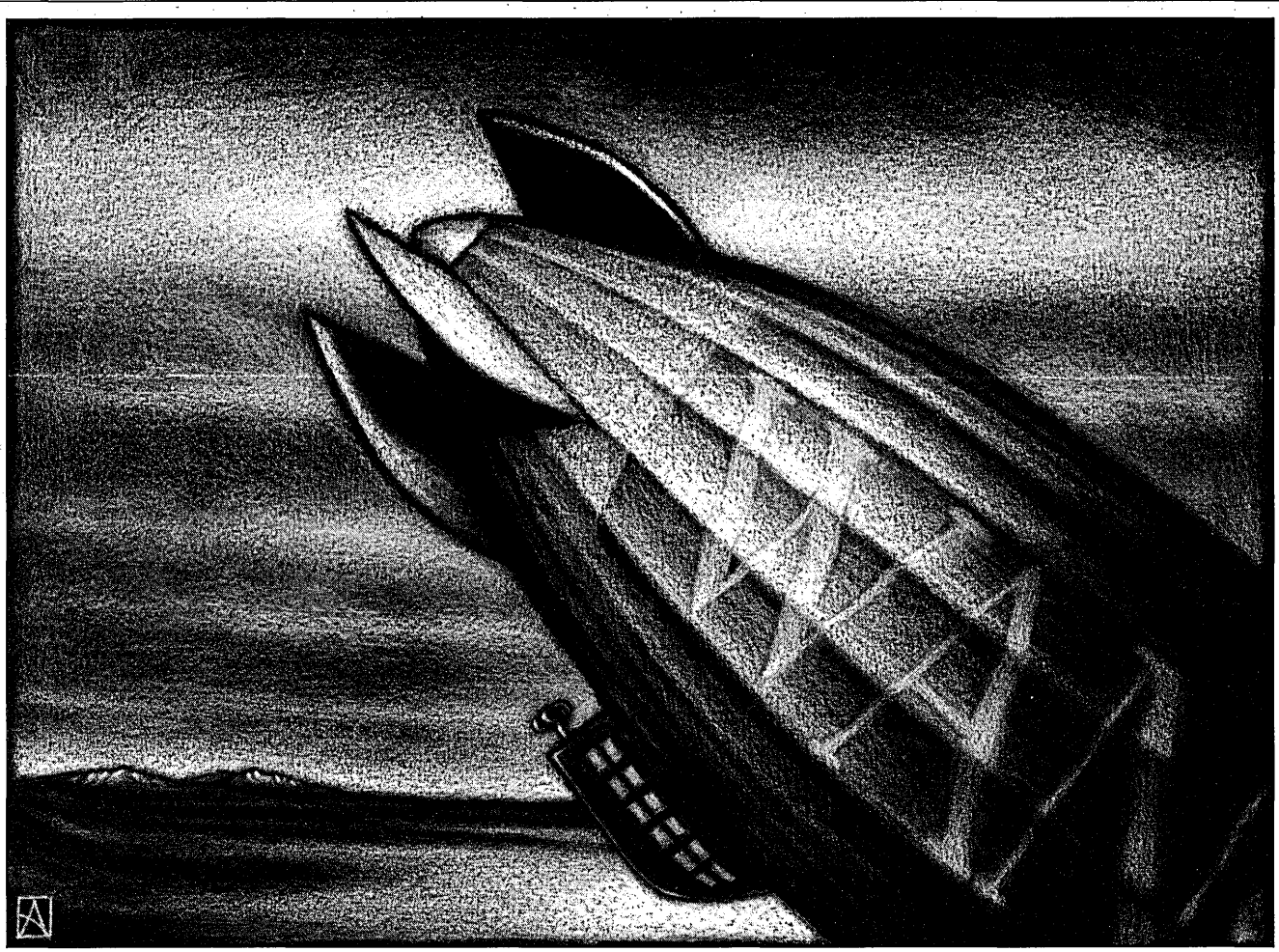

ILLUSTRATION BY DANIEL ADEL

Wang admits that selling to the MIS department after becoming synonomous with end-user computing will be a real struggle. "We want to make these people our friends, not challenge them," Gagliano says. "We believe we have the solutions they need for OA and a way to integrate the incompatibilities in their IBM shops."

Yet corporate MIS personnel, it would seem, require little goading to choose IBM's System/36 over the VS family. An added incentive, should one be required, is that the System/36 requires virtually no maintenance and is noted for its (Wang-like) ease of use.

The success of the System/36 hasn't been lost on Wang, which recently mounted an aggressive and internally controversial multimillion dollar advertising campaign against the product. "IBM has spread some FUD [fear, uncertainty, and doubt] in an effort to undermine our dp thrust. We're warning MIS executives that the System/36 is only a temporary fix—a two-year product," Gagliano explains. "Newly installed 36s run out of gas once you start to pile the terminals on. IBM could easily abandon these users once an effective 370 departmental DBMS machine surfaces.

"We've got a two-year window of opportunity," Gagliano explains, while IBM produces a 370-architecture implementation stretching from desktop to data center. "Once IBM's 370 runs from the top to the bottom of its line, the whole nature of the game changes."

As it turns out, Wang may be matching FUD with FUD when it comes to the System/36. Far from dropping the product, IBM recently signed a $110 million, eight-year deal with the U.S. Department of Agriculture to provide 2,896 System/36 cpus, 13,500 crts, and 6,400 printers. As part of the deal, IBM will also develop for the machine a new async-to-X.25 connection and extensive new microcode.

"MIS has been miffed for years by Wang's championing of the end-user cause, and there may be a day of reckoning for Wang."

In a separate deal showing the depth of IBM's commitment, according to Phoenix-based consultant Bob Djurdjevic, the company reduced the price of new System/36s 53% to win a contract against NCR's Unix-based Tower, normally 45% cheaper than a System/36.

While selling against the System/36 at the middle of IBM's range is tough, "it's not Wang's biggest problem," the former Wang salesperson says. "Wang's original strategy was to capture the corporate desktop with its workstations and build up to the VS and Wang Office from there. Unfortunately, IBM has convinced a good part of corporate America that it is not word processors that should be on desks, but IBM PCs."

Despite the unarguable fact that most of Wang's customers have standardized on the IBM PC, the company has appeared reluctant to support that unit wholeheartedly. "It's very frustrating," a dp executive at a large manufacturing company complains. "I've got $1.5 million worth of OIS word processors that I can't dump because secretaries love them, but Wang won't help make them communicate with our IBM mainframes. Now I have hundreds of IBM PCs that I can't use with my Wang systems."

Other users complain of "hyped up" VS systems that "laid down and died" as soon as more than a handful of terminals were attached. Wang's answer to all these problems, users say, is for users to wait for the VS 300.

"They tell me that in 18 months to

two years they'll offer IBM's 370 DISOSS support and its DIA/DCA protocols with my Wang VS systems, and all my problems will vanish," the large insurance company user says. "Like others, I'm simply not buying that. We love our Wang equipment, but we don't believe the company can take us where we want to go in the future." The user adds that he put a long list of grievances to Wang over a year ago, so that "we could discuss [them] on a partnership basis. But I haven't been able to hold their attention."

Wang says that's changing. An early expression of its good faith will indeed be a new, compact version of DISOSS that Wang has written over the past two years, Gagliano says. "We talked to IBM's customers and they told us that DISOSS was a hardware hog, as well as clumsy and indigestible in its present form. So we fixed it, and will make the product available this year."

Wang will also support IBM's document exchange standard, DIA/DCA, and its VM-based Professional Office System (PROFS), predicting a base of 100,000 units for the applications software. Perhaps most important, though, the company says it will fully support the IBM PC. "By July a new keyboard for the IBM PC will be announced, which supports Wang document formats and word processing," Gagliano reveals. "This is a necessary foundation for full Wang Office support for the IBM PC by year's end."

Clearly, Wang needs to be successful with all these products to get back into favor with this sampling of users. But the problem may be even more widespread, according to several securities analysts. Stephen K. Smith of Paine Webber recently polled Wang's largest customers, and only 20% told him that they would increase their purchases from Wang by over 10% in the next few years, he says. "The users' stated preference for their primary data processing vendor to be their office automation supplier strongly suggests a slowdown for Wang"—and gains for IBM.

John Levinson of Goldman Sachs is also decidely bearish on Wang. He says he discussed the company's situation with many Wang customers and "they gave me the impression that Wang hadn't given them a great product in four years—just lots of marketing glitz and promises."

Levinson's view is that a great deal is riding on the VS 300 and particularly the umbrella OA software, Wang Office, which was originally supposed to have been shipped last June. "Rather than just posture as a dp company, they have to deliver the goods, and with IBM waiting to carve them up the product has to be something out of the ordinary."

It's not surprising that user skepticism and disenchantment has translated into slumping orders and sales. Wang's December quarter was one of its worst in years, with revenue growth plunging from 30%-plus levels to 18%; total revenues for the quarter were $610 million. The company's backlog grew only 16% over the comparable quarter in 1983, and what growth there was came largely from the service and support side (up 29%), not from products.

"Delays in Wang Office and WP-Plus software contributed to poor hardware sales," Levinson says. "It's clear that not even Wang believes it can return to 30% sales growth or 14% pretax profit margins." IBM's pressure is intensifying, as is the collective challenge of other dp companies with office automation software, such as DEC, Data General, and (soon) Hewlett-Packard. Then again, consistent growth of better than 15% a year is still impressive; it is Wang's past record of even faster growth, combined with its current product problems, that color current results.

Wang's new strategy—to replace its poor IBM communications and to bring forth a new, revitalized product line—is nonetheless geared toward making the company a true bridge between the office and IBM. Unfortunately for the company, it's not a bridge that many users wish to cross at this time. ◉

MICROCOMPUTERS

MASSING AT THE GATE

IBM's PC AT is ahead of the pack, but vendors are jockeying for the inside track with "clone" machines.

by Karen Gullo

"Window of opportunity" is the marketspeak of the moment among a growing group of microcomputer manufacturers poised to make what they hope will be a splash in the pc arena with IBM PC AT clones. Everyone knows the window is there, and the idea is to squeeze through it without getting guillotined when it closes. Memories of the PC-compatible explosion and subsequent shakeout still linger.

But then again, some people never learn. There will always be many vendors willing to risk a ride on the IBM-compatible wave. "You won't see a lot of startup companies entering the market like you did with the PC compatibles," explains Michelle Preston, an analyst at L.F. Rothschild. "The central players will be companies that have had small successes in the pc market and that hope to use AT compatibility as their next major strategy to make it bigger in the market."

Some observers predict that by this time next year there will be hundreds of AT clone models flooding the market. Analysts and market researchers say AT-like machines are the next wave in pcs, and micro vendors will have to offer an AT clone if they hope to survive the next two years. The AT clones are "a risky business now," says Dave Wilson, an analyst at Future Computing, a Dallas market research firm, "but in two years, it'll be a must for anyone who's really serious."

Wilson points out that at present the AT, based on Intel's 80286 microprocessor, is perceived as a high-performance machine that runs MS/DOS, and that owing to a lack of software its true capabilities as a multitasking pc running Xenix are yet to be realized. The explosion of AT look-alikes that's certain to occur will spur software development, he says. Just as hundreds of programs were written for the PC, hundreds will be available for the AT over the next two years, the analyst adds.

Finally, throw in an IBM-developed Unix-like operating system, rumored to arrive in the next several months, and the traditional 8088-based MS/DOS pcs will be replaced with the 80286 AT-like micros, Wilson says.

Not so, says Mort Rosenthal, president of Corporate Software, Waltham, Mass., a software distributor. "Look-alikes don't play an important part in the software development process, especially in light of the problems the AT has had" with shipment delays due to technical glitches. "Large companies will be hesitant to pick look-alikes because the technology is unstable right now. Not until the installed base of ATs is much greater, which will probably occur later this year, will software development take off."

From the AT's introduction last August through the end of the year, IBM sold 49,000, according to Future Computing; this year, the firm predicts IBM will sell about 343,000.

Entering the AT-clone race will be a tough act for some vendors—tougher than it was during the PC-compatible boom, analysts say. "In 1984, there was such a demand for PC-compatible micros that almost anyone could make a box and sell it," says Norm DeWitt, director of personal computer industry services at Dataquest in San Jose. "This year many of those players are under financial pres-

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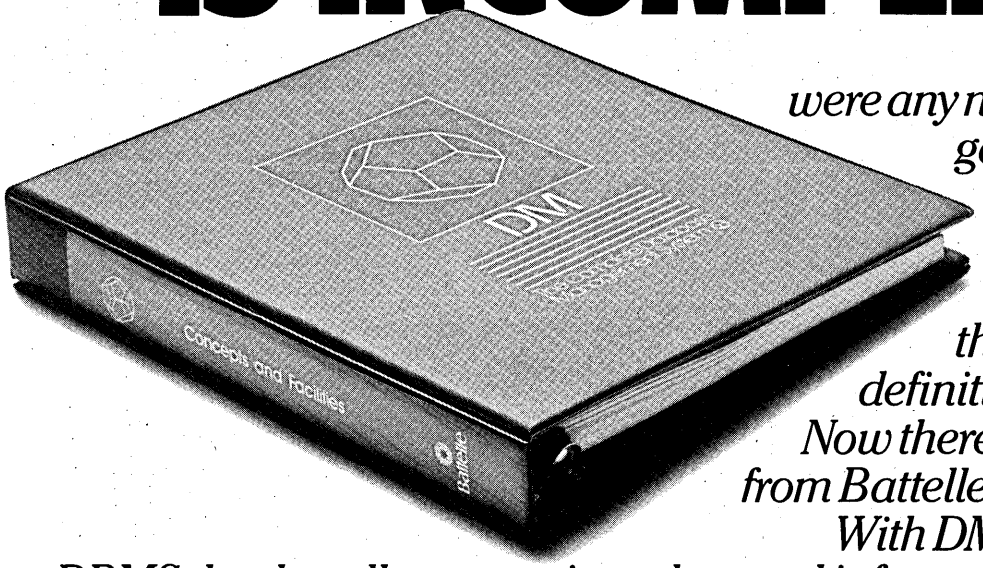

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sure. With the AT priced so aggressively [starting at $3,995], only the most financially stable companies can take the risk of entering the market. And the technology is more complex, which will limit the number of companies making AT clones."

Already a handful of vendors have tossed their hats into the ring.

Yet already a handful of vendors have tossed their hats into the ring. Leading the pack are Compaq Computer, Kaypro, Molecular Computer, and AT&T, all of which have introduced or are about to introduce AT clones. As with PC-like micros, the big issue for these and subsequent vendors will be compatibility, Future Computing's Wilson says. "With the technology being more advanced, compatibility is at least as important, if not more so, with AT look-alikes as it was with PC clones. That includes the operating system, whether it's Xenix or an IBM Unix OS," he says.

"Machines that are not very compatible with the AT won't last. Dealers want to show only those machines that will run Lotus and other programs the way an AT will."

Kaypro Corp., Solana Beach, Calif., is taking on the AT with its 286i, a $4,550 80286-based MS/DOS system that's "as compatible with the AT as one can be," president David Kay says. The product features 512K of RAM, a color board, one serial and two parallel ports, and software. The 286i will be distributed through retail stores and vars.

Also aiming directly at the AT is Molecular Computer, the company that recently merged with Durango Systems Inc., both of San Jose. Before the merger—indeed, six months before IBM introduced the AT—Durango introduced the Poppy, an AT look-alike. The newly formed company is now calling the product the Series 12, priced at $11,050 with 512KB of RAM, a 20MB hard disk, a floppy drive, Xenix, and two terminals. The Series 12 uses the 80286 as the main processor for computing tasks and a slave 80186 for I/O. The product is fully compatible with the AT and runs the same software, according to company sources.

"Large companies will be hesitant to pick look-alikes because the technology is unstable right now."

Barry Dearborn, vice president of sales, says the Series 12 is being distributed through vars to oems and systems integrators. Some 15,000 were shipped in its first year. "IBM says that their price is $6,800 now, but until they ship end-user 80286 Xenix systems we can't know what their price structure will be," he notes. "I imagine that a system configured like ours would probably go for about $12,000." He feels Molecular has an additional edge because it uses the coprocessor to boost performance.

Molecular's micro has attracted the attention of vars. One, Innovative Computer Leasing, Denville, N.J., has received positive responses from its dealers, says director of marketing Linda Weiner. The machine is more economical, faster, and has a larger capacity than the AT, she notes. What's more, she adds, it is more easily upgraded than the AT.

Compaq, a company that has had great success with IBM PC-compatible machines and whose XT-like Deskpro has benefited from the scarcity of the more advanced ATs, is expected to introduce an AT clone as early as this week. Also thought to be entering the market are Sperry and AT&T. Sperry is most likely to oem the product, possibly from Mitsubishi (which supplies Sperry's PC clone),

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In addition to the "true" compatibles, there are other desktop units available that use the 80286, but an 80286-based machine does not an AT compatible make. Vendors of these systems hedge on the compatibility question.

"You can't be PC AT compatible," avers Jeff Swartz, corporate communications director at Viasyn Corp. (formerly CompuPro), Hayward, Calif. "It's not possible." Viasyn introduced the CompuPro 286, a bus-based desktop unit with an 80286 linked to a Z80-based slave processor. The system supports four users, runs Concurrent DOS, and is priced at $9,995.

"With the technology being more advanced, compatibility is at least as important, if not more so, with AT look-alikes as it was with PC clones."

The product can run AT software with the addition of a video display board.

"The CompuPro 286 is not an AT clone," Swartz says. "We're marketing it as a multi-user business computer system. And we chose not to go with a Unix operating system because we don't feel that it's viable yet. It doesn't allow users a choice of applications software."

Jeff Herman, product manager at Visual Technology Inc., Tewskbury, Mass., says the AT and his company's Visual 2000—also an 80286/Xenix-based system—address two different markets. Visual's product is a processor with disk storage, tape backup, and networking capabilities; it includes neither keyboard nor monitor.

"The AT is seen as a flashy high-performance pc," Herman says. "We resisted the temptation of hitting the AT head-on. Our product is aimed at systems integrators and value-added resellers. It has more memory capacity and more cpu power than the AT, so when you're comparing the expandability of the 2000 against the AT, ours is more attractive to systems integrators and vars who are building multi-user systems."

The key differences between the 2000 and the AT are not technological, however. "The true market for multi-user systems is very different from the pc market," Herman says. "The pc market is retail-oriented, and there's brand name recognition that peaks out quickly for the smaller players. In a var situation, that doesn't happen as fast."

Indeed, some vars have latched on to the 2000 with a fervor. Angelo Hadjis, president of Cantel Data Systems in Montreal, says the Visual runs up to two-and-a-half times faster than an AT equipped with Xenix. The 2000 also provides better price points for multi-user configurations even though the single-user prices are similar, he notes. "Visual is about six months ahead of everyone else."

Viasyn's CompuPro 286 is also distributed through vars. Swartz says that's because multi-user systems don't sell well in retail outlets. "Retailers are not enamored with multi-user machines. They're too tough to sell, and too complex to demonstrate."

Future Computing's Wilson believes that these vendors are just being pragmatic. "Half the ATs are bought in stores," he says. "The big problem with selling an AT clone is getting good channels of distribution. There's a lot of competition for shelf space in computer specialty stores. In var channels, the competition isn't that fierce."

What impact will the flood of AT clones have on the multi-user system market? The answer depends on who you ask. Micro vendors say the future for multi-user systems will be shaky, while vendors of those larger systems are apparently undaunted by the AT and its clones. Molecular's Dearborn predicts there will be a shakeout.

"Multi-user micro vendors won't make it in the aftermath of the AT," he says. "There will be a shakeout, especially among 68000-based proprietary products."

Phil White, vice president of marketing at Altos Computer, San Jose, doesn't feel the AT will have much of an impact on his company's products. He hints that Altos is about to introduce its own 286-based machine, but is resolute that the product will not compete with the AT.

"Retailers are not enamored with multi-user machines because they're too tough to sell and too complex to demonstrate."

"Our products are aimed at a higher class of users," White says. "They want more memory, greater file capacity, and to connect more users. We don't view the AT as a direct competitor."

Future Computing's Wilson says Altos stands on very firm ground. "Altos has carved a niche for itself," he says. "The AT market won't be a real threat."

The AT clone race is just heating up and the players are lining up at the gate, but there's considerable caution in the air at this latest pc outing. Vendors have learned their lesson and now go to great lengths to avoid the "me too" tag they once sported; one vendor even says 80286-based micros are not AT clones, but "a new class of products." No one's kidding anybody anymore: a serious race is about to begin. ◉

WHITHER GRAY PC SALES?

Will Big Blue's recent efforts curtail the gray market for PCs?

by David Stamps

Selling IBM personal computers has become something of a free-for-all these days. It seems everyone on the block has a piece of the action.

A customer who needs a quantity of PCs has a choice: he can do business with IBM directly; buy from a national computer retailer, such as Computerland; or deal with an authorized local distributor, value-added remarketer, or dealer of some stripe. Or, if one needs only a few PCs and wants to get them at the best price, there are mail-order houses and other so-called gray marketeers—firms not authorized by IBM to sell PCs, but which nevertheless acquire them from other dealers for resale at anywhere from 10% to 50% below retail cost.

This crazy quilt of PC sales channels is presumably good for buyers, making hardware available at cutthroat prices, but it has been rough on dealers, who now complain about low margins. IBM itself has apparently decided that things on the PC front have gotten more chaotic than it can tolerate. Two recent moves by Big Blue indicate that it will try to impose at least some order again.

First, IBM signaled its intent to crack down on the gray market late last year. Dealers were reminded at the fall Comdex show that they could lose their contracts if they were caught selling their overstock of PCs and PC XTs to unauthorized dealers. In December, IBM made good on its warning when it reportedly canceled the sales contracts of some 40 dealers.

Then, in January, IBM moved to consolidate its internal organization for PC distribution. It transferred responsibility for PC dealership sales and support away from its Entry Systems Division, the Boca Raton, Fla.-based organization that originally developed the PC, to its National Distribution Division, the Atlanta group that is responsible for alternate distribution channels for small to medium systems, such as System/34s and System/36s, sold by value-added dealers and remarketers.

While this latest move is not aimed specifically at curtailing gray market activity, experts say it should allow

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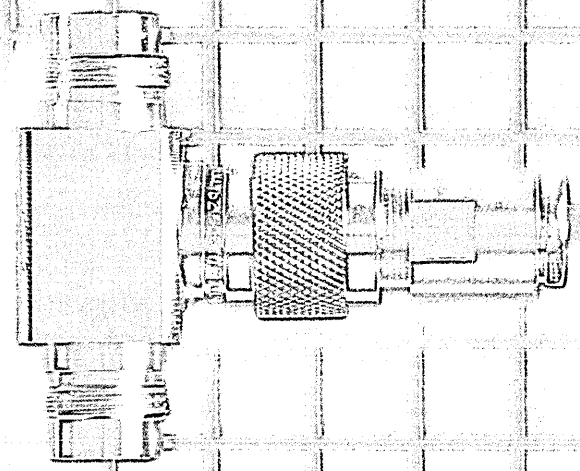

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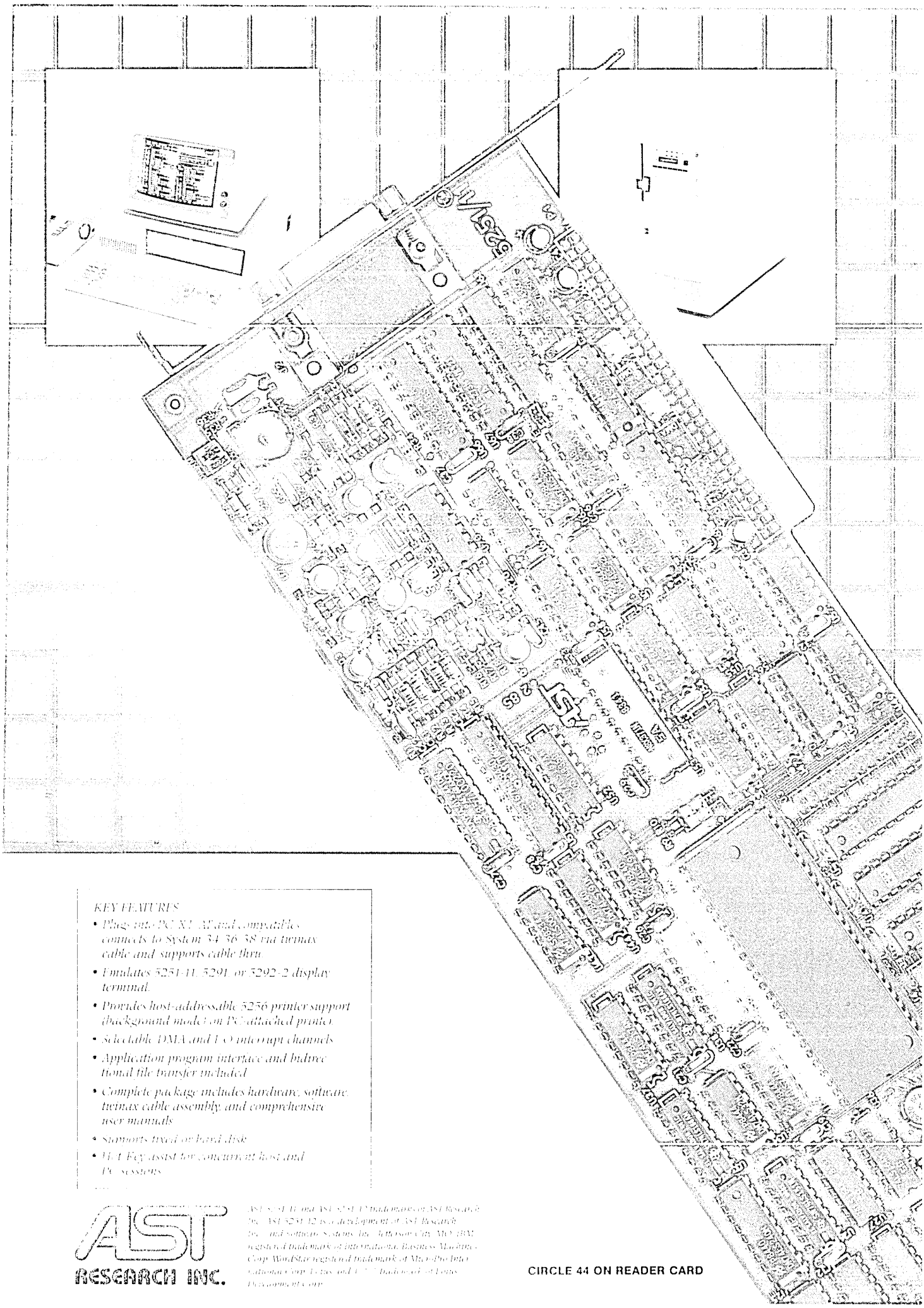

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NEWS IN PERSPECTIVE

IBM to exert more stringent forecasting and planning controls over its PC product line. (Just how uncharacteristically out of control Entry Systems has gotten is evident in the slipup with the PC AT, which is in short supply now because Entry Systems failed to secure a secondary supplier of disk drives for the machine.)

More control on IBM's part should make for a saner PC market. According to dealers, the gray market exists to its present extent only as a direct consequence of IBM's own willy-nilly PC sales approach.

"IBM has done some things so unlike IBM, I can hardly believe them," says Virgil Pint, a direct sales manager for Computerland's franchise in Minneapolis. "They've simply glutted the market with dealerships to the point where you can now buy PCs in stereo shops."

While the dealer glut hasn't hurt his own sales to Fortune 500 firms in the Twin Cities area, says Pint, it has generally created a muddle of overlapping competitors. "Some say the gray market is responsible for the low margins in the retail business. I don't see it that way. There is a flood of dealers, many of whom are calling on the same accounts. That's what cuts the margins. With PCs and XTs readily available now, dealers order in volume to get discounts, then dump the unsold product on the gray market."

IBM of course makes money regardless of how the PCs are sold; from a profit standpoint it needn't be concerned about the glut of dealerships. "But IBM is concerned enough about its image that I think maybe it will cool it a little bit now," says Pint. "That's how I interpret the move to put all PC sales under National Distribution."

There are no figures and only rough estimates as to how extensively the gray market operates, but most dealers agree with Computerland's Pint that the gray market is a result of a dealer glut, and is not itself the cause of the low margins in the PC retail business. Gray market sales to corporate customers are probably rare, dealers say, because few gray marketeers deal in a volume sufficient to satisfy large customers.

There are notable exceptions, such as 47th Street Photo in New York, a retail and mail-order computer dealer reputed to be one of the largest sellers of IBM PCs, even though it is not an authorized IBM dealer. Its aggressive national advertising campaign is clearly aimed at business computer users, though. It is thought that the typical gray marketeer is a small, fly-by-night operation.

"Most gray market transactions are done on a cash basis, usually on a loading dock, and usually within a few days after the gray marketeer has gotten his hands on the goods," says Russ Smith,

vice president of operations at Inacomp Computer Centers, Troy, Mich. "Because of their low overhead, they can sell machines at 30% off retail cost, but gray marketeers don't do much business with large companies. Those guys are more concerned about service and would rather pay the price and buy from dealers who can offer support."

"We would never deal with the gray market for PCs," says Ray Pregler, purchasing manager for McDonnell Douglas Corp., St. Louis. "We prefer to do business on the up and up. Even when PC fever struck a year and half ago, and delivery was a problem, we relied primarily on IBM directly for PCs," says Pregler.

McDonnell Douglas, which buys PCs both as a user and as a value-added reseller for a couple of its software products, has struck a "pipeline agreement" with IBM whereby a quantity of PCs are automatically on order at all times. Last year McDonnell Douglas purchased about 700 IBM PCs directly from the manufacturer.

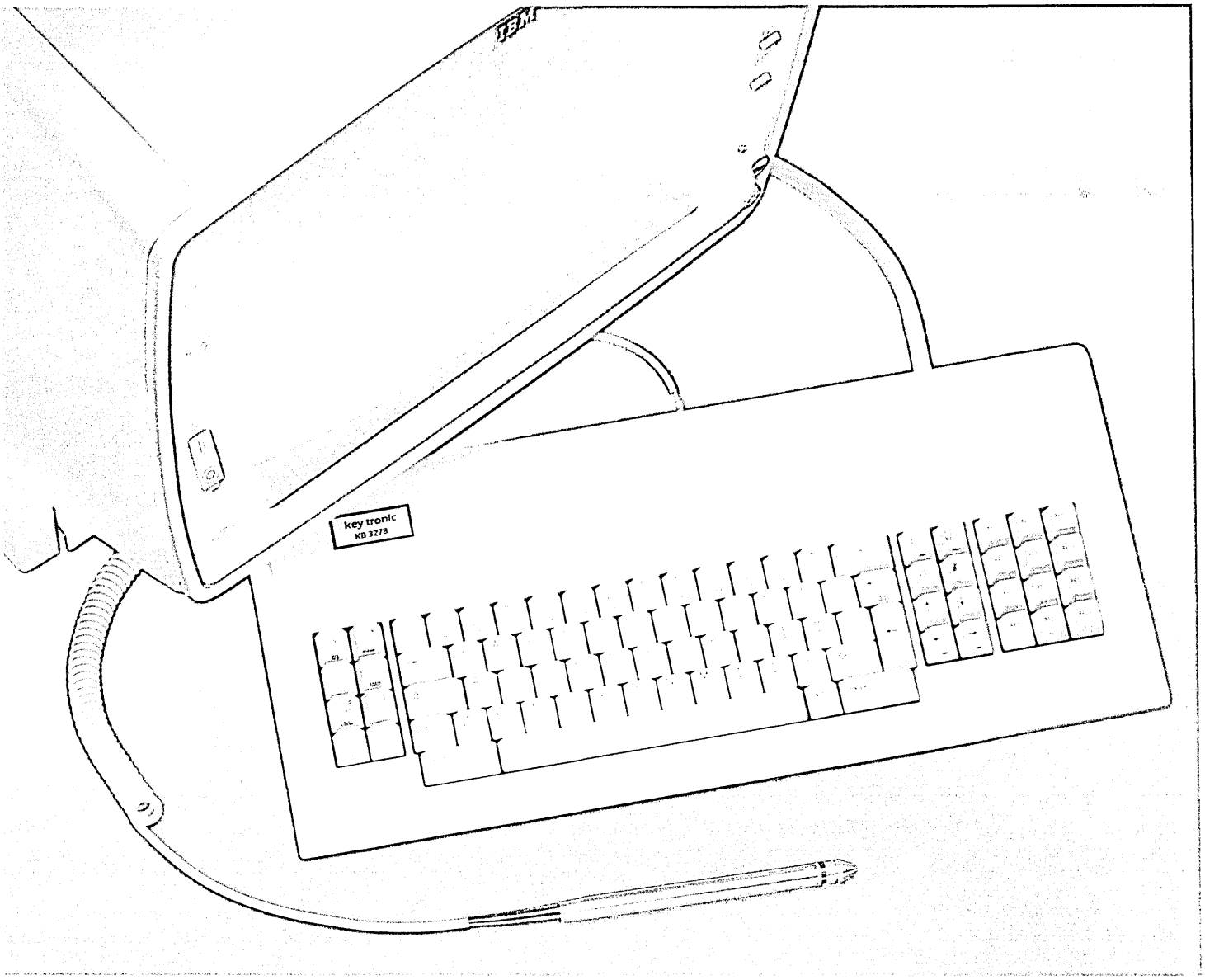
Pregler's loyalty to IBM as a direct supplier is echoed by the operations director at a major consumer products company with a total of 3,000 PCs. "We rely on a volume purchase agreement for 90% of our personal computers," he says. "If they can't get us one in a big hurry, we'll occasionally do business with a local retailer, but we'd never do business with the gray market. Our philosophy is to do everything aboveboard."

"With PCs and XTs readily available now, dealers order in volume to get discounts, then dump the unsold product on the gray market."

Not all large purchasers of PCs are so happy with IBM as a direct supplier, however. K-Mart Corp., Troy, Mich., six months ago terminated its direct agreement with IBM because it tired of waiting six weeks for delivery, a source at K-Mart says. Instead, K-Mart designated Computerland as the prime supplier for its PCs.

Some dp managers do find happiness in the gray market. Ingersoll-Rand Co., Woodcliff Lake, N.J., recently let its volume purchase agreement for IBM PCs expire. According to George Tabback, manager of corporate data processing, the company will instead look to the retail market for PCs and will, in some cases, even look into the gray market.

"With PCs and XTs plentiful now, there isn't much reason to go to the gray market for those, but we can get a fully configured PC AT for about $8,000 from 47th Street Photo," says Tabback. "The same machine from IBM costs $10,500,



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While corporate customers prefer to avoid the gray market, there is no clear preference between manufacturers and retail suppliers, according to a survey done by Future Computing, a Dallas market research firm. Among PC users in companies of 1,000 or more employees, about 46% said they bought their machines direct from the manufacturer and 39% said they bought them from retailers. That leaves about 15% from other channels, such as mail order and the gray market. Computerland's Virgil Pint thinks this almost even break between direct and retail sales has taken IBM a little by surprise.

"IBM expected it would get most of the Fortune 500 business and that the dealers would sell to the consumer market. That hasn't been the case," says Pint. "We sell to more Fortune 500 accounts in our area than IBM does."

The recent reorganization by Big Blue may only be the first of many moves to bring order to the personal computer market. "One of the things IBM is trying to do is to eliminate the chaos in the PC distribution channels," explains Tim Williams, senior analyst at Future Computing. "IBM itself created the chaos. They created a lot of channels vying for a piece of the pie that's not as big as everyone anticipated, including IBM. It now remains to be seen just what IBM will do with its pricing to clear up the various distribution channels." ◉

SOFTWARE

SO WHERE IS THE MARKET?

The disintegration of the integrated software market has left many scars on both users and vendors.

by Irene Fuerst

Integrated software for microcomputers, a seemingly surefire idea if ever there was one, now looks instead like a technology in search of a market. The idea is simplicity itself: combine several productivity functions into a single internally consistent program, and price it below the sum of similar standalone products.

The can't-miss idea missed because vendors missed two key factors. The first, an attribute of the software itself, is that such products are hard put to perform on anything less than a PC XT outfitted with half a megabyte or more of memory. The second is the difficulty of developing an integrated program that does everything except make coffee and still ending up with individual components that work as well as their standalone competitors.

Says one microcomputer manager at a large corporation, "One of the pivotal things we find is that none of the integrated products are as good as the individual products." Take, for example, the spreadsheet function in Symphony from Lotus Development Corp., Cambridge, Mass. It is smaller than and uses a number of different commands from the spreadsheet that is provided with Lotus's 1-2-3 product.

Yet perhaps the biggest miscalculation on the part of vendors was overestimating the potential market. According to several microcomputer managers, rarely will individuals in large corporations perform all of the tasks that integrated software is designed to perform. "All users have something they use primarily,"

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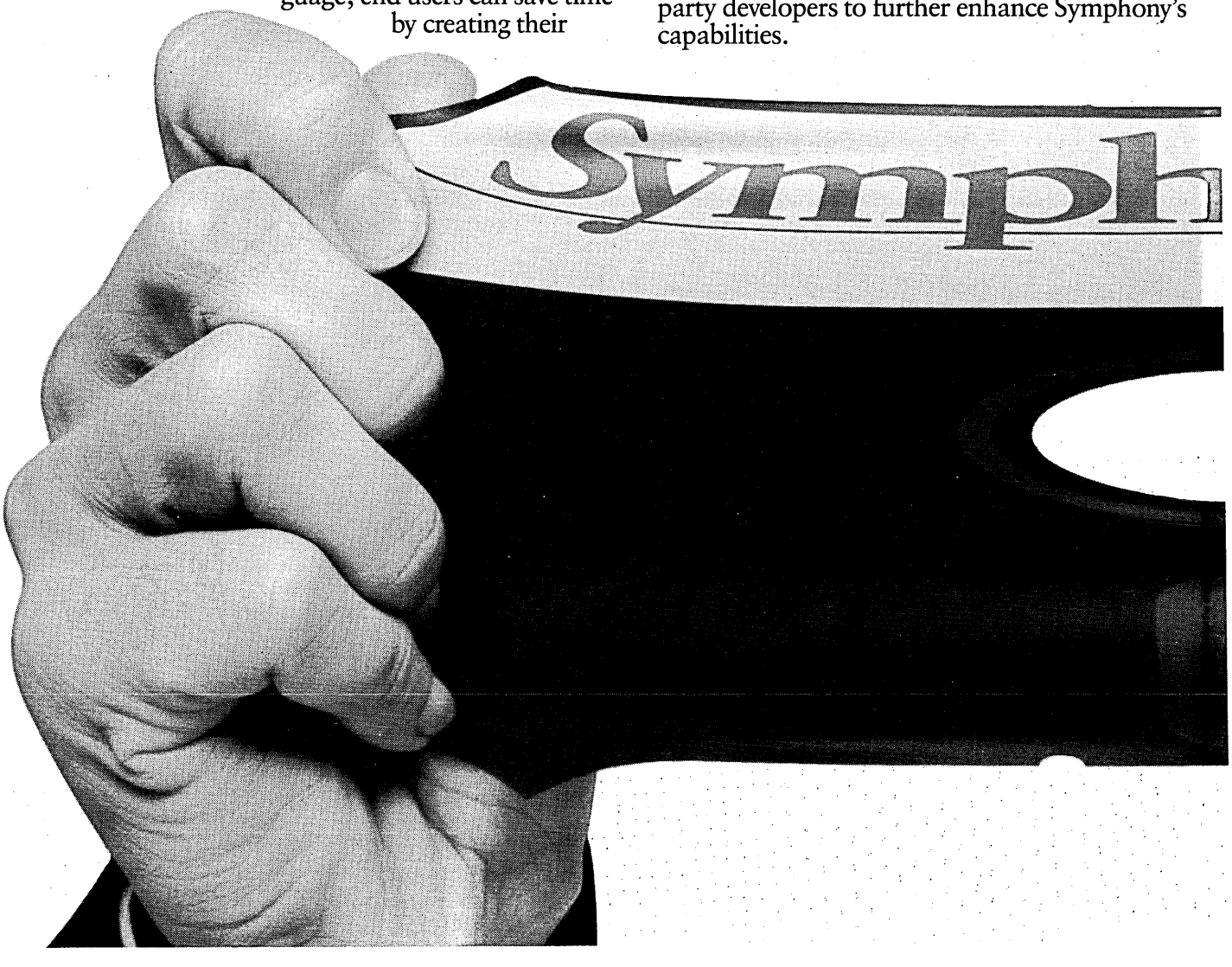

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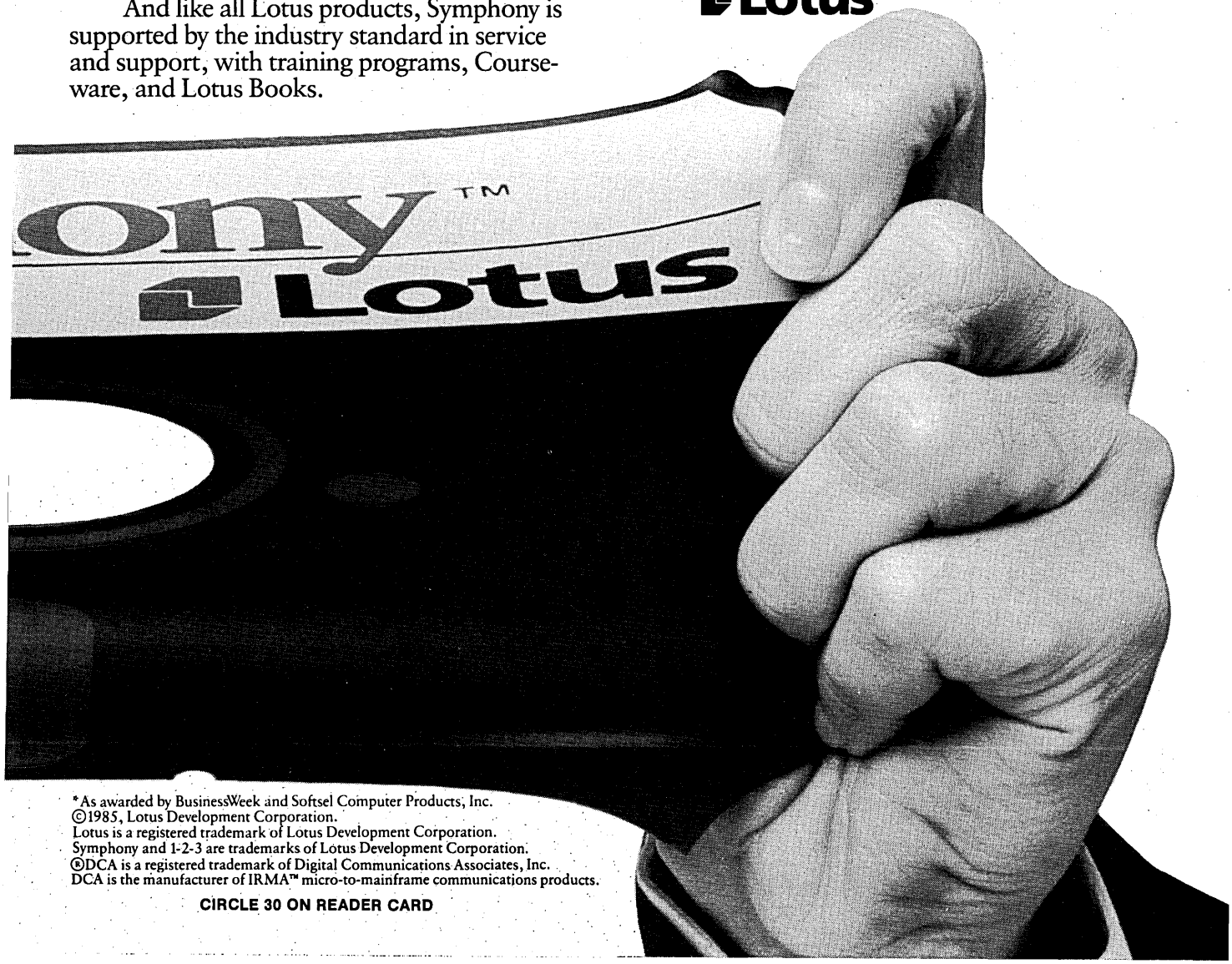

*As awarded by BusinessWeek and Softsel Computer Products, Inc.

CIRCLE 30 ON READER CARD

notes Reno Davenport, vice president of marketing for Smartware, a San Francisco company that specializes in direct sales to corporations. With integrated software, he adds, "you have to assume 30% this and 30% that." Davenport says some corporate customers who had traded 1-2-3 for Symphony now want their old 1-2-3 disks back. "Symphony was just too much."

Using integrated software "is like trying to jam 10 pounds into a five-pound bag," says John McCarthy, vice president of the advanced technology group of the Bank of Boston. "The simplicity virtually disappears."

"My own impression is that Symphony is not catching on as quickly as it might because it's too complicated," says one technical specialist. "It's so much overkill."

Another manager says, "Symphony leaves me groping."

"You have to spend days learning how to use them," a software evaluator for a publishing house says. "So users will buy a standalone product for $195 instead of spending $495 for an integrated product."

A cursory glance at industry numbers, however, seems to indicate that the idea of integrated software has caught on. Integrated products represented 10% of the 7.1 million units of microcomputer productivity software shipped in 1984 and 28% of the $1.3 billion industry revenues, according to Bill Coggshall of Software Access International, a market research firm in Mountain View, Calif.

Rarely will individuals in large corporations perform all the tasks that integrated software is designed to perform.

Yet those figures are misleading, and they have led scores of integrated software vendors down the primrose path to oblivion. Lotus's 1-2-3 product accounted for 70% of the integrated software market in 1984, according to Future Computing, a Dallas market research firm. That left precious little for others to split—about $111 million.

Consequently, software companies have been failing with the regularity of Philadelphia commuter trains and new Italian restaurants. With about 70 integrated software packages on the market, according to Chris Yalonis of the Jupiter Group in Sausalito, Calif., any slipup can be fatal. Internal problems—which have included poor management, poor marketing, and development difficulties—have contributed their share to the grim reaper of bankruptcy.

With the beacon of Lotus 1-2-3 always before them, software vendors seem blind to the facts of life. "No one's demonstrated that there's a substantial market for integrated software," says Efrem Sigel, president of Communications Trends Inc., a consulting firm in Larchmont, N.Y.

The failure of everything except 1-2-3 boils down to a question of semantics. 1-2-3's appeal is not that its spreadsheet is integrated with its graphics, but that the spreadsheet itself is one of the best available.

"If you call 1-2-3 integrated software," says James Bird, director of information services for General Mills in Minneapolis, "then we use integrated software extensively."

"People buy 1-2-3 because it's a really great spreadsheet with graphics. That's what people use it for," says Bob Leff, president of Softsel, the Inglewood, Calif.-based software distributor. "It's only called an integrated product today because that was the extent of integration when it was introduced." Now, he says, "it's hard to take it out of that category."

"Everyone I know who has looked at spreadsheet packages thinks 1-2-3 is far and away the best, primarily because it's faster," says one internal software consultant for a large bank.

That allegiance to 1-2-3 has caused other problems for purveyors of integrated software. As the micro software industry matures, users say they are no longer automatically jumping to new generations of product.

"We have a growing investment in 1-2-3," says General Mills' Bird, who was not impressed with Symphony. Another integrated product would have to be at least as good as 1-2-3, and with additional capabilities—especially communications—for him to switch, he says. In addition, another program "is going to have to offer an easy conversion route. Otherwise we wouldn't want to throw away our investment."

What else will it take for a vendor to change the minds of users like James Bird? Money and prestige help, but even they are not guarantees. The Jupiter Group's Yalonis warns that "if a company doesn't have a least $5 million to $7 million to introduce a product in the horizontal—i.e., general purpose—marketplace, it can't do it."

Getting the ear of opinion makers can be equally important. Working well with a key group of individuals in the securities and venture capital firms, as well as with existing major vendors, has been an ingredient in Lotus's recipe for success that subsequent firms have been hard-pressed to reproduce.

Ashton-Tate, Culver City, Calif., spent $8 million to introduce Framework and had the backing of many securities analysts and consultants, but the product still went nowhere.

"Integrated application packages are now a dead-end street," says Gib Hoxie, founder and former president of Context Management Systems, Torrance, Calif. Context created the first integrated package, MBA, which offered more functionality and integration than Lotus, had little competition early in its life cycle, and still languished. Hoxie is currently ceo of Schoenburg & Hoxie Inc., Rancho Palos Verde, Calif., where he is developing software for the "friendly" operating environments of Apple's Macintosh computer and Digital Research Inc.'s GEM interface.

Others agree with him. "The problem is that it's human nature," the technical specialist says. "People don't like to change. People have a job to do. They don't give a damn about the computer. I don't think people would be willing to change for any reason." ◉

WORKSTATIONS

CT'S CARAVAN MOVES ON

Will a juicy deal with AT&T-IS plus a new boss mean a comeback for Convergent Technologies?

by Charles L. Howe

Little guys like Convergent Technologies Inc., who have been taking their lumps lately, need powerful friends. To understand Convergent's plight it is instructive to consider the case of Oofty-Goofty, a Barbary Coast character from San Francisco's ragtime era. For a few coins this curious little man would let passersby belabor his backside. If the going got unduly rough, a policeman would suddenly materialize and haul the assailant off to jail. Oofty-Goofty's secret for survival, rumor had it, was a brother-in-law who was the station sergeant at the Hall of Justice.

It would be both inaccurate and grossly unfair to suggest that Convergent has anything in common with Oofty-Goofty. Still, the high-rolling firm seems to be coming back after a chain fire of problems that included product headaches and a management style some have uncharitably characterized as Marxian—as in the Marx Brothers. Thus, if one substitutes AT&T Information Systems and new management for Oofty-Goofty's ser-

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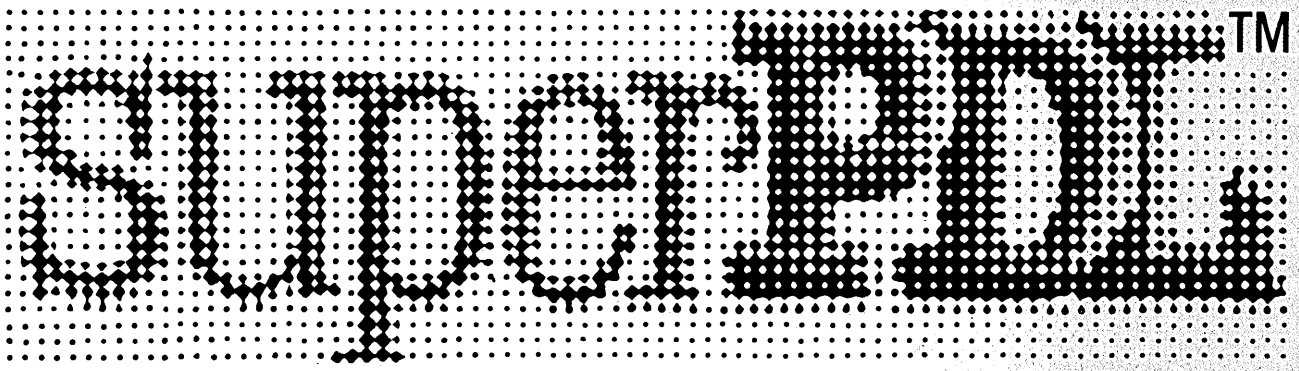

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NEWS IN PERSPECTIVE

geant of police, a certain commonality becomes apparent.

Key to Convergent's new look is the 7300, a voice/data workstation that it is building for AT&T-IS. The device has had more release dates than a regiment of recidivists, which has helped to further promote Convergent's name as a builder of errant boxes. In its defense, others say that the delays in product have been caused by AT&T-IS, which slowed things up at one point by demanding a change in logos, plus other picayune modifications. Rumor has it that AT&T-IS has ordered $100 million worth of the workstations.

The 7300 differs considerably from the 6300, the non-Unix micro that Olivetti builds for AT&T-IS. Industry observers say the data-only 6300 has sold poorly, gaining less than 1% of the market for a total of some 30,000 units in 1984, despite an AT&T-IS computer advertising budget that may have topped $100 million.

The 7300—which may be sold under the name of Unix PC—will be the telephone titan's answer to the IBM/Rolm

In any case, a handful of potential vars and users who have the machine are raving about it.

venture last year, which gave the world Juniper and Cedar (see "A PC and Phone in One," Nov. 1, 1984, p. 34). IBM's strategy is to conquer the office with voice/data workstations using Rolm's installed base of some 16,000 CBX and CBX II digital switches. AT&T-IS will attempt the same thing with the 7300 using its System 85 and 75 digital switches for local and remote connections.

The market for these voice/data devices may be firming up. Dataquest, the San Jose research firm, says that 30,000 of the units were sold in 1983, but that almost 1.1 million units will be sold in 1988. It is reported that the 7300 can function in a standalone configuration as well as in a switch-driven environment. If true, it would give AT&T-IS and Convergent a leg up over the IBM/Rolm product, which can only operate off the CBX switch. Whether IBM will beef up its AT product by adding a board for voice remains to be seen.

Details on the 7300 remained scarce at press time. Convergent once leaked like a sieve, employing a host of high-powered press agents, but as the company prepared to announce a net loss for 1984, a pall of silence hung over the Santa Clara-based oem. In any case, a handful of potential vars and users who have the machine are raving about it. "I am familiar with the AT&T product on a nondisclosure basis," a midwestern MIS executive of a retailing company says.

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"My guess is that it will blow everything away. And that's on human engineering, too."

The 7300 will digitize speech, either by a codec in the machine or via an add-on board. It resembles Apple's Macintosh in that it has windows and a mouse. Like IBM's AT, the 7300 could be shared by up to four users. The device has a half-height 5¼-inch floppy drive and a 12-inch screen. It will be offered with an internal 10MB Winchester disk and up to 2MB of memory.

The machine uses Motorola's 68000, is Unix-based, and will come with an optional MS/DOS coprocessor. Sources say that the machine will sell for from $5,500 to $6,500, which makes it at least $1,300 more costly than the comparable Cedar product.

The 7300 may help Convergent in the short term, but analysts are taking much long-term comfort in Paul Ely Jr., who recently took over at Convergent after running nearby Hewlett-Packard's computer operations for 10 years. "Convergent still has lots of breath left in it," says Jim Renalds, an analyst with Dataquest. "The firm remains strong technologically, and Ely is clearing up things, like overlapping functions."

Ely came aboard in January, long after the five-year-old Convergent's problems became public knowledge. On sales of $362 million in 1984, the firm suffered a loss of almost $14 million. Now taking a back seat to Ely are cofounders Allen H. Michels and Ben Wegbreit, who hired Ely when the Wall Street wolves commenced to howl.

Ely's first move was to dump WorkSlate, Convergent's lap-top micro that was introduced with huzzahs in August 1983 and subsequently died on the vine, causing Convergent to halt production last summer. The devices once carried a retail price tag of $1,195, but Ely ordered an unsold inventory of 6,000 to be sold at an auction for prices ranging from $150 to $200 apiece. This single product caused Convergent to take an $8.5 million write-off, and was a big factor in the company's net loss for the year.

In any case, a handful of potential vars and users who have the machine are raving about it.

More a child of freewheeling technology than one of bean counting, Convergent sells a variety of workstations, minis, and superminis to oems and vars. These customers include Burroughs, Automatic Data Processing, Datapoint, Gould, and Mohawk Data Sciences.

"A lot of Convergent's problems came down to management," says Peter Rogers, a technical analyst with the brokerage house of Simpson & Co. in New York City. "Take N-Gen, a 16-bit multifunction workstation, on which they started making pilot shipments in late 1983. They estimated how many of them they could sell, what they could build them for, came out with this great price, signed up a lot customers, and then found that they couldn't build it in great volume for that price. So they had to redesign the product. They still couldn't get the costs down, so they had to go back in the summer of 1984 and renegotiate prices. That didn't make them the most popular guys on the block." A similar story preceded the WorkSlate fiasco.

ELY OF CONVERGENT: Can the Hewlett-Packard veteran successfully repair the damage?

Another machine that came as an initial technological coup was MegaFrame, Convergent's 32-bit multiprocessor supermini that the firm started shipping in the third quarter of 1983. The device is a system of parallel processors connected by means of a high-speed system bus. Each processor is a single logic board that runs independently of the others, Convergent says, with its own memory and its own copy of its own operating system. The machines use Motorola 68010 and Intel 80186 microprocessors.

One particular configuration of MegaFrame runs on the Unix operating system and supports a mix of RS232C ASCII terminals and Convergent PT intelligent terminals. This configuration also damaged the company's reputation. It didn't work in a multiprocessor setting. Estimates are that half of the MegaFrames sold were running on CTIX, Convergent's version of Unix.

"That's one of the reasons why Sperry didn't pick Convergent for its Unix thrust," recalls Omri Serlin, head of ITOM International Co., in Los Altos, Calif. "The problem, until Convergent corrected it, was that MegaFrame showed up disappointingly in benchmarks. They also had big problems with a 6MB removable Winchester disk.

"These problems have been fixed or are being fixed," Serlin continues. "They got into trouble because they never paid attention to customer complaints. Their attitude was to throw money at problems. They diversified unnecessarily and there was very little infrastructure to monitor contracts. There were backlogs of orders running into the billions of dollars. They were simply going too fast and nobody was paying attention to business. They were sitting fat and sassy. Since Ely took over, Convergent is very high on my list of comeback companies to watch."

The reorganized Convergent is a soupçon more voluble than a sphinx in a sandstorm. Speaking for the company these days is Jay M. Spitzen, vice president of planning. "CTIX, which was our version of Unix System 5, had some bugs in it," he acknowledges. "We spent mid-1984 going to customers offering to trade good boards for bad ones. We've since gone on to CTIX 2.2, and version 3 is on its way."

Spitzen declines to speculate on how many users asked for new boards, nor will he say how many dud machines were reported. (User complaints were received, DATAMATION understands, from both American and European customers.) For that matter, Spitzen is unclear on just how many MegaFrames there are out there. Burroughs appears to be the premier purchaser, and is excercising its option to begin building them in Liege, Belgium, under license from Convergent. Burroughs sells the reconfigured machines as the XT 550.

"The problem was that MegaFrame showed up disappointingly in benchmarks. They also had big problems with a 6MB removable Winchester disk."

Burroughs seems to exude patience when it comes to Convergent's problem boxes. Fred Meier, vice president of product management, says the company worked with CT for almost a year to get the bugs out of its version of MegaFrame. "You have to remember that CT is an oem vendor and they don't have the same rigid rules that we have," he says. Among the bugs that Burroughs encountered, relates Meier, were "static electricity discharge and grounding in the boards, as well as in the software."

Burroughs also has a license to build the N-Gen, which it sells as the B25. Renalds of Dataquest says he has heard that Burroughs will build these machines in the People's Republic of China—a bit of speculation that no one else can or will confirm. In all areas, Burroughs remains Convergent's principal customer. In 1983 sales to Burroughs accounted for approximately 46% of CT's total revenues; in the first three quarters of 1984, sales were down to 37%. Analysts agree that the profit to Convergent

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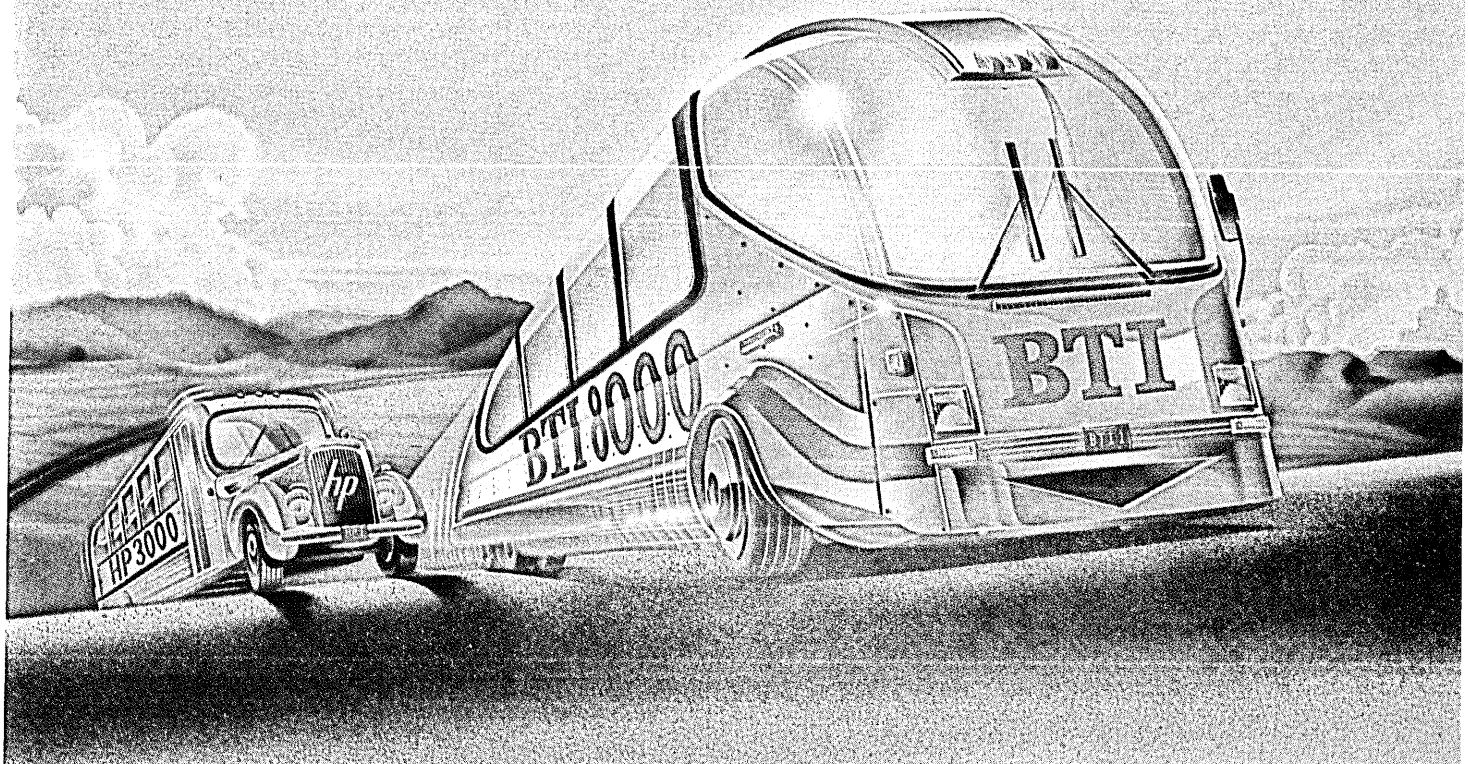

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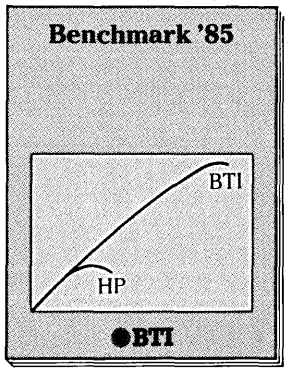

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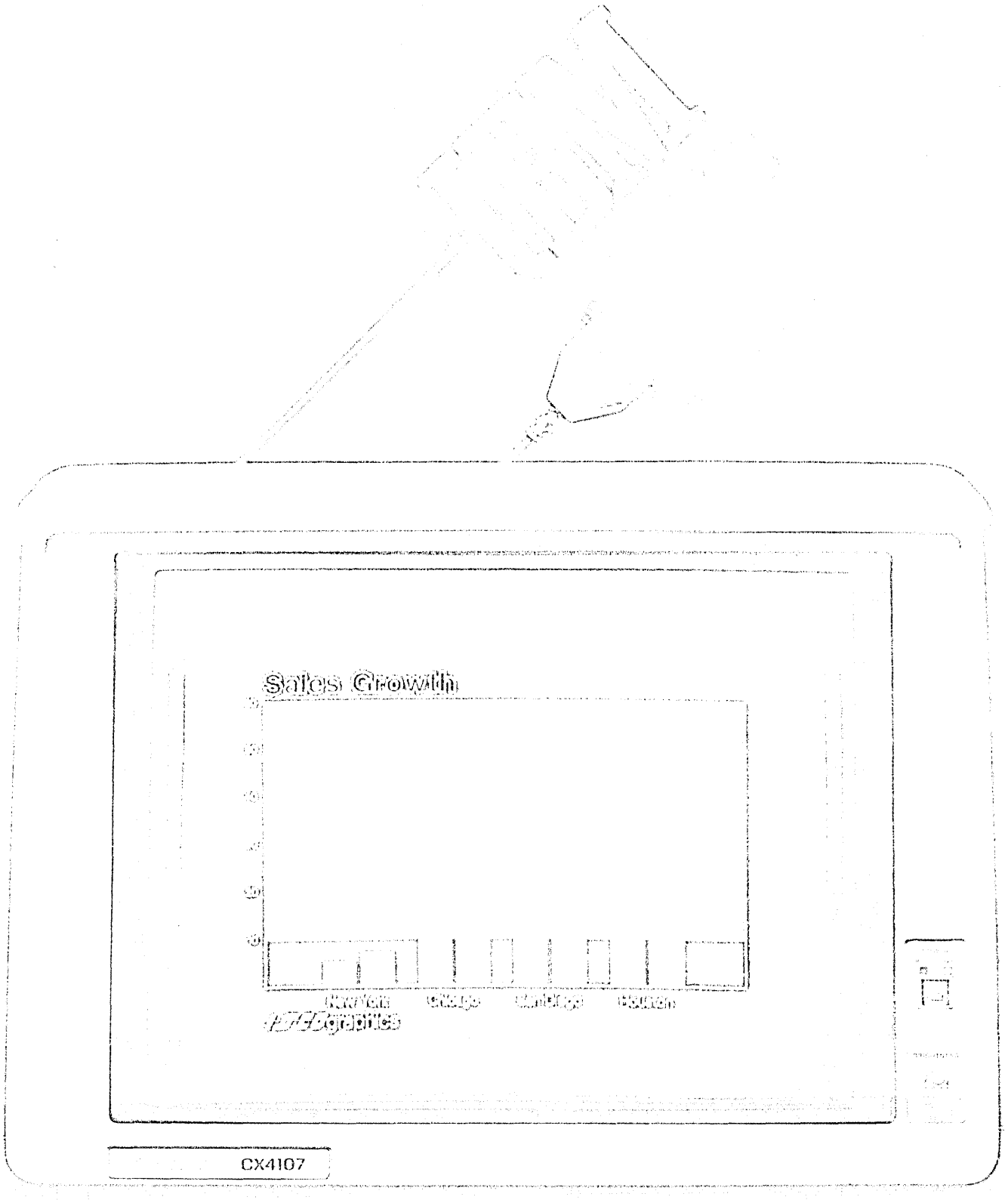
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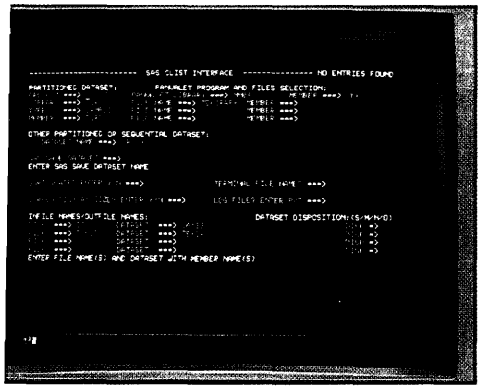

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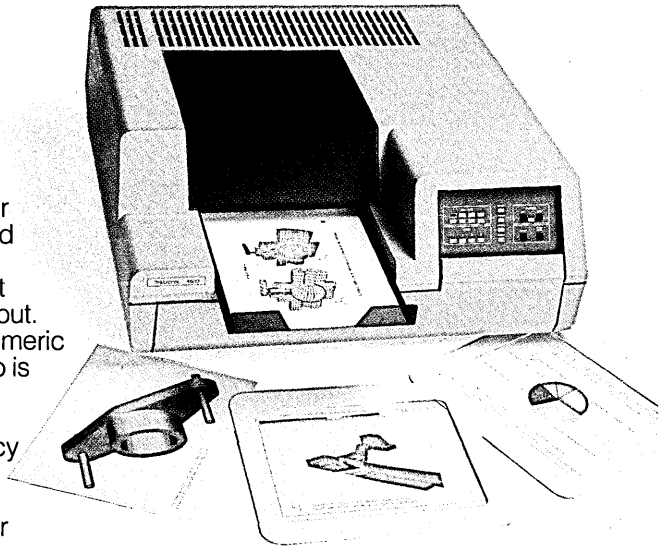

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from Burroughs and others building under license will be modest.

Convergent may not be out of the woods, Spitzen admits, but neither is it about to take a trip down the tubes. Spitzen says that the company had a backlog of a firm $149.2 million worth of orders on Sept. 30, 1984, as opposed to $82.9 million for Feb. 29, 1984 and $40 million for Feb. 28, 1983. A little more than half of those backlogged orders were for N-Gen machines. Two years ago the firm bragged about a $1.7 billion order book, so reality is starting to surface.

"In the long term we believe that we have some very great strengths and the means to capitalize on them," Spitzen says. "We've still got work to do to become more predictable with respect to customer shipments. We have an opportunity to become a $1 billion-a-year enterprise.

"In the short term we are experiencing very skinny margins on the N-Gen. AT&T-IS is clearly a very large riddle. Even a very small success by them will be a very large opportunity. Take all of these variables together and I'm just not sure of the short-term outlook."

Convergent has taken much criticism recently, and it has taken it with a degree of stoicism. "Might your attitude be that of, the dogs bark and the caravan moves on?" a visitor asks.

"Yes," says Spitzen. "That's it."◉

MANUFACTURING

BUILDING CASTLES ON CRTS

Companies are learning that simulating the manufacturing process on a computer may be cheaper and better than building prototypes.

by Edith Myers

While it's often been said that life imitates art, in this case the more appropriate phrase might be, manufacturing imitates art. Moviemakers have been using computers for scene simulation and animation since the 1982 film *Tron*, but manufacturers have been slow to adopt computerized simulations as a way of testing new manufacturing processes.

"The National Science Foundation has said that everything that is manufactured will soon be simulated first. We can't afford to waste any more," says

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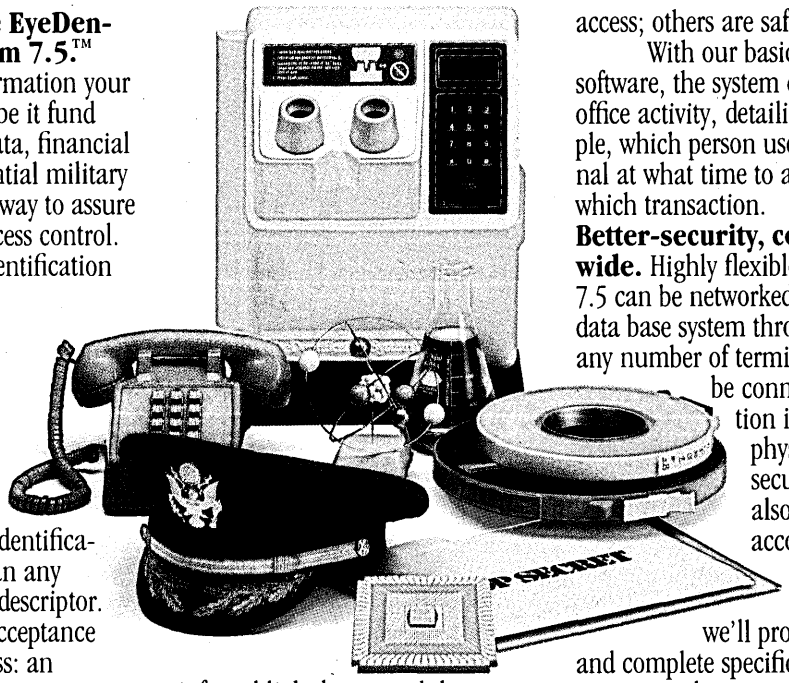

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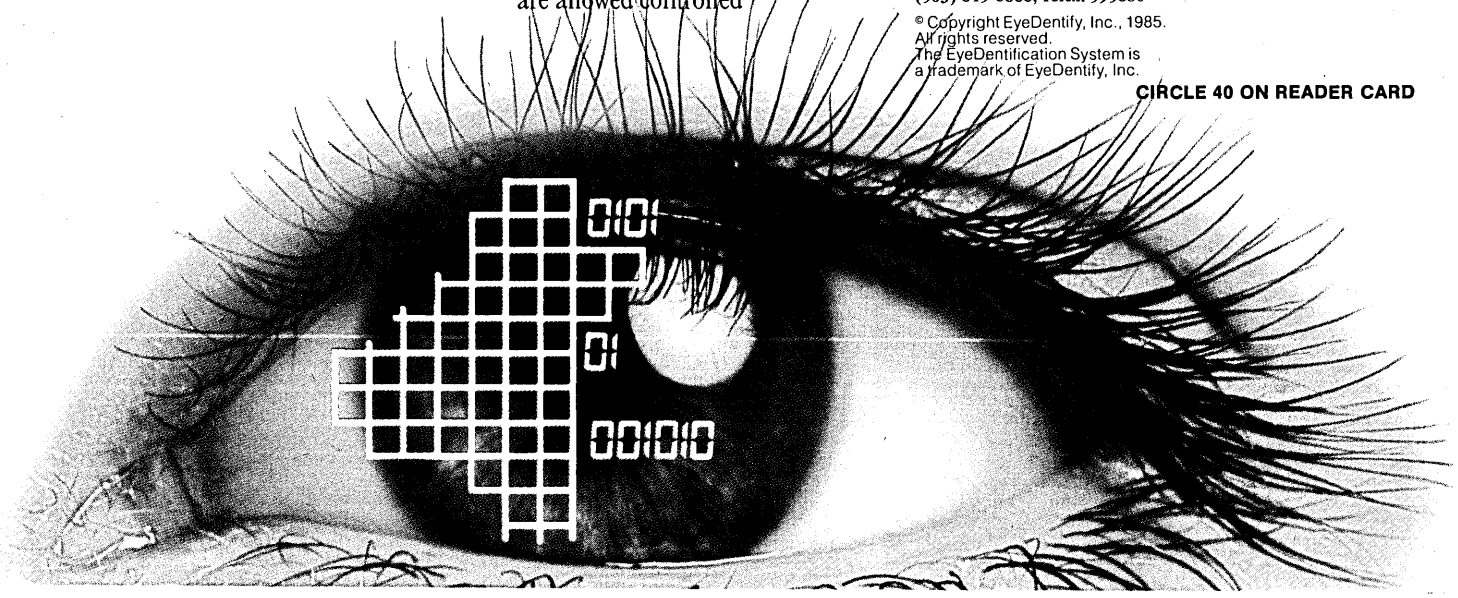

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Kenneth Dozier Jr., president of Interactive Machines Inc., Westlake Village, Calif. The NSF-sponsored report was prepared by a group of experts at Purdue University, West Lafayette, Ind., early this year.

Simulation using three-dimensional graphics systems can take two forms in manufacturing. First, products can be drawn and manipulated on crts to examine their behavior, replacing product testing procedures like the wind tunnel. Second, the actual manufacturing process can be simulated on a crt, testing how an assembly line will operate, how long it may take a robot to perform a task, what stresses production equipment will endure, and so on.

Products have been simulated on crts for several years in certain industries—such as automobiles and airplanes—but Dozier's firm is on the forefront of the move toward manufacturing process simulation. IMI has been selling the model 500 and 600 superminibased systems since 1981 to several movie producers, including Digital Productions, Walt Disney Productions, Universal Studios, and Magi-Synthavision.

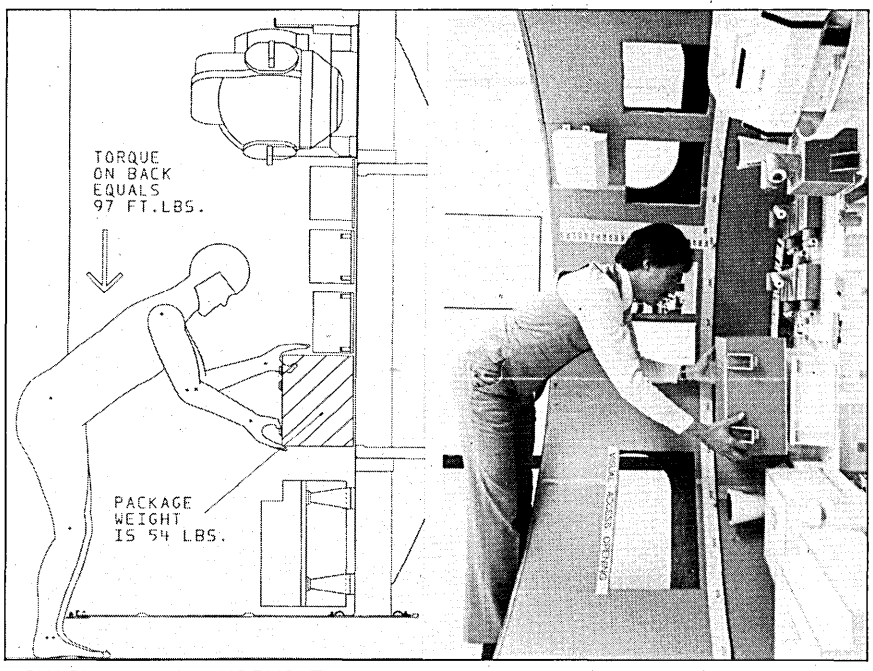
Industry observers share Dozier's belief that the idea of simulating the manufacturing process before implementing it is spreading across industries. "It's growing like crazy," says Charles A. Pratt, executive director of the Society for Computer Simulation, "and I couldn't have said that two years ago."

Steve Roberts, a professor of simulation at both Purdue and Indiana Universities, attributes the mushrooming demand to the pressures of international competition. "Manufacturing in general has seen what competition can do outside of this country, and it's embracing new technologies right and left. Simulation falls into this niche."

Roberts worries, in fact, that the use of simulation may be going too far. "It used to be that simulation was considered a tool of last resort. Now it's thought of more as a tool of first resort. There's a lot of euphoric optimism, to the point that some people expect more of simulation than it is able to give. They want to simulate entire factories."

Another Purdue professor working in simulation, Joe Talavage, differs with his colleague. "The people I've met in industry are pretty level-headed. I talk to people in industry who are using simulation and their attitudes are tempered by experience. They're not pie-in-the-sky people. They understand the costs as well as the benefits."

Talavage does agree with Roberts on international competition. "The country as a whole, and the government in particular, has since 1977 been putting emphasis on manufacturing systems because we've been slipping compared to international competition."



HOW SIMULATION WORKS: The computerized mannequin ADAM shows the strain put on Lockheed human factors engineer Rick Davids' back as he installs an electronics box in a section of the Trident II D-5 Fleet Ballistic Missile.

He says activity in simulating manufacturing processes "is very widespread. The Fortune 500 companies are all embracing simulation, as are many national laboratories."

And indeed they are. Roberts notes that General Electric has a corporate group simulating its manufacturing processes, and that General Motors is developing many simulation applications at its research center.

Nonmanufacturing applications are brewing as well. Both the Douglas Aircraft division of McDonnell Douglas Corp., St. Louis, and Hughes Aircraft Co., Long Beach, Calif., use IMI's model 500 in flight training simulations, and NASA uses the machine to produce graphic displays to train space shuttle astronauts.

Mike Dincau, a senior engineer at Lockheed Aircraft Corp., Burbank, Calif., has three IMI machines, two of which are beta test model 600s. "We're a codeveloper on that," he says. "We're putting our own firmware on their processor." He likes both the IMI approach to a high-level modeling system and the company's willingness to "open up the system to us, where others won't let anyone see what's inside. We can be interactive with the algorithm." Dincau hopes to have the 600s in production work by the middle of this year.

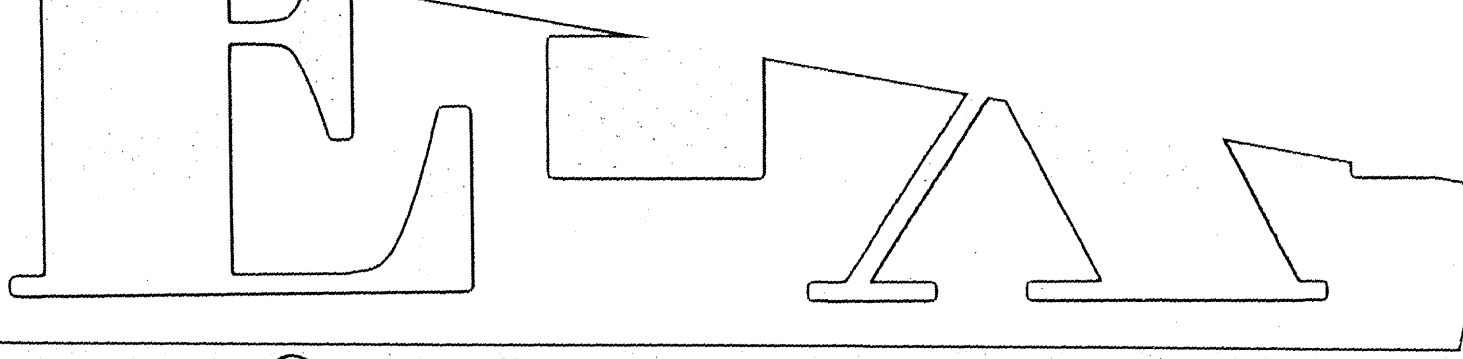
Bob Anderson, vice president of LinCom Corp., Houston, uses the IMI system for NASA contracting. LinCom had originally done a rendevous-and-docking study for the space agency and made a movie of it with the PS 300 computer graphics system from Evans & Sutherland Computer Corp., Salt Lake City, Anderson says.

"NASA liked it so much they told us to buy a machine to make more movies," Dincau says. "We looked at 200 vendors and all of their machines had problems. The Evans & Sutherland machine wouldn't interface to our computers so that they could drive the visuals. No one but IMI had an interface that will allow any computer to drive the graphics."

The difficulty of finding a suitable machine was exacerbated by the preponderance of CAD/CAM applications available, Dincau says. "Those devices that had interfaces didn't provide three-dimensional perspective. They were CAD/CAM systems, not animation systems." Anderson says he particularly likes IMI's vector graphics, as opposed to the more common raster displays, and its 4,100-line resolution. "It gives us real-time 3D graphics. We can view our simulations in an animation mode."

Anderson of Lin-Com says IMI's machine is the only way to simulate man-machine interaction in a cost-effective way. "I could do it with an Evans & Sutherland machine that costs several million dollars but [with IMI] we're talking $40,000.

Evans & Sutherland does provide an interface between its systems and VAX



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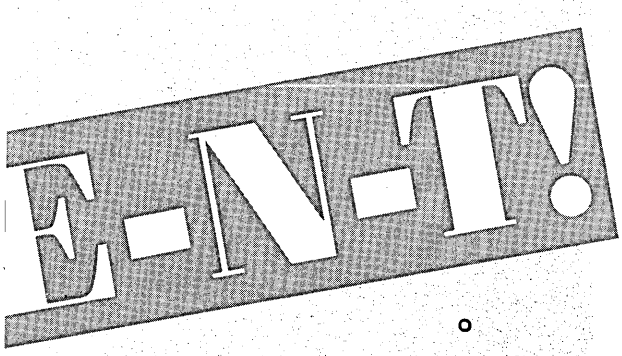

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superminis, and in February the firm announced an interface for the Symbolics 3600. That interface was developed jointly by E&S and Symbolics Inc., Los Angeles. Manufacturing simulation is a targeted application market for the interface, which will be available at the end of this month, say sources at E&S.

Companies will find manufacturing simulation particularly valuable where "there is a man in the loop" of the process, according to Dozier of IMI. Lockheed Missiles & Space Co., Sunnyvale, Calif., for example, last year developed ADAM and EVE to show how humans coordinate with machines in assembling the Trident II D-5 Fleet Ballistic Missile.

ADAM (Anthropometric Design Aid Mannequin) and EVE (Ergonomic Value Estimator) can be used with Lockheed's CAD/CAM software to give engineers a realistic basis for considering human access, reach, and working postures, the company says. "Users here are delighted with it," a spokesman gushes. CADAM Inc., a Lockheed subsidiary also in Burbank, now hopes to sell the ADAM and EVE technology to other firms. "It isn't a company product yet, but that isn't to say it won't be. The response and interest took us completely by surprise."

Likewise, IMI's success in simulation was unexpected. The company was formed in 1979 as a three-man partnership, by George Semerau, now director of research and development, Joe Edwards, now executive vice president, and David Hunsicker, now chairman of the board. The original intent was to develop a graphics computer for architects, but none was ever sold for that application.

The company evolved into a research and development operation, building the 500s one at a time. With the new machine, IMI plans full-scale production and hopes to be building 150 a month a year from now.

Dozier, the current president, was working at Hughes Aircraft as part of a fellowship program when the simulator was being developed. "We were looking for a graphics device with tremendous computational power. I was looking at IMI for an inside-of-the-cockpit display when I realized that their 6MFLOP processor was capable of solving all of our problems. Anything you can do in algebra can be done inside that engine." The 500 is a general-purpose number cruncher with several concurrent processors running asynchronously. Hughes purchased 50 IMI 500s on Dozier's recommendation.

Dozier was recruited by IMI in March 1984, after an intermediary stint at Digital Productions, a Los Angeles-based special events production house, where he used an IMI 500 as a front end for a Cray.

As IMI 500s and 600s, E&S PS 300s, and other simulators are more widely installed, users are beginning to demand more customized software. So far, about 25 simulation languages are in use, says Roberts of Purdue, who sells his own general purpose language through Systech Inc., Indianapolis. "It's been used by students at Purdue in industrial engineering for the past five years," he says. "Every student has done a simulation project, generally in manufacturing."

In the next few years, Roberts says, "general purpose simulation languages will give way to special purpose languages, such as to simulate assembly line balances and other specific tasks." He foresees vendors of heavy equipment designed for use in the manufacturing process, such as conveyor makers, constructing their own simulation languages as part of their marketing programs. "These would help a manufacturer determine how many conveyors to buy, and so on."

His colleague Talavage sees simulation moving to the micro level. "If you're simulating a large system in great detail over a long period of time, that can be costly in terms of computer time. With a microcomputer owned by an engineer, sitting on his desk, cost is not so much of a problem." ◉

TELECOMMUNICATIONS

WHEN YES MEANS NO

Japan says it's opening its telecom industry to foreigners this week, but that doesn't make doing business there any easier.

by Willie Schatz and Thomas Murtha

It's the old half-full, half-empty story. The Japanese say that their telecommunications market has never been so open. The U.S. says it's shut down tight.

While the two countries have been yapping this way for the last few years, the issue has suddenly become extremely urgent. The Japanese Telecommunications Business Law becomes effective April 1, meaning that the Japanese telecommunications industry will metamorphose from a public monopoly—Nippon Telephone and Telegraph (NTT)—into a somewhat private NTT. That also implies that the rest of the world, heretofore shut out of the Japanese market, can now come running for orders. In theory, at least, that may represent the best chance the U.S. has had in years to right its woefully unbalanced balance of trade with Japan.

Fat chance, according to American companies attempting to crack NTT's monopoly. "We don't buy their current moves at all," says Ed Burfine, telecommunications manager for Harris Digital Telephone Systems, Novato, Calif. "They throw up one transparent barrier after another. Japan has become a tertiary target for us now. There's tokenism involved to show that NTT is opening up, but it's really well protected."

What's more, Burfine is not alone. "Everybody's of the opinion that the Japanese should give us the same access in telecommunications that we give them," says Clyde Prestowitz, special assistant for Japan to Commerce Secretary Malcolm Baldridge. "We're taking a tough attitude on this one." The issue goes beyond the NTT itself (see "Digital Dialing Doldrums," Dec. 15, p. 48), since it affects U.S. efforts to sell directly to Japanese end users.

"On April 1, the whole telecom industry in Japan changes. Their market could be more closed than it is now. So we've got to do it before it's written in stone." Yet so far the U.S. has barely been able to get a word in edgewise.

Since 1980, when the Japanese market was supposedly opened by the NTT Agreement, U.S. firms have not exactly overwhelmed it, doing $110 million in the Japanese telecom business in 1984. The Japanese, on the other hand, exported a hefty $1.5 billion to the U.S. last year. Not a bad ratio if you're a vendor in the land of the Rising Sun. And a wonderful selection of products to buy if you're a user flying the Stars and Stripes on your front lawn.

The Telecommunications Business Law was designed to right all those perceived wrongs. NTT would become one-third privately owned over the next five years. Private organizations, rather than NTT, would inspect and approve new telecommunications equipment. The Japanese Ministry of Posts and Telecommunications (MPT) would publish the standards and requirements of the new law and give interested foreign companies a chance to comment on them. The spirit and letter of the General Agreement on Tariffs and Trade (GATT) would be followed scrupulously.

"There's no way they've done any of that," fumes Bill Krist, director of international affairs for the American Electronics Association. "They haven't had a reasonable approach at all. Any vendor wanting to do business there has to go through a multilevel approval process.

MPT'S VAN PLAN

To the consternation of end users and foreign firms, Japan's Ministry of Posts and Telecommunications (MPT) regulates value-added network (VAN) services through ministerial ordinances filled with red tape that restricts new—especially foreign—competition.

"Trying to convince MPT bureaucrats to allow something new, not specified in their administrative guidelines, is virtually hopeless," laments a Japanese member of a Tokyo pc users group. "Users just don't have any political clout in this country. If you've got corporate mega-yen and retirement sinecures for doddering bureaucrats, somebody might listen. But nobody ever got promoted at MPT for helping the end user."

The new regulatory scheme, effective April 1, places all foreign VAN offerings under the regulatory discretion of MPT. Foreigners must have a Japanese majority partner in order to provide their own telecom circuits.

"An American firm that wants to play ball with a Japanese company can participate in this market," says Dave Keller, a securities analyst at the Tokyo office of James Capel & Co. "Some of the administrative roadblocks are weakening under American pressure. But outsiders still need a good partner's client base, marketing know-how, and insider connections to navigate effectively the regulatory maze."

But it's already late in the race for American firms. "The major Japanese electrical companies already have the more lucrative VAN markets sewn up," says Bernard Key, an analyst at the Tokyo branch of the Jardine Fleming Ltd. securities firm. "It's the losers that are shut out of the game, like Mitsui and Mitsubishi, that have tied up with [American companies like] AT&T and IBM. But these guys are left out in the cold. What do they bring to the party compared to hardware heavyweights like Fujitsu and NEC?"

In Japan at present it's not state-of-the-art technology that matters. The largest Japanese corporations are seeking national communications networks to link their production and distribution facilities. They're after something that's cheap and works with their installed base of Japanese equipment.

"It's not a set of punitive regulatory criteria holding back both smaller and foreign firms," Key says. "Other firms have simply had a tremendous head start in positioning for a fat market supplying large corporations with VANs. They might not be state of the art but they'll be there tomorrow ready to deliver."

Getting started is the big problem in Japan. All VAN suppliers must either formally register or obtain a permit from MPT prior to commencing business. The application process requires submission of a business plan showing expected demand for services, a balance sheet, a profit and loss statement, specification of telecom facilities and equipment, and proposed services.

It doesn't stop there. Friends at MPT are helpful, because if a business makes any changes in the items covered in the approved permit or registration—like upgrading equipment or offering a new service—MPT must approve it first.

One MPT official explains the prevailing philosophy: "We don't want excessive competition to disrupt the market."

—Tom Murtha

First there's MPT. Then there's MITI. It's ridiculous. The Japanese don't have to go through this rigamarole in the United States."

Pretty soon they may not be able to go through the U.S. at all. Some members of Congress have their dander up over this one. Sens. John Danforth (R-Mo.), chair of the Senate Finance Committee's trade panel, and David Boren (D-Okla.), have introduced a resolution saying that ending the voluntary restraint on autos (which was due to expire on March 31) without a comparable improvement for competitive U.S. exports to the Japanese market "will severely exacerbate the bilateral trade deficit," which "has the potential for undermining the entire range of bilateral relations between the U.S. and Japan." What is this, World War II again after a 40-year Pax Pacifica? Rep. Bob Michel (R-Ill.), the House minority leader, has introduced the same language in that chamber.

That's not all, folks. Rep. Matthew Reynaldo (R-N.J.), the ranking minority member on the telecommunications subcommittee, was scheduled to introduce legislation requiring nations that export equipment to the U.S. to give the U.S. reciprocal access to their home market. If it failed to do so, that nation would be denied FCC registration of its interconnect equipment, thereby shutting Japanese vendors out of the U.S. FCC chairman Mark Fowler is also looking into using the certification program as a way to ensure the openness of foreign markets.

"The Japanese have virtually unlimited access to the U.S. market for products where they are competitive," a staffer for a key senator says. "In products where we are competitive, like telecommunications, we don't have access. Their market was closed totally until 1980. Based on the amount of U.S. sales made under the NTT Agreement, it's obvious [the NTT Agreement] hasn't worked."

Not to the Japanese. To them, everything is copacetic, right?

"The problem isn't GATT," says Akiyoshi Takada, senior advisor in the telecommunications bureau of MPT. "The problem is that the U.S. is asking us to change our legislative process fundamentally. U.S. government officials have their own image of transparency in Japanese bureaucratic procedure. But Japanese bureaucrats have to follow their own administrative procedure. You can't expect us to change our system. After all, this is Japan."

Indeed. They don't do it by the U.S. book over there. According to a document from the U.S. embassy in Tokyo, MPT refused from April 1984 until late February to provide any information on the proposed standards and certification system under the Telecommunications Act. (When MPT finally delivered, it didn't tell much.) This apparently is a 180-degree pirouette from Japanese government promises in May 1982 and March 1983 that foreigners would be allowed to participate in standards drafting committees.

"There's tokenism involved to show that NTT is opening up, but it's really well protected."

Once the law was passed, the embassy says, MPT officials claimed it was contrary to government administrative procedure to provide details of the proposed ordinances. MPT then went to fairly elaborate lengths to set up public hearings at which interested parties could offer opinions on the new standards and systems.

All MPT got for its troubles were rooms of no-shows.

"We said no because there was no meat on the table," says Jack McDonnell, chairman of the Electronics Industries Association Telecommunications Committee. "Hearings on what? They already had plenty of input from U.S. companies. They knew where we stood. The energy and expense weren't worth it. Why go through a charade?"

The American Chamber of Commerce in Japan told the MPT minister that "without the opportunity to examine and comment on the actual ordinances, we cannot say that the Ministry has given us a fair and impartial opportunity to comment." According to a U.S. Japanese embassy interpretation, sections 2 and 7 of the GATT Standards Code obligate the Japanese government to provide other parties with particulars of proposed technical regulations and the proposed certifi-

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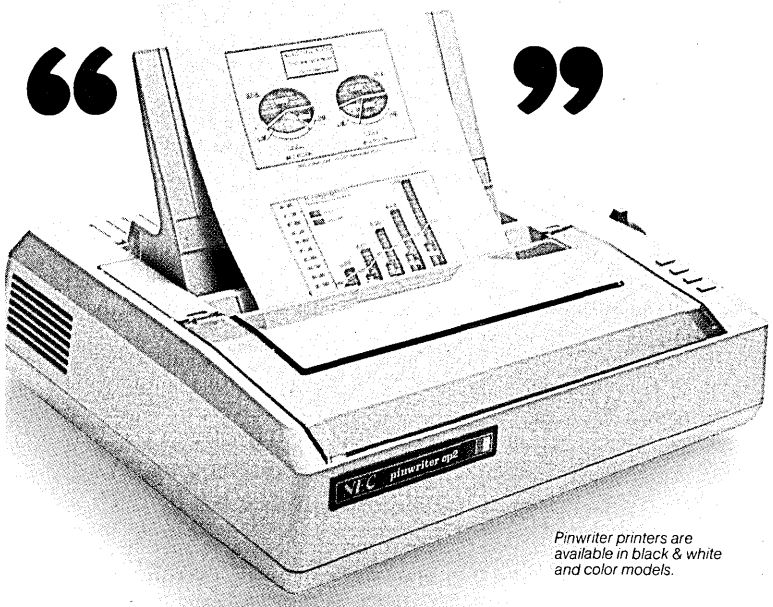

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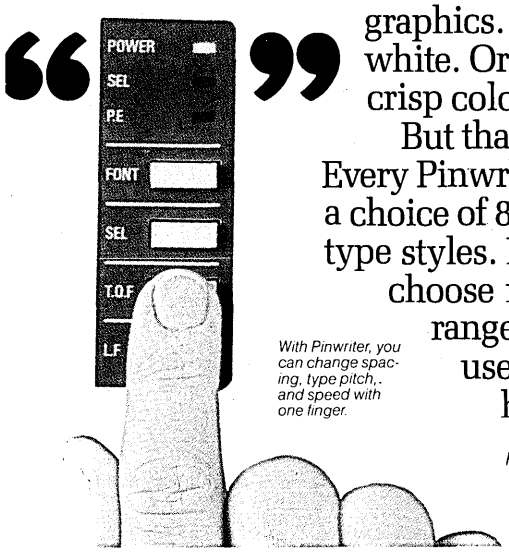

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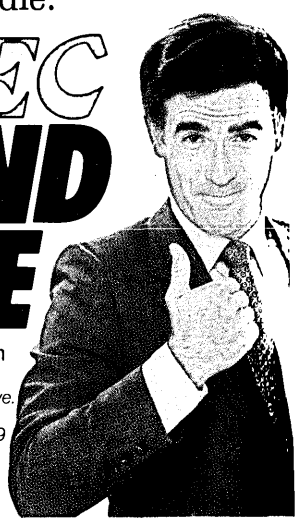

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NEWS IN PERSPECTIVE

cation system. The Japanese are also required to allow reasonable time for comments and take those into account.

"The Japanese don't legislate like we do," says Warner Simbach, manager of telecommunications policy for General Electric. "We do it in great detail, so that when a bill passes you have a good idea what it means. Their legislation is real broad. The regulations implementing it are written in the innards of the agencies and are rarely made public."

One of those regulations established the Telecommunication Terminal Equipment Inspection Association Foundation to provide the testing and certification function under the law. The testing facility will be the Japan Approvals Institute for Terminal Equipment (JATE). Its money comes from banks, and its members are all Japanese. Among other procedures, JATE accepts applications only in Japanese and won't so much as look at foreign test data. It also may certify equipment by the piece, rather than the type. Hardly the objective testing body

"You can't expect us to change our system," a Japanese official argues, "because, after all, this is Japan."

for which U.S. companies were praying.

The end result? The Japanese market could become tighter, not looser. A few firms have already found the yen not worth their time.

"We looked hard at Japan and decided that to get into the market would be quite an expense," admits Bill Kiss, vice president and general manager of Mitel's Canada and international group. "The amount of effort and money required to enter is just not worth it. Japan isn't totally forgotten, but it's not a high priority. If we classified the world into 20 markets, Japan would be 20th."

Many U.S. vendors would like to make it number one in their balance sheets, if not their hearts. After all, that's what the Japanese have done. Of the United States' $123 billion trade deficit, $37 billion comes from Japan. So much of this sound and fury is rooted in balancing the unbalanced, if only slightly.

Yet "they're not even talking a wonderful game. They're not responsive at all," insists Don Abelson, director of technical barriers for the United States Trade Representative. "The procedure is to clarify what the plans are. The closer we get to clarifying, the more problems we run into. As we clear up the clouds, there are more problems on issues they wanted to be cloudy in the first place. The current situation stinks."

So blame it on President Reagan and Japanese Prime Minister Nakasone.

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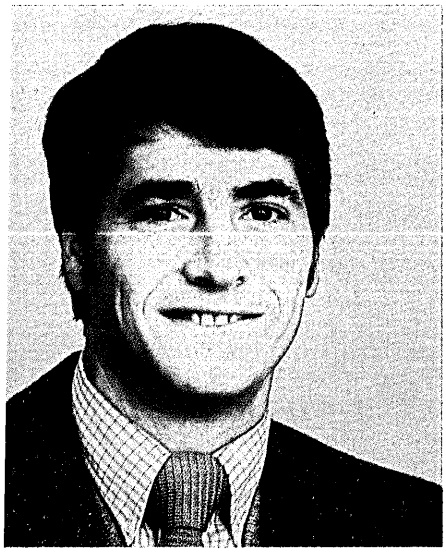

"DI-3000 has saved our company a lot of time and money."

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Director of Product Marketing
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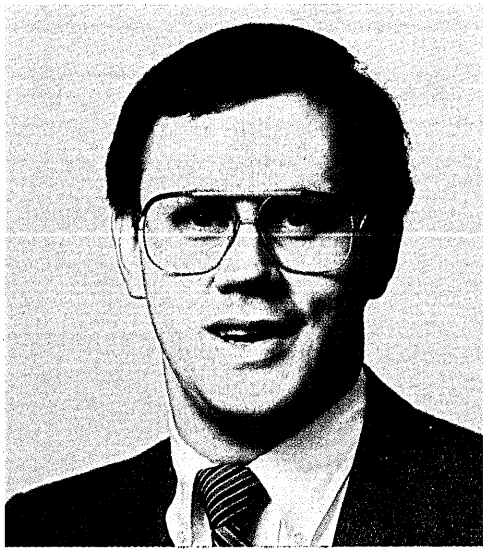

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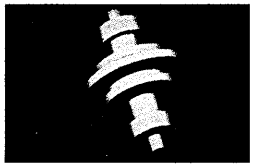
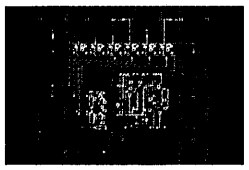
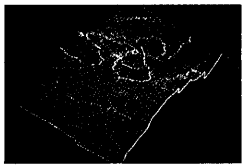


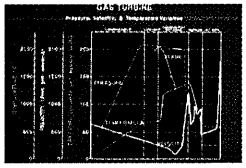
Interactive 3D Modeling using DI-3000®



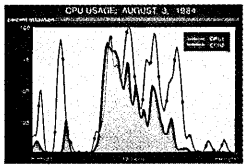
2D Circuit Design using GK-2000™



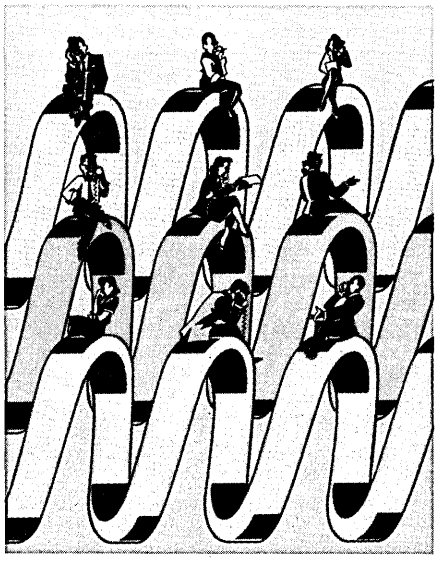
3D Surface Display using the Contouring System



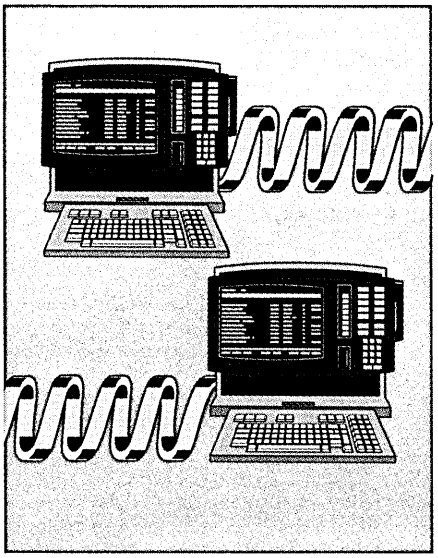
Powerful Chartbuilding using GRAFMAKER™



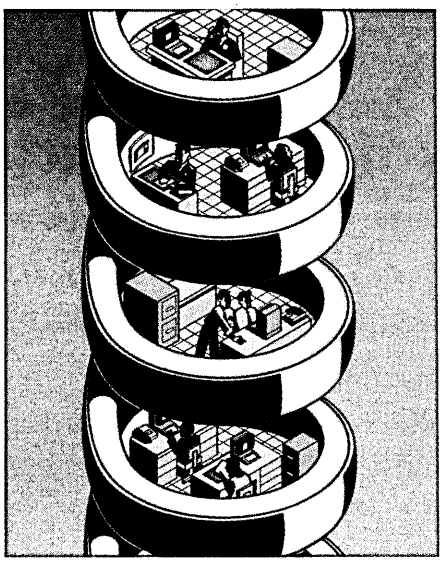
Technical Data Presentation using PicSure™



Voice Management



Data Management



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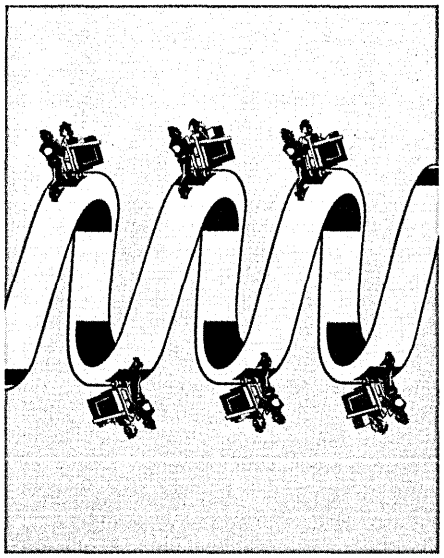
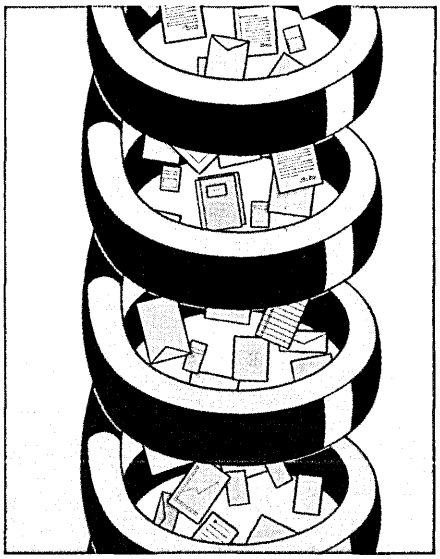
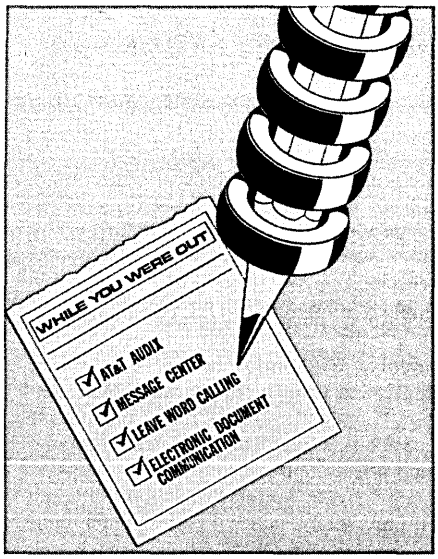


System Management



Office Management



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WHEN YOU'VE GOT TO BE RIGHT.

AT&T
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They started this soap opera when they agreed in January that the recommendations of the U.S.-Japan Advisory Commission Report should be implemented. One of the key areas was product standards and certification, in which the Japanese agreed to make their policies as "transparent" as those in the U.S. So far, they seem opaque to U.S. companies.

"It's not in their interest to move rapidly," GE's Simbach says. "It's in their interest to give the appearance of changing. They're afraid they'll lose business to U.S. companies. I don't see them changing their system overnight."

"It's a complex question that's not all one-sided," DOC's Prestowitz says. "I can't say the NTT Agreement hasn't worked. If it was such a failure, why did American industry fight to have it renewed last year?"

Perhaps because it was better than nothing, from where U.S. vendors came and where they may very well go if, as is likely, the telecommunications dispute isn't settled by April 1. Or perhaps it was because U.S. companies knew with whom they were dealing.

"International agreements are one thing," says a mid-level MPT official. "Doing business in Japan is another."

He's got that right. ◉

PRINTERS

WHEN$10K EQUALS $400,000

A new generation of laser printers and software offers top-quality output at a fraction of the cost.

by Irene Fuerst

A computer-generated printed page will soon look nearly as good as this magazine page, and include graphics as well as text, if the new generation of low-cost laser printers catches on in corporate America.

What these printers are doing, says analyst Stephen Pytka, vice president of C.A. Pesko & Associates, Marchfield, Mass., is "bringing into the office typographical-quality output. . . . [They have] the power to create a page as a typographer would in a commercial print shop."

Large corporations are adding smaller, distributed printers to systems that already include sophisticated centralized mainframe-driven laser printers or phototypesetters. A large group of companies as diverse as Crocker Bank in San Francisco and Kimberly-Clark in Neenah, Wis., are either designing such distributed printer networks or thinking about them. "Everybody is having to look at merged text and graphics systems," says Louise Forbush, manager of a publishing group at the multibillion-dollar Bechtel Corp., San Francisco. Small companies are buying scaled-down but sophisticated micro-based laser printers.

Indeed, by 1986 nonimpact page printers (primarily laser printers) will have a 10% share of a $10 billion market, according to Datek Information Services of Newtonville, Mass., compared with 4% of a $5.5 billion market in 1983.

What's special about the new laser printers is not only the technology of the printers themselves, but the controllers and the software that run them. In fact, many of these are based on the same Canon LBP-CX engine, with a resolution of 300 dots per inch.

The software and hardware has come together at the right time. New page composition software for personal computers can create newspaper-like pages, complete with multiple high-quali-

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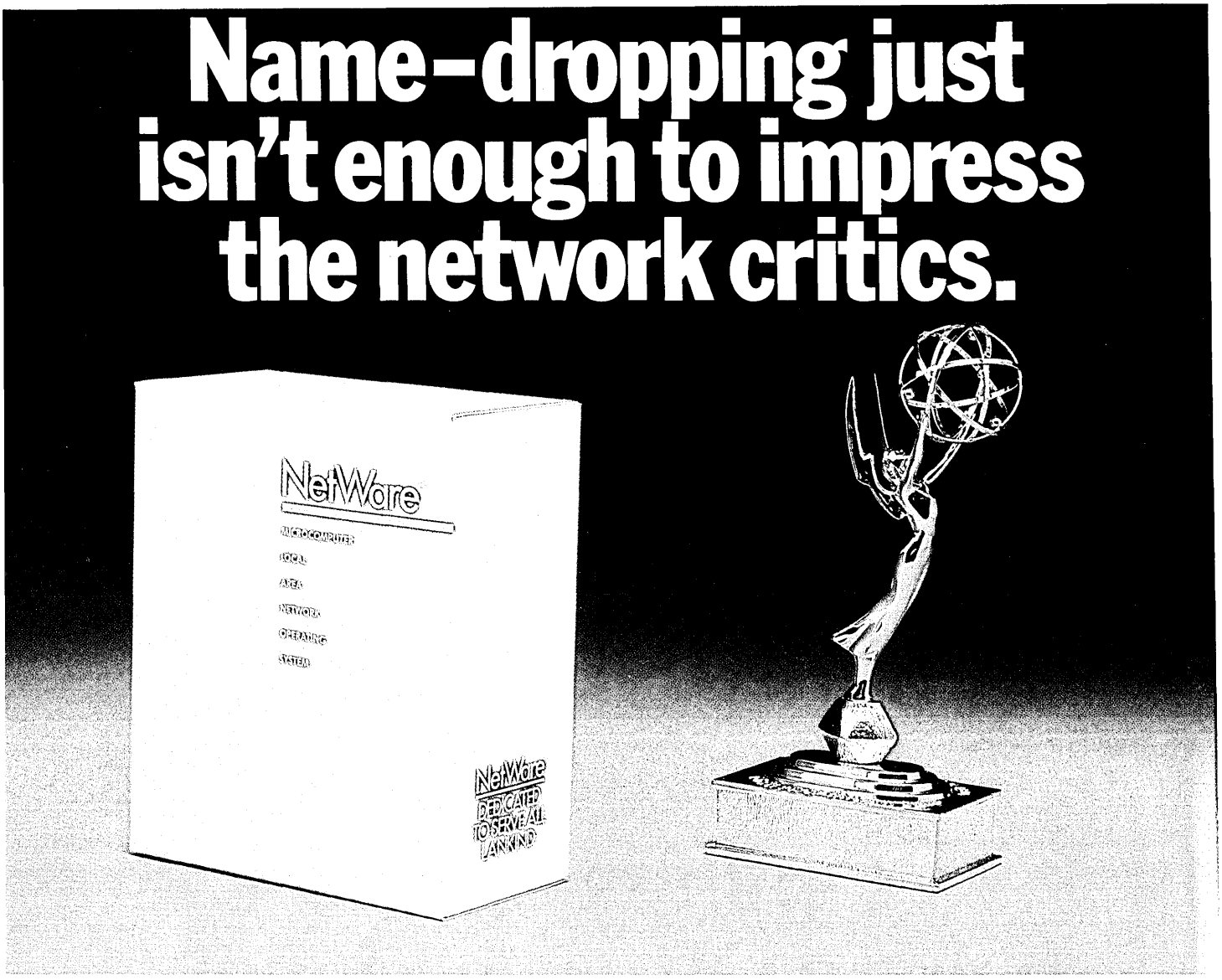
Name-dropping just isn't enough to impress the network critics.



Now that the local area network (LAN) industry is booming, some pretty big names in the computer business are jumping on the bandwagon. Their goal is simple: get a LAN on the market and let all those who pay homage to The Name run out and buy it.

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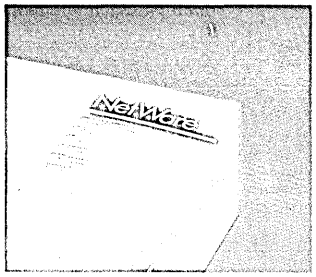

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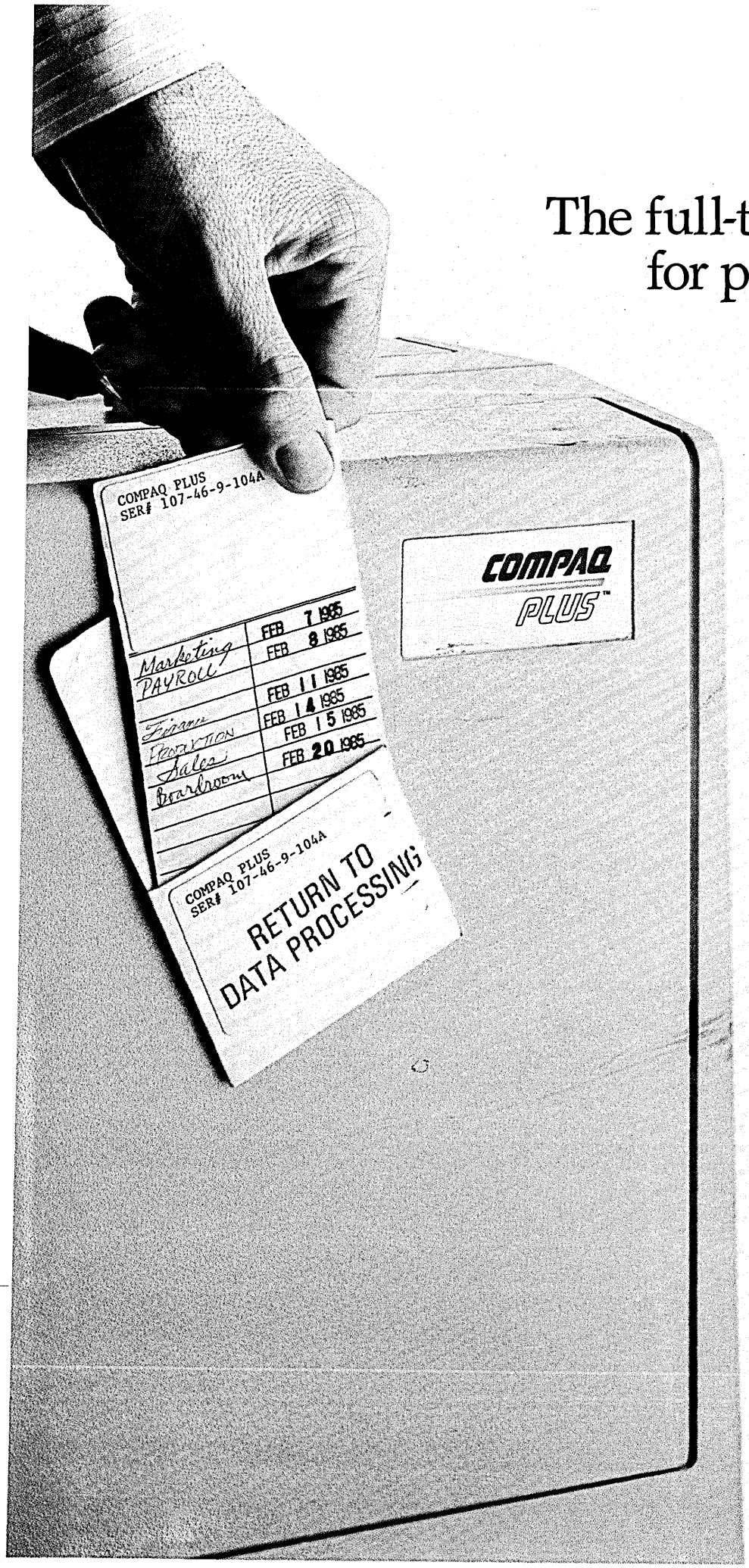

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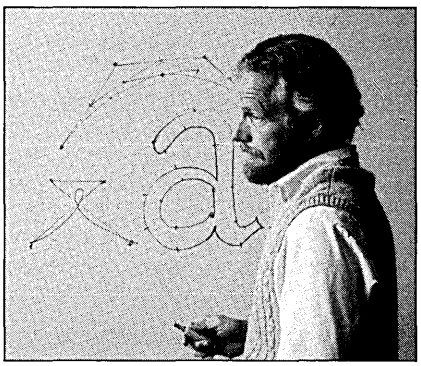
NEWS IN PERSPECTIVE



WARNOCK OF ADOBE: Older systems never "have had the flexibility of dealing with device independence."

ty fonts, page divisions, and graphics. Improvements in controller technology and the plummeting cost of 256K RAM chips have contributed too. "The pieces are falling into place," says Pytka.

Hewlett-Packard's $3,500 LaserJet was one of the first low-cost, office-quality laser printers for personal computers, and to date the most successful. But the one that's exciting analysts is Apple's new LaserWriter. The LaserJet basically duplicates a dot matrix or daisy-wheel printer, with some graphics capability. The LaserWriter is the first printer to incorporate the PostScript page-description language, licensed by Apple from startup Adobe Systems of Palo Alto.

PostScript stores descriptions of entire pages, including graphics, at one time. A pc and a PostScript-equipped printer can duplicate the quality, if not the speed or volume, of a $400,000 and up mainframe-driven printer such as the Xerox 9700, for a fortieth of the cost.

John Warnock, Adobe's president, says the one thing that's kept the printing industry from integrating—using interchangeable, compatible components—was a lack of a single way to describe an arbitrary page. Purchasers of document preparation or corporate publishing systems are locked in to those systems.

Warnock hopes that PostScript will be the standard that will bring device independence to electronic printing. He says PostScript has "the potential of opening up the printing industry. The problem of printing pages and the problem of composing pages is completely decoupled." What this offers to users, he says, is the opportunity to make intelligent buying decisions to bring in-plant publishing into the corporate structure.

"Before," Warnock explains, "you had the intelligence in the workstation," with heavy communication between a dedicated workstation and a printer. Now, he says, the intelligence is in the printer, which communicates with a microcomputer through an RS232C cable. None of the older corporate publishing systems "have had the flexibility of dealing with device independence," he says.

PostScript can accommodate any laser printer of any dot resolution. In order for the language to do this, says Warnock, it must describe a page independent of the resolution of the output device to which it's directed. "It has to describe a page in abstract terms," he says. PostScript can drive any raster printer, in addition to laser printers.

Linotype, of Melville, N.Y. (formerly Mergenthaler Linotype), will soon incorporate a PostScript controller in two high-resolution typesetters. QMS Inc., of Mobile, Ala., has announced that PostScript will be available for its Lasergrafix laser printers. As a manufacturer of Canon- and Xerox-based laser printers in the $5,000 to $35,000 price range, and with its own page description language, called QUIC, QMS would ordinarily be considered a LaserWriter competitor. In this case, however, the company apparently decided, "If you can't beat'em, join'em."

"PostScript is even more powerful than QUIC," concedes QMS. "It can scale fonts and rotate them 360 degrees. Its page composition abilities are excellent."

Warnock predicts that "a whole slew of printers" equipped with PostScript will be announced "probably next year," and that they will address the whole midrange between the LaserWriter and Linotype machines.

Adobe Systems has plenty of competition in the page description language area, including Xerox's Interpress, the American Mathematical Society's Tex, Unilogic's Scribe, Bell Laboratories' troff, IBM's DCF, and others. As for setting a standard, Pytka thinks Adobe is "making a good run at it, but setting a standard is difficult." He warns that it's going to be a while before the market sorts itself out.

The market is still so new that it's hard to make solid predictions. "You are asking people to make a quantum leap in the way they do things," says Pytka.

Dp managers eyeing their newfound options find plenty to be excited about in the new printer technology and economics. "We're definitely going to distribute I/O," says Tom Mauss of Crocker Bank. He foresees shared, networked printers at user sites (Crocker has nearly 400 branches in California), along with the centralized processing and centralized high-volume printing. "Productivity will go up because of distributed printers."

The main concern of dpers reviewing this latest technological wonder is compatibility. The printers must be able to handle a variety of input devices, notes Mauss. His vision of hundreds of laser printers improving Crocker's productivity "depends on the state of the art." ◉

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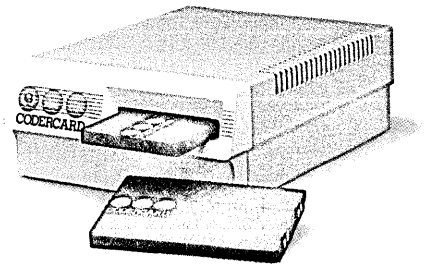

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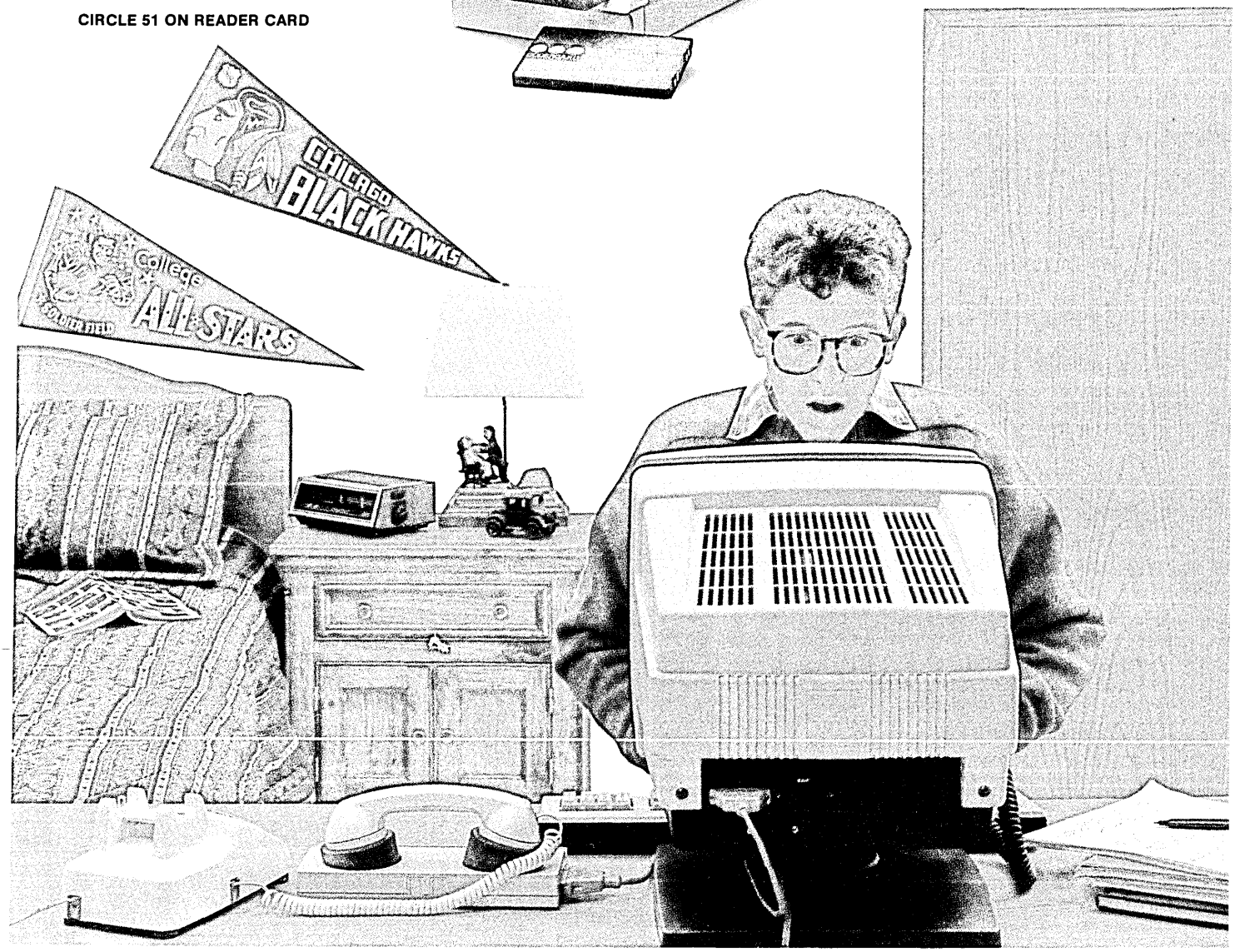

The HP 3000 compu

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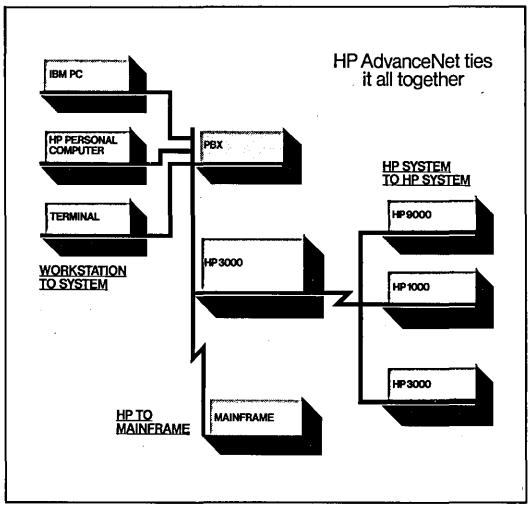

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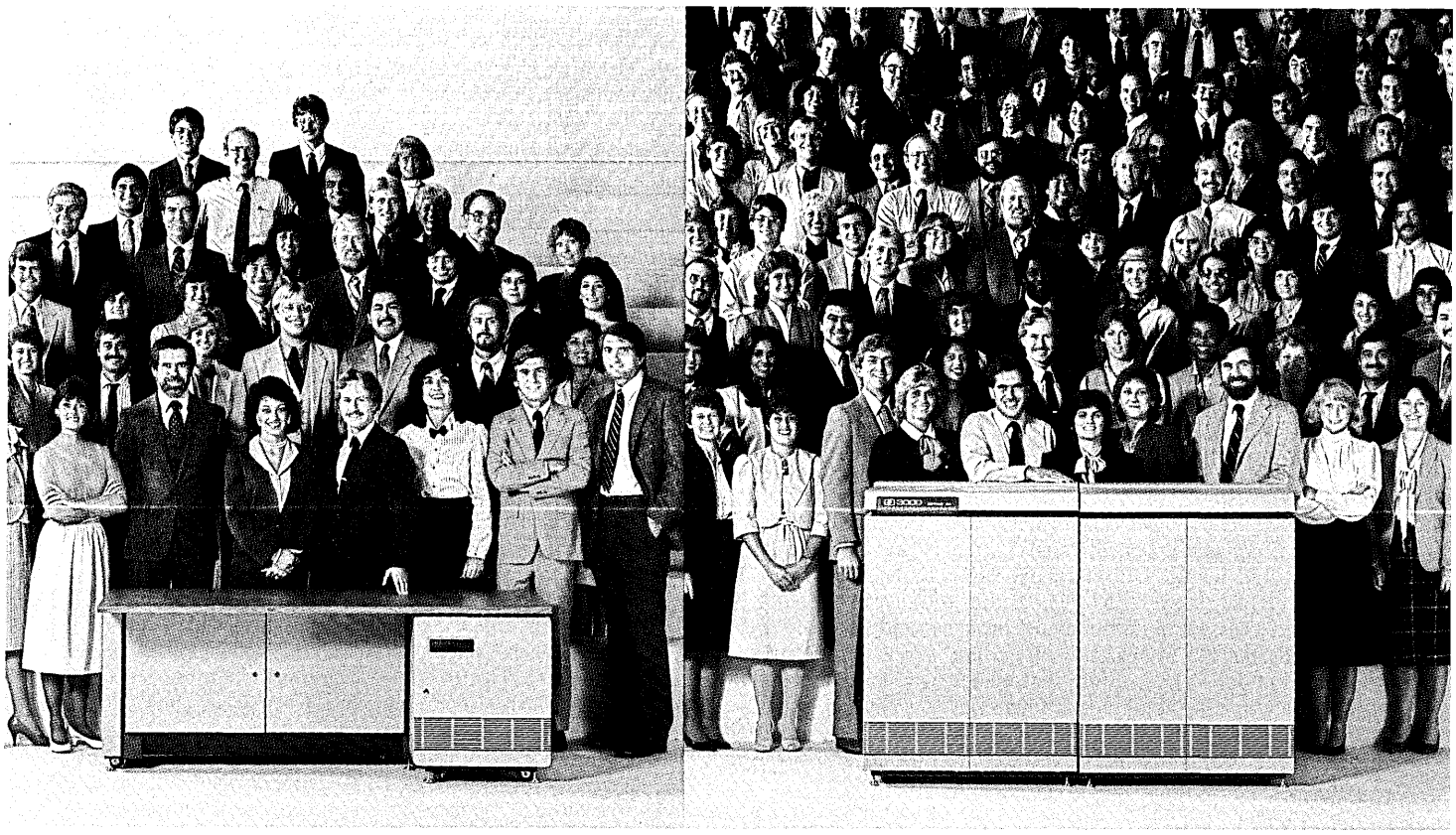

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NEWS IN PERSPECTIVE

BENCHMARKS

PIRACY INDICTMENT: Once again life on the mainframe imitates life on micros. A former employee of a large New York hospital was indicted on charges of software piracy—not of Lotus 1-2-3 or dBase II, but of a mainframe hospital administration package. Frank Russo and a company he now heads were charged with illegally duplicating a $300,000 patient tracking system at University Hospital in Stony Brook, N.Y., and then selling the copy to Albert Einstein Medical Center in Philadelphia. Russo, formerly director of university systems analysis for the hospital, helped University Hospital install the IBM software in 1981, the hospital said. Russo and his company, Stony Brook Systems, Hauppauge, N.Y., were indicted under a state statute that makes it a felony to copy computerized material belonging to others. At Einstein, vice president Art Spikol, expressing the company's opinion, says, "We never would have purchased" the system had its illegitimacy been known.

ADOPTS UNIX: The Open Group for Unix Systems, composed of six leading European computer makers said that member companies would all provide new software based on a common operating system, derived from Unix. The six companies—ICL, Olivetti, Nixdorf, Siemens, Phillips, and Bull—said that the software standard would allow computers made by any of the six to communicate with each other. The announcement was seen as an attempt to bolster the Europeans' competitive position against IBM and to increase the size of the entire European dp market. The six together accounted for only 18.5% of all European dp expenditures in 1983, the most recent year for which figures are available, while IBM contributed 30.6%. The group, formed after initial contacts were made by ICL, may admit more members, although it said it believes it would be inappropriate for U.S. vendors to join. Nonetheless, the group has contacted several U.S. software vendors—including Microsoft, Interactive Systems, Unisoft, and AT&T—in an effort to assure cooperation and wider use of the new software. The six companies would continue to maintain proprietary software for their hardware as well, according to Bull.

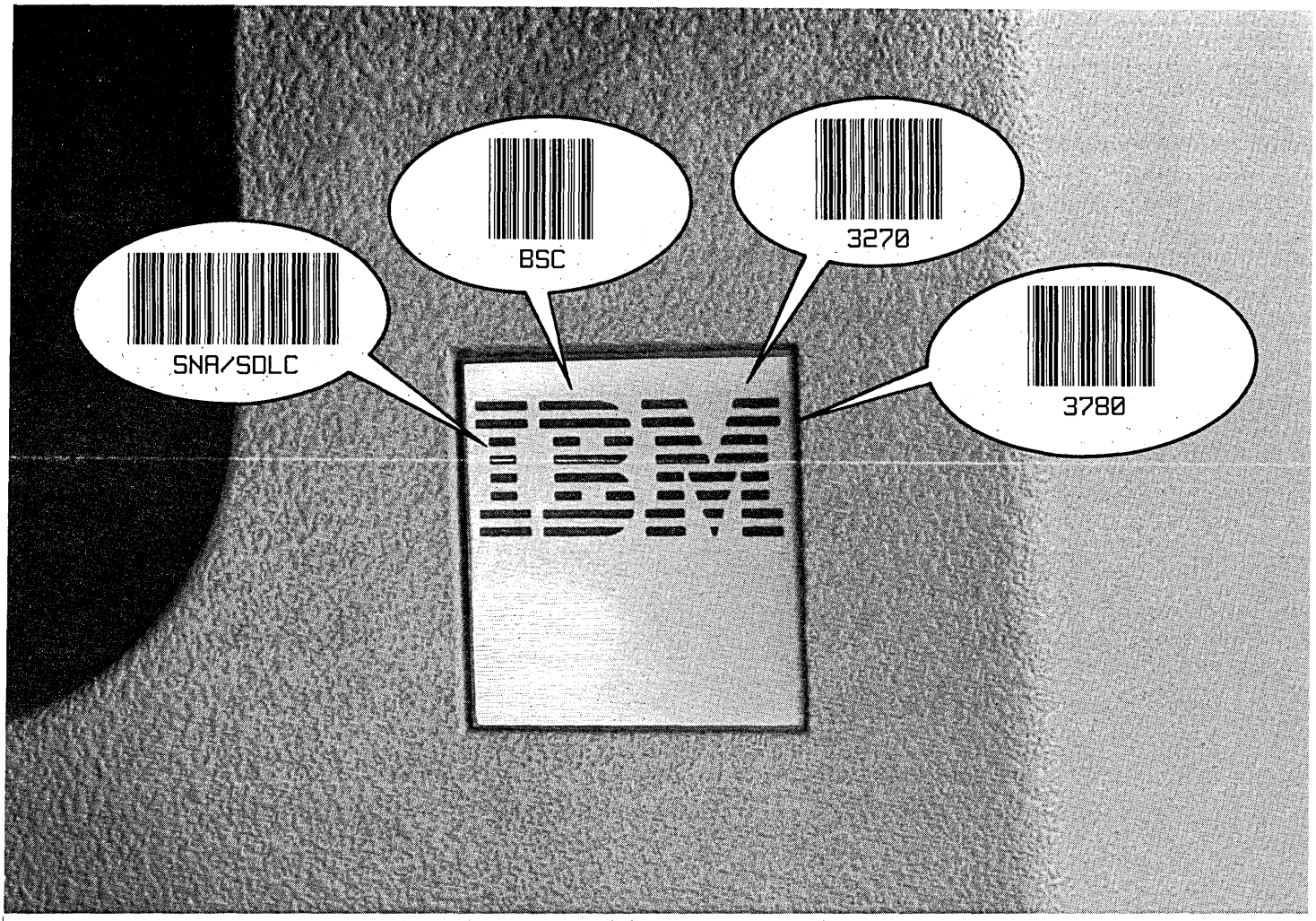
TAPS PRESIDENT: Storage Technology Corp., despite its bankruptcy, continues to attract senior level executives to come to its rescue. Less than a month after luring Ryal Poppa from BMC Industries, St. Paul, to be its chairman and ceo, the Colorado pcm named Stephen G. Jerritts to be its president and chief operating officer. Jerritts had been the president of international operations for Lee Data Corp., Minneapolis. He fills the slot left vacant by Naim Aweida, brother of StorageTek founder Jesse I. Aweida. Naim Aweida resigned from the company shortly after it filed for bankruptcy on Oct. 31. (Jesse Aweida, who remained as chairman after Poppa became ceo, has also since left the company completely.) Jerritts is a former president of Honeywell Information Systems, and he and Poppa served together as directors of the Minneapolis Symphony. The new StorageTek executive will be amply compensated for his work in attempting to turn the company around, whether he succeeds or not. Under his contract, he will receive $240,000 a year for three years, and up to $96,000 in bonuses each year, with $48,000 guaranteed the first year. He also will receive $480,000 in cash if StorageTek is sold or liquidated and has options to buy as much as 1% of the company if it successfully reorganizes. Poppa also hired Robert Costain to be StorageTek's first corporate vice president for strategic planning. Costain worked for Poppa as a vice president of Pertec when Poppa ran that firm. At Lee Data, vice president for finance and chief financial officer Duane Carlson takes over Jerritts' post.

DROP PC LINES: Phase two of the micro hardware shakeout continues, as major dp vendors find that even their vast corporate resources can no longer justify pc offerings. The most recent big dropouts include Digital Equipment Corp. and Xerox Corp. DEC recently halted all production of its Rainbow line of pcs, although it will continue making its DECmate and Professional lines. The company will retool its Westfield, Mass., plant to produce other products, and did not anticipate any layoffs related to the halt. (About 1,400 people were employed making Rainbows.) The company plans to sell off its inventory of 10,000 units and continue to support installed machines. DEC says it may restart the Rainbow line if demand merits the effort, and it is refusing to accept inventory returns from dealers who want to drop the machine. But, veteran DEC watcher Adolph "Sonny" Monosson, says "I don't think there's any chance."

Separately, Xerox halted production of its low-end 820-II and 16/8 micros, saying that inventories were adequate "for the foreseeable future." Xerox also hinted that new micros are on the way as replacements for the $3,000 machines. The 820-II is an update of the original 820, announced in 1981. The 16/8 was introduced in 1983. Neither model helped Xerox gain more than 1% of the microcomputer market, according to a source at InfoCorp, a Cupertino, Calif., research firm. The company is still producing the $9,000 Macintosh-like 8010 Star workstation along with the $12,000 model 860.

BUYS MDS UNITS: New York arbitrager Asher Edelman has begun making good on his plans to dismember Mohawk Data Sciences Inc., the troubled Parsippany, N.J., computer manufacturer. Although Edelman, who is vice chairman of Mohawk's board, owns only 7.7% of Mohawk, he was able to persuade Continental Telecom Inc. to buy Mohawk's computer service division and its credit and lease operation. The deal cost Contel $152.5 million. Contel, which has spent about $350 million in the past half decade to purchase nonregulated computer and communications firms, said that the acquisition was intended to enhance its business products, networking, and third-party maintenance organizations. Mohawk's service division employs 800 people in 125 U.S. offices. Contel said that the division pulls in $60 million in revenues per year serving 11,000 customers, and that it would continue to service Mohawk-made equipment. The credit and lease operation, which brings in $6 million annually, will be merged into Contel's credit business. Edelman and Contel have worked together before; in January, the company considered assisting Edelman in his effort to buy Texas computer company Datapoint Corp. of San Antonio.

COMING OUT: The first micro vendor to file for bankruptcy recently became the first to emerge from the protection of Chapter 11. Victor Technologies Inc., which makes the Victor 9000 pc for the U.S. market and the Sirius pc for European markets, was given a final approval by the U.S. bankruptcy court to resume normal operations. The Scotts Valley, Calif., firm immediately said it would move its manufacturing operations from California to overseas locations. Under the terms of the approval, Victor will become a partially owned subsidiary of Datatronic AB of Sweden. Victor's new business plan emphasizes its office products division over its computer division. When Victor entered the computer business three years ago through its acquisition of Sirius Systems Inc., it largely put aside the office products business that had sustained the firm for over half a century. Mats Gabrielsson, chairman of Datatronic, said that Victor will be introducing new products in both the computer and office products areas later this spring. The new products, he said, will be fully compatible with IBM systems. ◉



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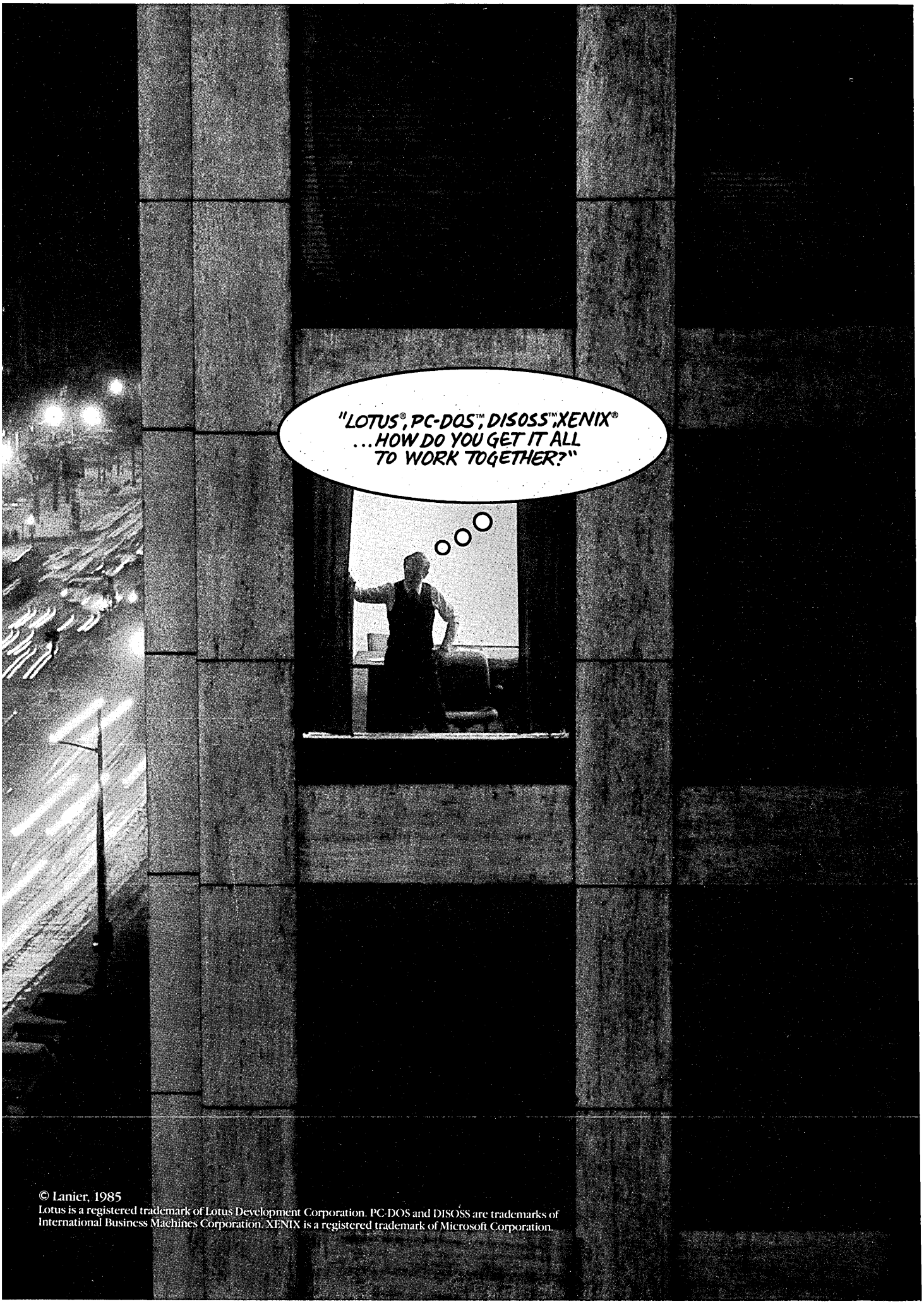

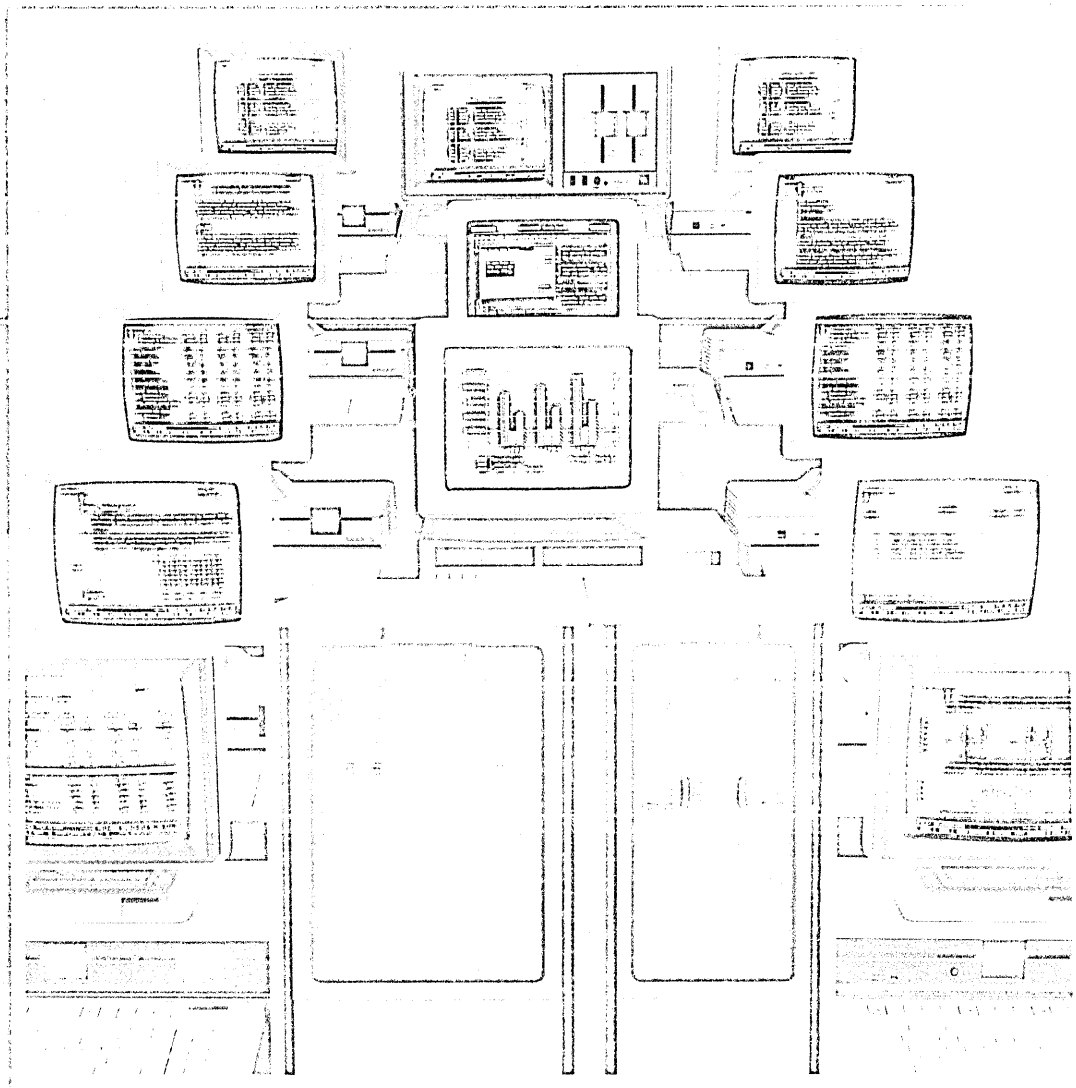

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Beware the hazards of chartjunk—vibration, grid, and the duck—says the Yale professor.

GRAPHICALLY SPEAKING WITH DR. EDWARD R. TUFTE

by John W. Verity

There's something wrong with computer graphics, says Edward R. Tufte, noted statistician and information designer: "Too much chartjunk. No sense of visual craft." And it's largely because of the current machinery's almost complete lack of wysiwyg, he says.

Lack of what?

What you see is what you get. Tufte, author, designer, and publisher of a widely acclaimed book, *The Visual Display of Quantitative Information*, says that for all the computer's convenience and speed, it too often seems to get in the way of making good graphics. In fact, in many cases applying the computer to graphics seems to have been a step backward, for in the change from monotype to microcode much of the graphical wisdom accumulated since Gutenberg began printing books 500 years ago has been lost. The computer's dazzling power to crunch numbers has blinded its users, almost literally, to the crude and often confusing nature of its graphical output.

The visual craft of master cartographers, typographers, and other graphic artists traditionally has been enhanced by the transparency of their tools—what they saw was what they got—and, in Tufte's view, the computerization of graphics production has worked to undo much that was gained over the centuries.

"Too often we're asked to admire the computer, not the information," says Tufte. "What good are 4,028 colors without [the user having] any sense of color? What good are 22 type fonts if they all have jaggies? Computer graphics has tremendous potential, but for several reasons it's largely unexploited."

This isn't to say that computers haven't done some wonderful things for statistical graphics, he emphasizes. The computer has enabled an increase of some 5,000-fold in the density of information portrayed in a graphic. He points to a remarkable computer-generated map, created at Princeton University by P.James E.Peebles and colleagues, showing the distribution of the 1.3 million galaxies in the northern galactic hemisphere. It contains more than 2.2 million tiny rectangles, each of which is shaded according to a 10-tone gray scale. The darker the rectangle, the greater the density of galaxies in that portion of the sky. This map is instantly readable because the gray scale is a naturally understood hierarchy. The many false color maps drawn with the aid of computers often require the observer to constantly refer to a legend so that the entirely artificial color scheme can be interpreted properly. The galaxy map yields a data density of 110,000 numbers per square inch—a record, says Tufte.

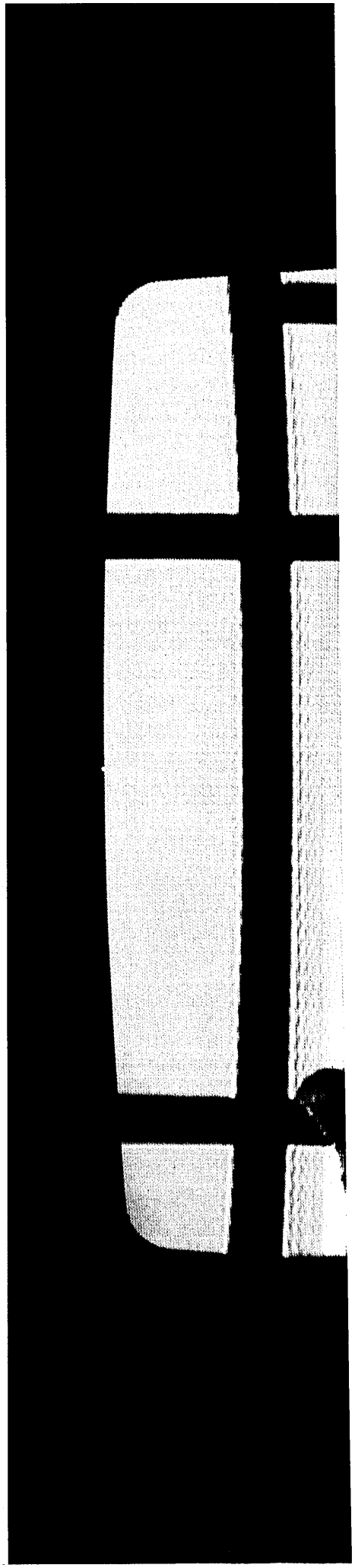
"Certain weather displays, processed aerial photographs, and high-density maps come close to showing 100 million bits per map," he comments.

But he is quick to point out that the computer has led to a "tremendous number of awful things with no sense of visual craft. We see too much chartjunk, noninformation squigglies, moiré patterns, lousy type, bizarre color combinations, and so forth."

Too often, Tufte says, those who use computers to produce statistical graphics have not learned the three basics, think, see, and count. None of these elements are completely gone from the computer, he says, but there's been a damaging segregation of the technical means from the substance and the visual craft. Seemingly powerful graphics systems are in the hands of people who don't respect their audiences, who don't really care about what they are doing with and to their numbers.

THE BEST GRAPH OF ALL TIME

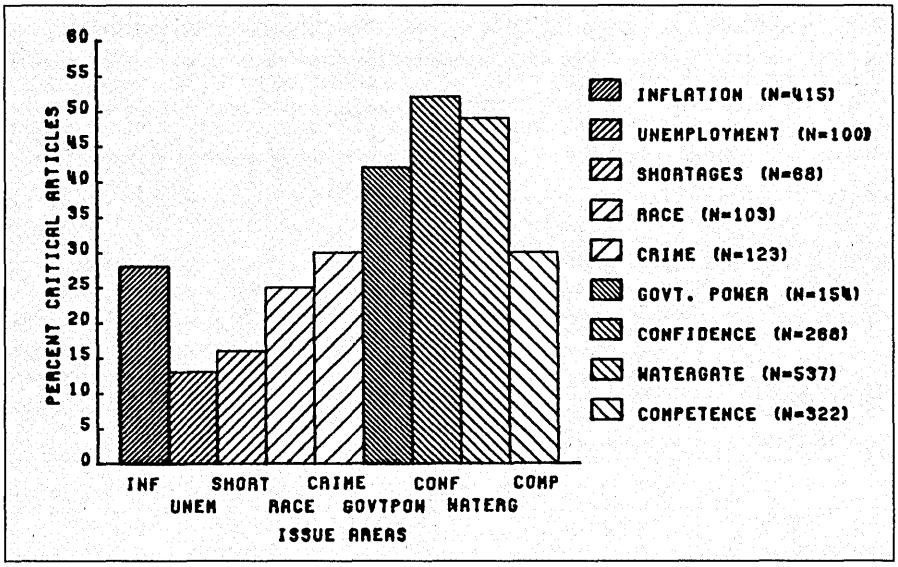
Tufte calls forth Charles Joseph Minard, a French engineer of the nineteenth century whose graphical narrative of Napoleon's treacherous march into Russia he considers perhaps "the best statistical graphic ever drawn," as an example of the crafted but committed graph maker (see Source Data, Feb. 1, p. 153). "Minard could draw, he could see, and he could count, but most of all he cared about war. He hated it," Tufte says.



PHOTOGRAPH BY NICK PASSMORE/VIDEO PHOTOGRAPH BY PETER ANGELO SIMON

PRIME DUCK

Dr. Edward R. Tufte, author of The Visual Display of Quantitative Information, *writes of this graph describing the content and tone of certain newspaper articles:*
"The symptoms of the We-Used-a-Computer-to-Build-a-Duck Syndrome appear in this display from a professional journal: the thin substance; the clotted, crinkly lettering all in upper-case sans serif; the pointlessly ordered cross-hatching; the labels written in computer abbreviations; the optical vibration—all these the by-products of the technology of graphic fabrication. The overly busy vertical scaling shows more percentage markers and labels than there are actual data points. The observed values of the percentages should be printed instead. Since the information consists of a few numbers and a good many words, it is best to pass up the computerized graphics capability this time and tell the story with a table."



"People who don't see particularly well are designing the interfaces to [graphics] machines," he continues. "People have been doing books for 500 years and much wisdom has come from all that activity. There's no reason to start de novo. This is difficult stuff."

Indeed. So is trying to describe what makes the best cartographic art tick, as Tufte found out during the 10 years it took him to complete his book. Much of that time was spent looking for the right words to use in order to get beyond the obvious, but nevertheless important, notions of clarity and simplicity. Only a few traditional visual artists' writings caught Tufte's eyes and ears—Paul Klee, for example—but he finally found help from modern architects. They, too, are concerned with straight lines, science, and numbers. In fact, it's easier to show and tell what's wrong with graphics than it is to say what's right about it. (One is reminded of Isadora Duncan who, when asked what she meant by her avant-garde dances, replied, "If I knew how to tell you, I wouldn't have to dance them.")

So, in a chapter of his book titled "Chartjunk: Vibrations, Grids, and Ducks," Tufte describes three varieties of "weeds" that flourish in bad graphics, particularly those generated automatically by several popular computer products. First are the shimmering op art-like moiré patterns that result from the eye's natural tremor as it gazes on evenly spaced parallel lines. And what makes more parallel lines than a common matrix printer driven by Lotus 1-2-3?

"Moiré effects have proliferated in computer graphics and with the widespread use of transfer designs printed on thin plastic sheets," notes Tufte. He is particularly critical of computer graphics manuals that are "filled up with vibrating graphics, presented as exemplars of design." In the 1981 manual for Tell-A-Graf, a graphics package sold by Issco, the San Diego graphics software vendor, Tufte found more than half of the 459 graphics to be vibrating excessively. There's no such thing as a good vibration in computer graphics, he claims. Vibration makes for "undisciplined ambiguity, with an illusive, eye-straining quality that contaminates the entire graphic."

Grids too often compete with the data they are supposed to be illuminating. "Dark grid lines are chartjunk," says Tufte, recommending that grids be suppressed completely or at least printed in a muted gray. For those diehards still plotting with pencil and graph paper, he suggests that "the reverse [unprinted] side should be used, for then the lines show through faintly and do not clutter the data. If the paper is heavily gridded on both sides, throw it out." Don't get locked into grids.

Finally, Tufte condemns self-promoting graphics, or ducks. "When a graphic is taken over by decorative forms or computer debris, when the data measures and structures become design elements, when the overall design purveys graphical style rather than quantitative information, then that graphic may be called a *duck* in honor of the duck-form store named Big Duck—and shaped like one. For that store, well known to vacationers on Long Island as a classic piece of American vernacular architecture, "the whole structure is itself decoration." Common graphics software products have brought the prefab duck to data graphics, forcing users to embellish their data with clotted, overly cross-hatched designs. "Chartjunk can turn bores into disasters, but it can never rescue a thin data set."

TEN YEARS IN THE MAKING

The 42-year-old Yale professor knows of what he speaks. One has only to look at his book, a masterpiece by any measure, to see how much Tufte has thought about graphics and "information design," as he describes his work. After 10 years teaching political science at Princeton University, he came to Yale where he now teaches political science, statistics, and design. While at Princeton, under the influence of leading statistician John W. Tukey, who is credited with having instigated a major new emphasis on graphics as a tool for investigating statistics rather than manipulating their meaning, Tufte began work on his book. Ten years later, after exploring the history, theory, and practice of graphics (as well as learning about book design and publishing, and running a mail-order business), his "celebration of data graphics" was greeted with high praise from many quarters. "A tour de force," Tukey himself called it. Tufte has been selling many thousands of the $36 volumes ever since.

If someone is smart, they'll hire Tufte to help them build a statistical graphics workstation, a tool that would enhance the cartographer's task without getting in his way. Above all it would provide unadulterated wysiwyg. Such a machine would need a high-resolution screen—at least 1,000 lines per inch to enable high-quality viewing of type and graphics—and however much computing power is needed to enable real-time editing of both.

"The industry has been slow in getting what everyone wants. For the last seven years this dream machine has been just 18 months away," notes Tufte. "It's hard to get editing at the same time as high-quality type and graphics. You need all three at once. That will make all people their own

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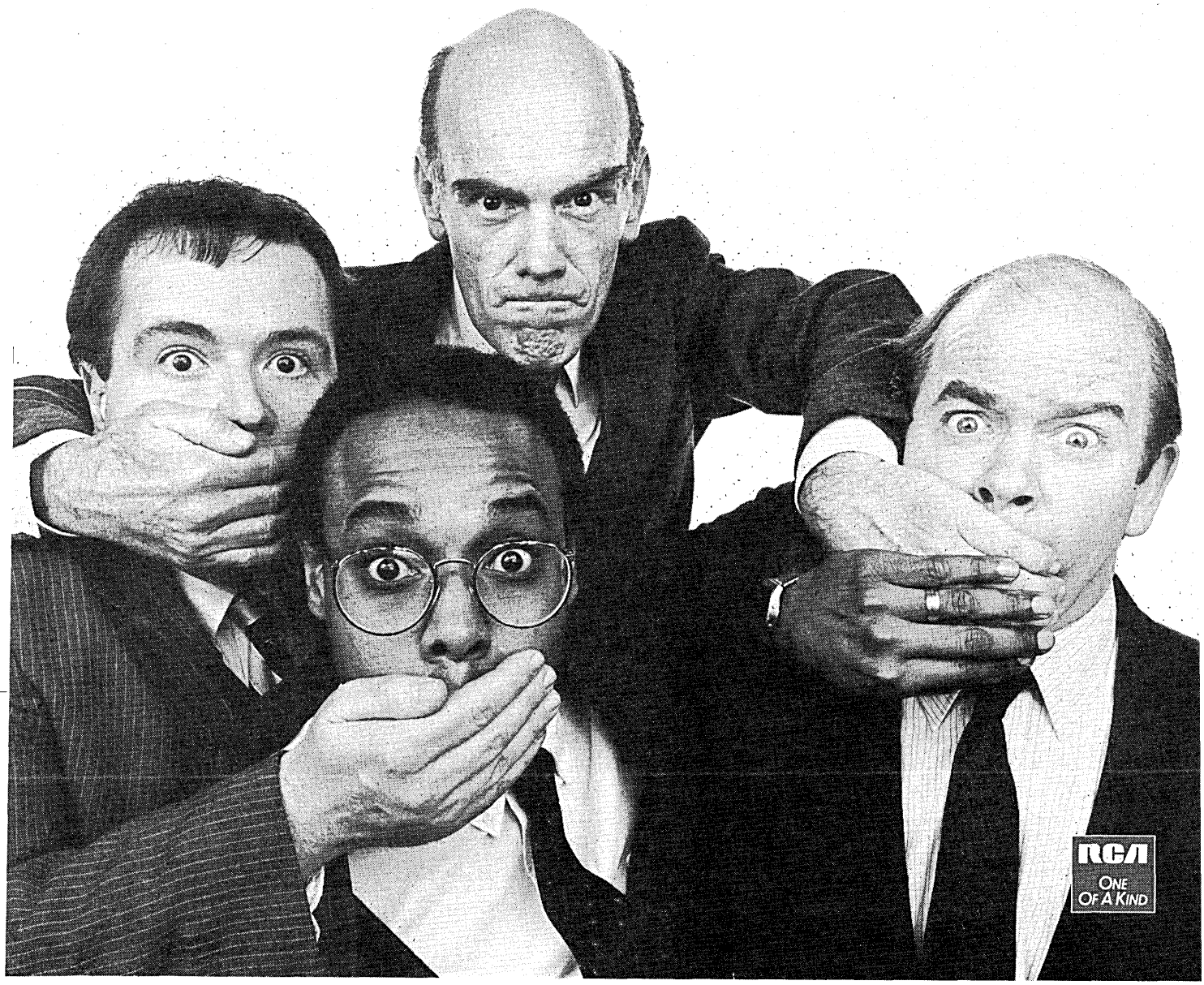


"The industry has been slow in getting what everyone wants. For the past seven years it's been just 18 months away."

typographer as well as writer. There's a tremendous scope of personal power there."

One of the more promising systems—"it's half way there"—Tufte has seen so far is that sold by Interleaf, a Cambridge, Mass., company that packages proprietary test and graphics editing software with a Sun Microsystems workstation and laser printer. He points out, though, that even Interleaf's display of type is not up to snuff—its screen does not have enough resolution to let the user see exactly how a final printed page will appear. The subtleties of fine type fonts are lost unless at least 1,000 lines per inch are available in the display or printing device. Most crts these days have resolution far less than that and even laser printers, for all their vaunted speed and resolution, produce crude type compared to what's possible with a true printing press.

He notes that all the necessary pieces for producing good computer-assisted graphics exist separately now. Nobody's ever brought them all together. Obviously there are powerful text processors about, and there are machines that handle graphic images well, and there are even some good computerized typesetting machines, but they remain segregated from each other. Part of the reason for this separation of functions, which would seem easily merged into a single machine, is that "book craft and computer expertise are found in different types of people," says Tufte. He says he thinks some of the best computer graphics are currently being made in Hollywood, "where there is money and a sense of craft. They have to sell the movies, not the machine."

As his exploration into graphics has led him repeatedly into the computer realm, Tufte has some strong thoughts on computer manuals, those tomes that are ostensibly designed to document programs and show novices how to use them.

"Why are they so bad?" Tufte asks about manuals. He answers himself, "There is the natural, inherent difficulty of getting technical material translated into English, so to speak. Also, making these books involves people [who are] not necessarily naturals at writing. They are good at many things other than writing.

"Finally, there are interests served by bad manuals. If machines are difficult to use, then there is a need for experts and professionals. A good example is lawyers and the legal code. The breakthrough will come when the interest in usability wins out over maintaining a kind of elite jargon. Right now the trade-off is all in favor of keeping things in code. Jargon is more effective for the initiated, but it's highly inefficient for those not in the know." He concludes, "It's a question of balance of power."

MANUAL LABOR PROBLEMS

Noting the swift marketing pace of the industry, Tufte concedes that computer manuals "have to be done quickly and the speed of the process means there's no time to rewrite. I do appreciate these folks' problems."

Asked about Apple Computer's Macintosh, a highly graphic computer that is promoted as having little need for external documentation because so much motherhood and apple pie are built into it, Tufte responds, "I think it's an effort to shift the balance. It's user driven, not technology driven. But I think the real test of future systems will be, can it be built with the assumption that the user will lose the manual? It's all talk otherwise."

Tufte is currently consulting with IBM on the design of its manuals, trying to devise guidelines for making future documentation easier to read and use. Even small changes in typography, such as printing acronyms in small capitals—OS/MVS rather than OS/MVS, for example—can make such documentation more pleasing to the eye and therefore more easily used.

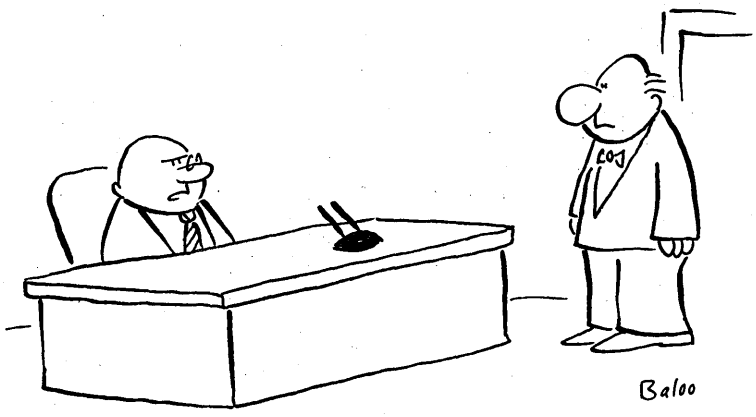
He's also beginning to plot out a second volume on graphics design. To be published by his home-based Graphics Press, it will touch on such subjects as typography, the use of color, tables, and information design.

The proper use of color, treated only in passing in *Visual Display*, will be particularly difficult to advise, Tufte states. "Color is so complex. Our perception of it is so contextual. It's like music," he notes, showing a visitor a prized collection of color perception exercises (*Interaction of Color* by the late Josef Albers) that show how even in trivial cases, context is all. Too often color graphics, especially those generated by simplistic computer programs, confuse and distract from the data. "We have few experts on color."

Part of his project calls for time to study in Japan. He states, "Statistical graphics is universal, it's free of uniqueness. It has the same independence of local language as mathematics. To see our use of graphics best, I needed to find a statistically and graphically rich culture as far away as possible from New Haven." Japan seems right, for so passionate is that Asian nation for numbers and graphs that each year it celebrates Statistics Day with a widely popular contest.

Meanwhile, working out of a glassy hilltop house, which looks nothing like a duck but is decorated inside and out with art of his own making, Tufte continues his quest for good graphics and reaps the success of his book; it's in its third printing now. He consults with various organizations besides IBM, including a nearby mass-transit authority, which has asked him to simplify its tabular timetables into easily read graphs. As writer and artist, he keeps his tools simple: a drawing board; the usual pens, pencils, and rulers; a Selectric 3 typewriter. Maximum wysiwyg.

"The glory will be when [graphics machines] reach the status of people with real visual craft," he concludes, "when the traditional standards of excellence are met by modern technology. Just because you have high technology shouldn't mean low quality. Why use a computer to plot eight data points?" ◉



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CARTOON BY REX F. MAY

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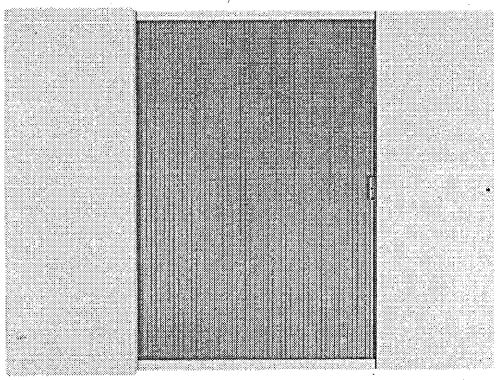

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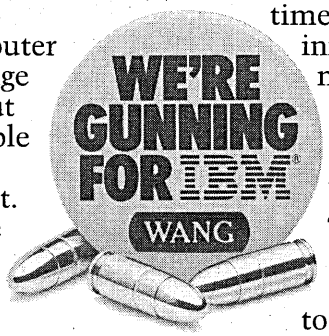

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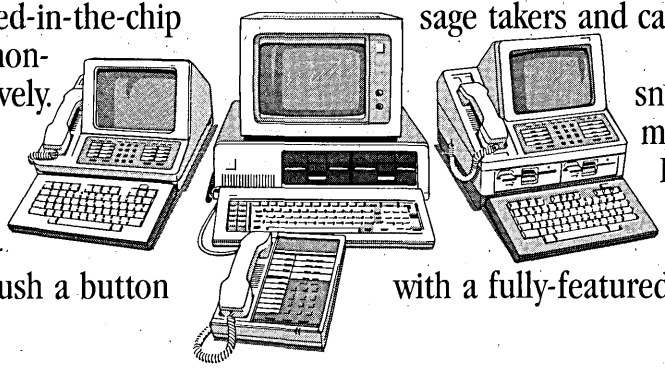

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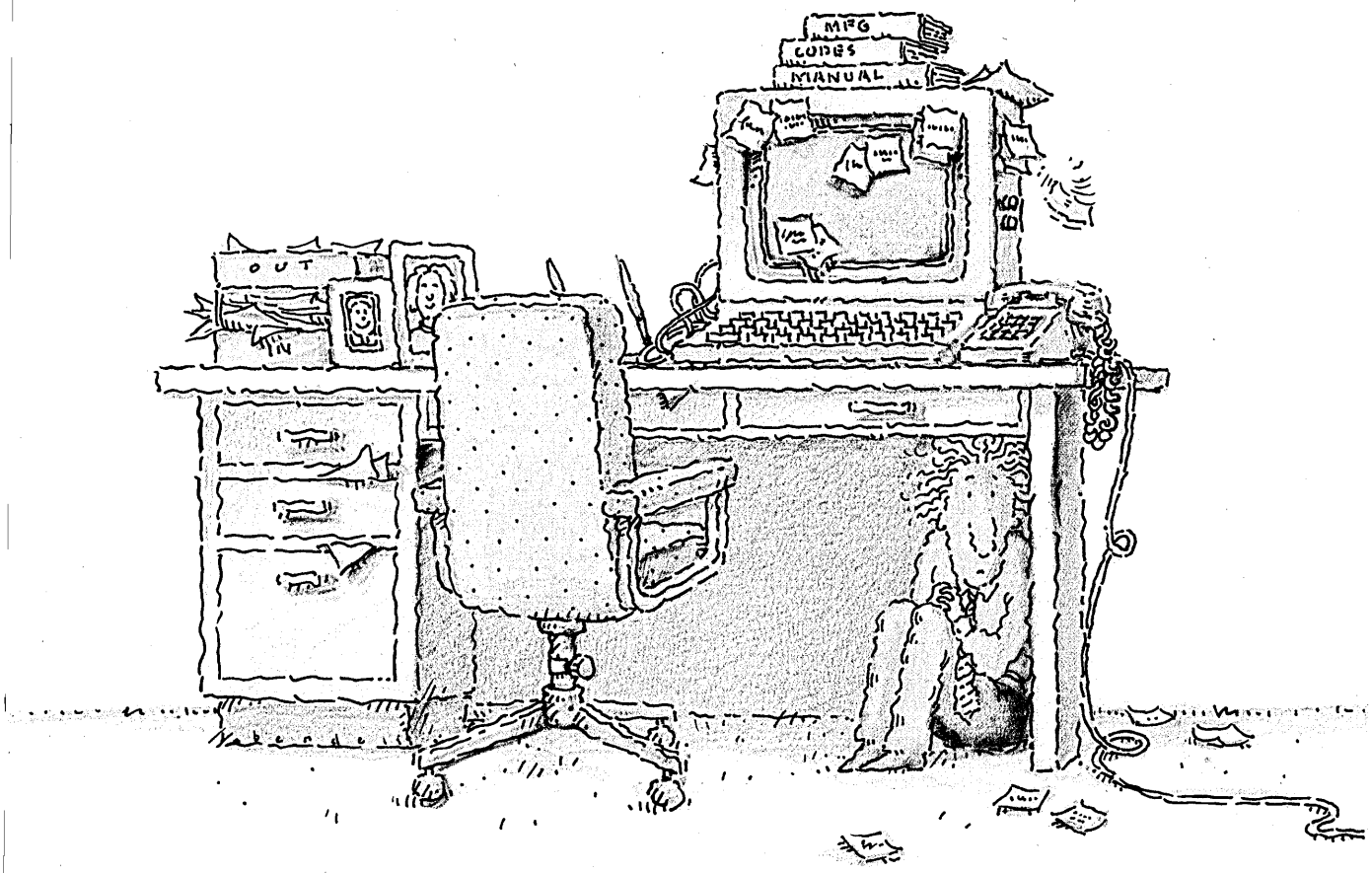

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Too often, "user friendliness" is a forced grin that serves only to hide serious flaws.

FRIENDLY OR FRIVOLOUS?

by Jon A. Meads

Computer graphics made possible a new kind of dynamic communication between the user and the application. The value of interaction was clearly evident, and the large majority of computer graphics applications were interactive. It was also evident that interactive systems, while providing distinct time-saving benefits over batch systems, could easily be frustrating and irritating to users. Developing a system that was comfortable and enjoyable to work with was not a trivial task. The term user friendly came to be used to describe a system that put a user at ease.

Unfortunately, advertising people discovered the term a few years back and found it to be an excellent whitewash for products of indeterminate merit. In a short time, user friendly became the modifier of choice for any interactive or graphics product. One would think that by now the term would be sufficiently debased to have gone the way of "the office of the future." The marketers are still using it, though, apparently without embarrassment.

During the past few years, the term has been applied to everything from circuit boards to software. A microcomputer with a minuscule seven-inch screen is user friendly. Keyboards with all the simplicity of an Apollo command module are user friendly. The term now brings to mind a stereotypical used-car salesman. The forced grin of user friendliness becomes a mask for lack of capability, insufficient performance, costly maintenance, or a collection of misfitting components.

Which is a shame, since user friendliness is a valuable concept. Perhaps, even if we cannot rehabilitate the term, a review of the issues will allow us to obtain a better understanding of what it is that we mean to express by it.

Hardware gimmicks and software tricks. If advertising hype is to be believed, user friendliness is everywhere. A circuit board supporting 3-D graphics is user friendly because it does exactly what it is supposed to do—provide 3-D graphics. A number of other hardware items claim to be user friendly because they provide graphics, interaction, color displays, touch panels, a mouse, or ergonomic keyboards.

The presence of graphics or interactivity is no guarantee that a system is user friendly. In fact, simply being on-line, directly interacting with a computer, can unsettle some people, especially those who have had little previous exposure to computer systems. Worse yet, if a person who is apprehensive about using a computer is unable to interact successfully with a so-called user-friendly system, then that person is likely to attribute the failure to personal inadequacy. Making a person feel inadequate is certainly not friendly.

Graphics are excellent presentation tools, but it's not always appropriate to present data in a graphical form. The graphical form may be ineffective because the system is limited in its presentation capabilities. Or the graphics may suffer from chartjunk, a term coined by Edward Tufte (see "Graphically Speaking with Dr. Edward R. Tufte," p. 88). The latter is all too common, because system implementers tend to leave no feature unincluded. As Tufte puts it, "The complexity of multifunctioning elements can sometimes turn data graphics into visual puzzles."

A system that supports color is automatically described as user friendly. While color is certainly attractive, it is easily misused. Color is primarily a selective variable, but it is often used to order and rank data. In such cases, varying shades of gray may be preferable. Color can also lead to clutter. Programmers who have not had design experience may, like children, decorate their displays garishly. But it is *how* color is used that matters in making a system friendly.

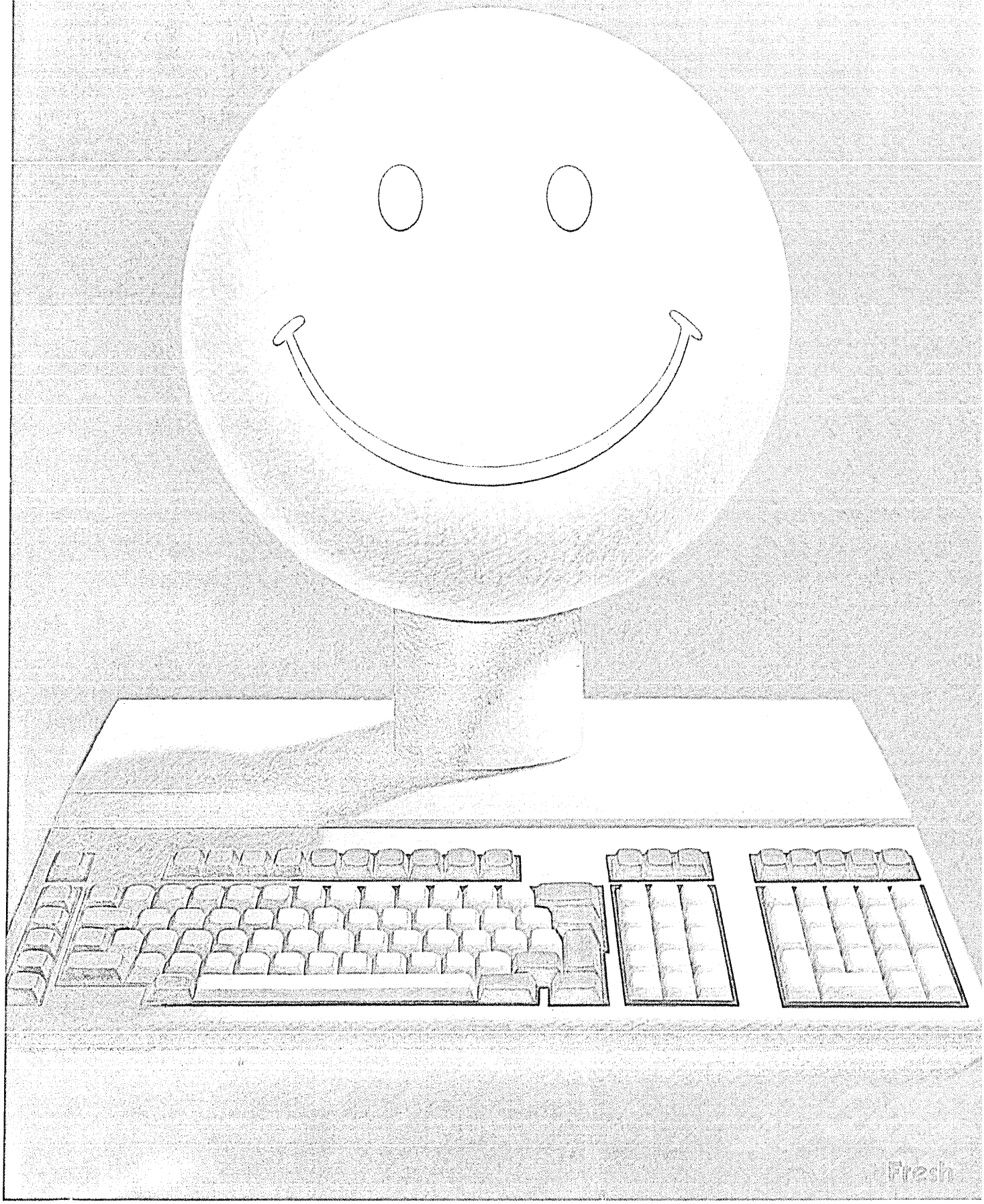
TOUCH PANEL MANIA

For a while it appeared that touch panels were synomynous with user friendliness. It didn't matter how poorly the system was designed or how frustrating the system software was. And the corollary, of course, was that a system without a touch panel was doomed to be a social reject. The fact is that touch panels are good devices for making some systems friendly. For the most part, these are systems with limited functionality, accessed on an occasional basis by casual users—automatic teller machines, for example. It is unlikely that touch panels can be very useful in complex systems used on a daily production basis. The panels themselves are not friendly, it is their use in an appropriate application environment that is friendly.

Similarly, a system is not automatically friendly just because it employs a mouse as one of its interactive devices. The mouse is a "Fitt's Law" device, which means the average user can easily learn to use it for selecting and pointing. A fair amount of training may be required before a mouse could replace a stylus for tasks like drawing and writing. But even when used for only selecting and pointing, a mouse may not be friendly. Software that requires constant switching between keyboard, mouse, and other devices disrupts the user's tactile continuity and increases the cognitive workload.

Keyboards are both damned and praised in regard to their user friendliness. First of all there is the myth that executives shy away from systems with keyboards because they don't want to look like clerks. Executives with this kind of insecurity have problems that won't be remedied by personal workstations. More likely, executives

ILLUSTRATION BY MARK FRESH



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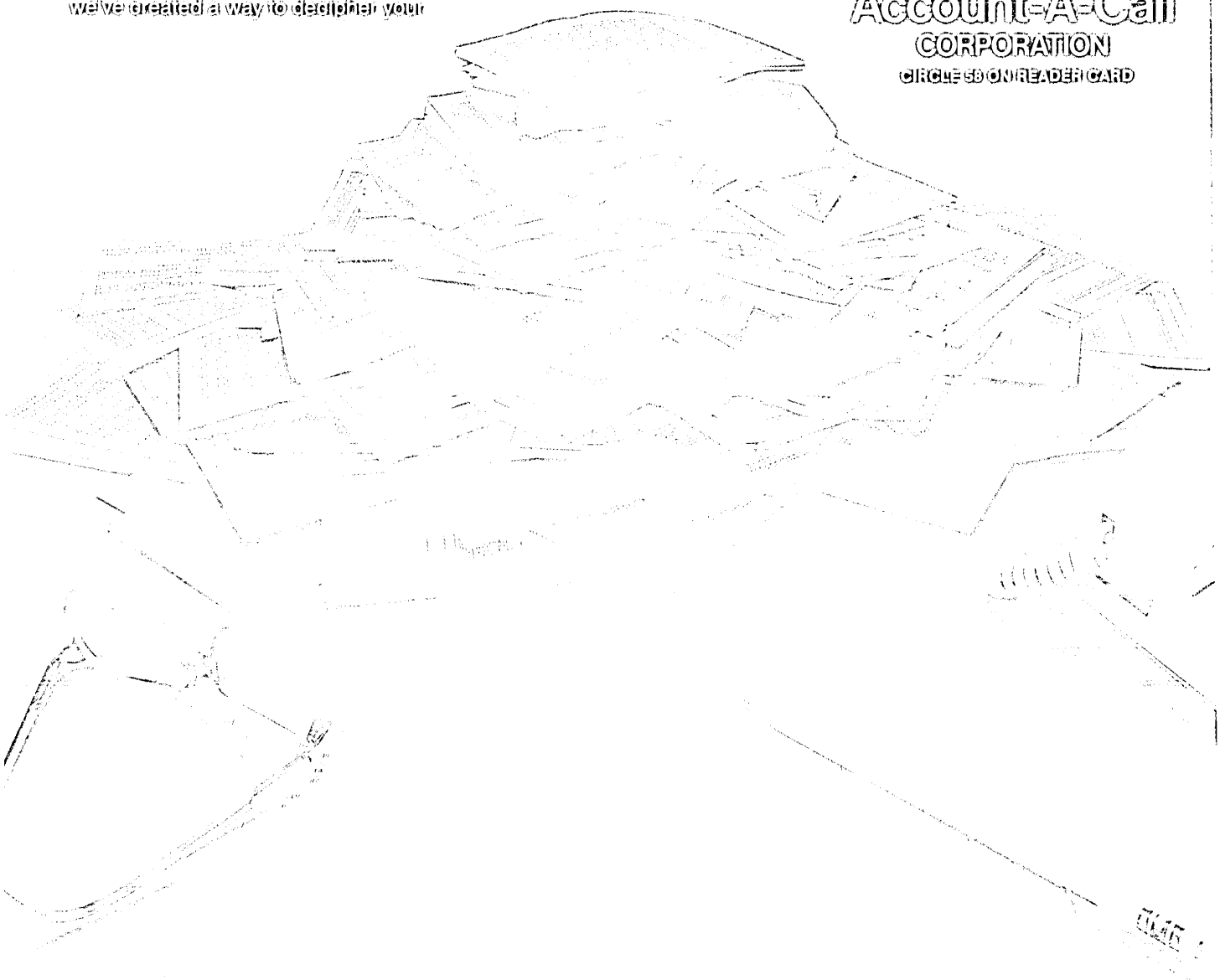

who don't use workstations find it more economical to let someone else undergo the training required to become proficient with a system. The presence of a keyboard does not make a system less friendly.

On the other hand, keyboards designed according to the ergonomic standards set by DIM (the German equivalent to ANSI) are often described as user friendly. Such keyboards may be bedecked with more keys and switches than a Wurlitzer. In fact, several years ago one individual claimed his adapted organ keyboard was the wave of the future for user interaction because it allowed a higher data input rate than any other device. Why, gee! After only 10 years of intensive evening practice, you too can be a virtuoso data entry clerk. The concept is still promoted. The more keys and switches, the more likely the keyboard will be advertised as user friendly.

Software features, primarily icons, menus, and window systems, are also heavily publicized as being user friendly. Each of these can enhance the geniality of a system greatly; but in and of themselves, they are not necessarily amicable.

Currently icons are much in vogue. It is interesting that *Webster's New Collegiate Dictionary* offers both of the following definitions for icons:

- a pictorial representation
- an object of uncritical devotion

The value of icons is in the human ability to discern pictorial differences more quickly and easily than textual differences. Our ability to interpret the meaning of various icons is distinctly limited, however. Let's face it, hieroglyphics as a means of written communication went out of style a few years back. Given a reasonable context and an established, restricted set of interpretations, icons serve very well as identifiers, especially when augmented with text. But the use of a large number of poorly designed icons would be more bewildering than helpful. The concept of a system such as Unix using icons to present well over 100 user-callable functions is more frightening than friendly.

While icons are relatively recent to mainstream computing, menus have been used and abused much longer. The major value provided by menus is the ability to guide a user through the steps needed to accomplish a task. The major drawback is that once the user has become experienced with the system, the need to step through a number of menus to achieve one's goal can be extremely frustrating.

Windows that present multiple, simultaneous views of one or more objects are also cited as user friendly. Windows may also allow a user to interact with several processes concurrently, with each window functioning as a virtual terminal. There are two basic types of window systems: tiling and messy desk.

Tiling refers to systems that don't allow the windows to overlap. As each new window is created, screen space for each existing window is reallocated. Tiling is a good mechanism for tasks that require concurrent access to several views or processes.

Messy desk window systems do not restructure displays automatically. When a new window is created, it overlays and obscures any previous window that happens to exist in the same space as the new one. Usually only one window, the topmost, is active at any given time. Messy desk window systems are most useful for multiple, independent tasks that may be interrupted and reentered at random. If any single technique could be characterized as user friendly independent of all else, it would be the messy desk window system.

EASY TO LEARN AND USE

Toward a definition of user friendly. Two other ergonomic slogans are often intermixed and confused with user friendly. These are "easy-to-learn" and "easy-to-use."

A system that's easy to learn is obviously friendlier than one that isn't. But there is a definite difference between a system that is clear, concise, and obvious, and one that treats the user as an unretentive two-year-old. Both types of systems may be considered easy to learn, but only one is truly friendly. Similarly, a friendly system would be easy to use. But a system that restricts capability to a limited set of commonly used features and options in order to reduce the user interface to trivial interaction is not necessarily friendly. It depends entirely on the needs and requirements of the user. Meads' First Law of Interactivity is: *The requirement for greater functionality is also a requirement for greater user expertise.*

Managers interested in low-cost development efforts and vendors of products with only a particular virtue prefer to consider user friendliness as a single issue. It isn't; user friendliness is a gestalt, comprised of many factors. The bottom line is that friendliness is relative. It is quite possible for a generally friendly system to have a few unpleasant traits. Unfortunately, it's more typical for systems to have many loathesome characteristics and few redeeming qualities.

In order to understand what we expect from a friendly system, we should review what we expect from friendly people. First of all, we expect more than empty glad-handing and loud guffaws over crude remarks. We are distinctly wary of strangers who profess a friendliness that's out of line with our experience with them. A friend is someone who shares our goals and is willing to help us attain them. A friend will help protect us from our own mistakes, yet does not police us, erecting barriers and placing certain domains off-limits. A friend makes us comfortable and relaxed with our situation and encourages us to explore. In short, a friendly system has three important aspects. It is cooperative, preventive, and conducive.

Cooperative. A friendly system does more than just provide access to the tools and features required for performance of a given task. It actively assists the user—as does, for example, a CAD system that informs the user of design rule violations *during* the design activity, not after it. A cooperative system is both easy to learn and easy to use. The user is aware of its basic capabilities, and can easily determine what additional capabilities exist. Assistance is low-key, in a style that would be approved by Miss Manners.

Context-oriented prompts keep the user aware of interactive progress. Menus and forms are used judiciously. Defaults eliminate the need to specify unnecessary parameters. The system provides appropriate and sufficient organizational facilities for management of the tools and data required by the user. Personalization and scripts are available to support an individual's standard modes and procedures.

USERS DO NOT PLAN AHEAD

Cooperative systems are aware that false starts are a way of life, and will allow the cancellation of an operation from any of several levels of interaction. A cooperative system knows that a user seldom gets to complete a task without interruption, and will provide mechanisms that allow suspension of a task and quick return to it at a later time. A cooperative system is quite well aware that we users seldom plan ahead, and will allow us to reach out to reference or obtain information at the time it dawns on us that we need it.

Finally, a cooperative system does not pass the buck. It is clear and obvious about what it is up to and what difficulties it has encountered. System gurus are not needed to solve problems or interpret errors.

Few systems are as cooperative as they could be. One reason is that cooperation not only requires a good and sufficient design as a framework, but also requires better planning, a longer development ef-

Quality costs. There is a limit to what people will pay for friendliness.

fort, continuing support from auxiliary professionals such as educational specialists and design artists, and, most important, more physical resources (memory, disk, capacity, etc.). Quality costs. And there is a limit to what people will pay for friendliness.

Preventive. A friendly system is concerned about the anguish that overtakes a user when several hours of brilliant, creative work is lost. A friendly system recognizes that people make mistakes, sometimes very stupid ones, and is designed in gentle expectation of such. A common technique is to require conscious thought before allowing a potentially disastrous operation to occur. A friendly system realizes that even with the best fail-safe methods, users have a peculiar affinity for screwing up, and it behaves so as to reduce the cost of all mistakes. Catastrophic events are delayed until the last possible moment, just in case there is a change in plans. Nothing is thrown away until the resources required for their maintenance are needed elsewhere. Operations may be canceled without penalty or loss of data.

In all of this, a friendly system remains at the service of the user and does not act as the user's keeper. A friendly system reverses Isaac Asimov's first two Laws of Robotics. First, a system must obey the orders given it by the user. Second, a system may not injure a user, or through inaction allow one to come to harm, except where this would conflict with the first law—in which case, the system must inform the user of the potential danger before proceeding.

Conducive. It's a pleasure to be with a real friend, and a friendly system is enjoyable to use. It's comfortable, and the user is encouraged to explore. Actions may be undone with no damage or loss. The user is not ignored. System response is conversationally appropriate. Additional feedback is regularly provided as needed. And the user is never left in a system hole from which there is no easy and obvious exit.

Unlike some friends, a friendly system must be reliable. Trust must be established, not only in performance but in promised utility. A system that professes friendliness without providing adequate and expected capability is an electronic charlatan.

A friendly system is predictable. It behaves consistently even in different modes, thereby allowing the user to make reasonable assumptions even when operating in unfamiliar territory. But most of all, a friendly system does not do anything unexpected. No surprises.

Finally, a friendly system accepts the fact that it is no more than a programmed machine, and it behaves with quiet deference. Its purpose is to assist the user, not to control the user. It offers guidance but does not direct. It may anticipate but it doesn't rush the user. It is responsive, not demanding of attention (except in situations of extreme emergency).

If talk of friendliness were a sufficient condition, the computer world would be one of the jolliest professional communities around. But few, if any, of the items touted as user friendly are inherently so, although many can contribute significantly to a system's amicability. But this requires both talent and planned effort. Mere inclusion is not enough.

"What I'd like to do first is establish your stress-fun ratio."

CARTOON BY SIDNEY HARRIS

PARANOIA QUOTIENT SOARS

My Banana 9000 lookalike is easy to use and is generally a convivial system. But I still encounter significant frustration and loss of work. In spite of many advanced user interface techniques, it regresses to the old, "ERROR #763-RESTART," which translates, "Tough luck, baby! You lose (everything you've been doing for the past three hours)! And, although I know why, I ain't even going to give you a hint!" Whenever I'm forced to relearn Unix, I find my paranoia quotient skyrocketing. In spite of Unix's many cooperative capabilities, the damage I can do to myself with little effort is downright scary. Yet these systems are claimed to be very user friendly.

"User friendly" has become a hackneyed term, but the concept is still a valuable one. I believe that truly amicable systems are possible and I look forward to the day when I can take my user-friendly personal workstation to the neighborhood bar and let it buy me a beer. ◉

Jon A. Meads, a consultant based in Portland, Ore., specializes in user interface and interactive computer graphics systems. He is chairing a workshop on user interface standards at ACM/SIGCHI in San Francisco this month.

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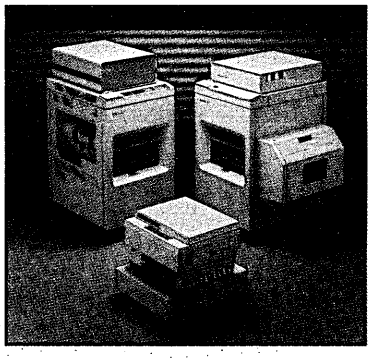

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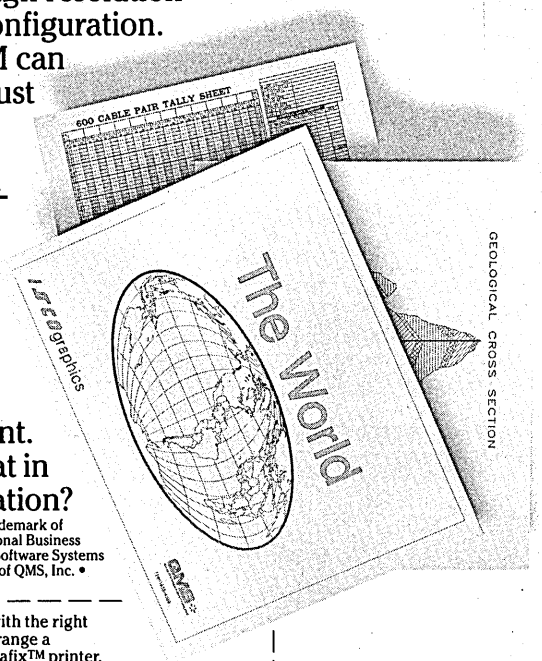

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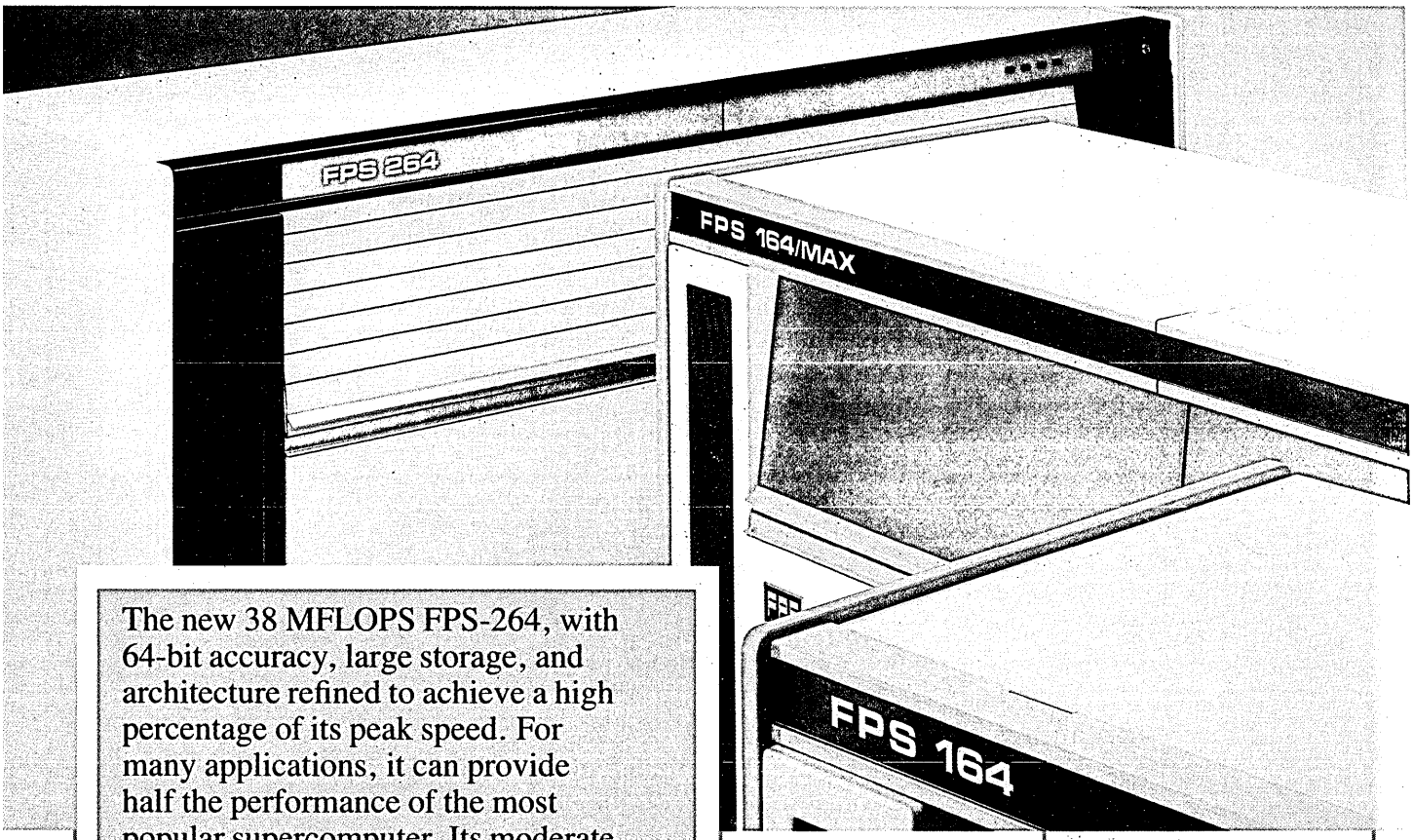

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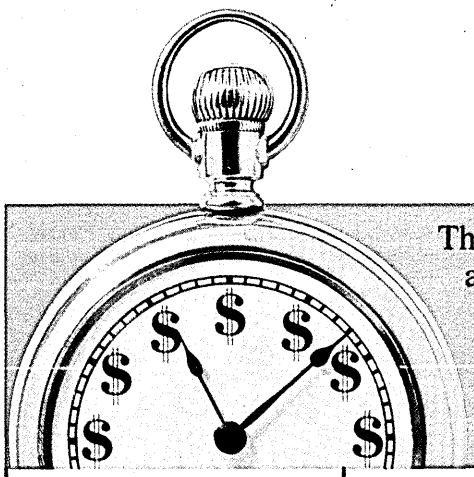

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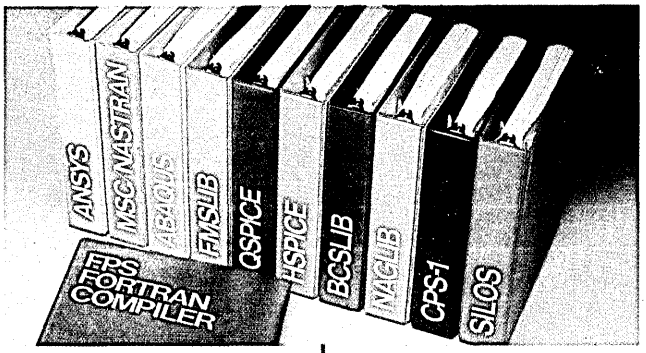

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Logic format	64 bits	64 bits	64 bits
Main memory capacity	4.5 MWords	15 MWords	7.25 MWords
Maximum disk storage capacity	16 Gbytes	3 Gbytes	3 Gbytes
Precision	15 decimal digits	15 decimal digits	15 decimal digits
Vector registers	4 x 2K	124 x 2K (max.)	4 x 2K
Scalar registers	64	184 (max.)	64
Host interfaces	IBM, DEC	IBM, DEC, Sperry, Apollo	
Program Development Software	FORTRAN Compiler, Overlay Linker, Assembler, Object Librarian, Interactive Debugger.		

Family Performance Measures

	FPS-264	FPS-164/MAX		FPS-164
		15 accelerators	1 accelerator	
Peak MFLOPS	38	341	33	11
Peak MOPS	190	1705	165	55
Peak MIPS (Multi-instruction partcels)	19	5.5	5.5	5.5
Typical MFLOPS, LINPACK Benchmark	9.9	20.0	6.0	2.6
Whetstones (64-bit)	20,100	5800	5800	5800
1000x1000 matrix multiply, seconds	53	10	66	189
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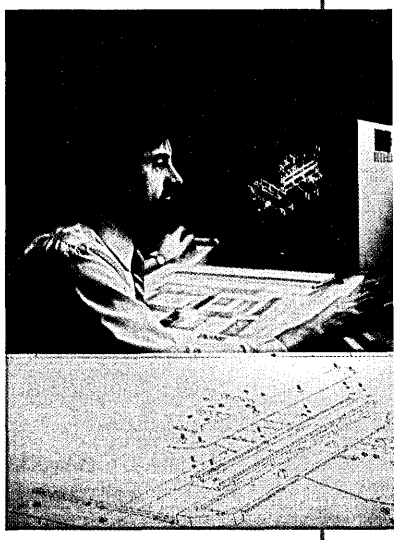

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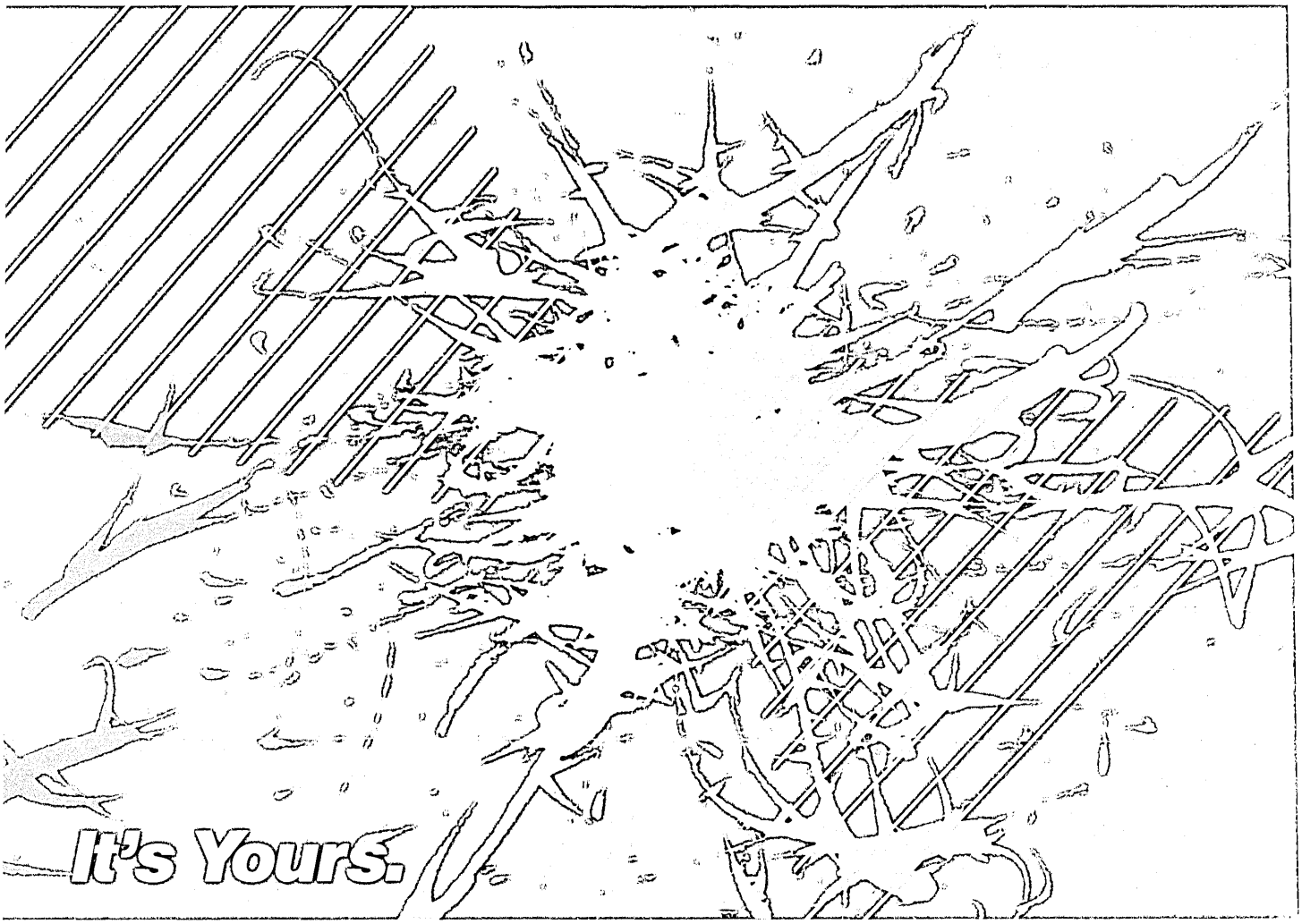

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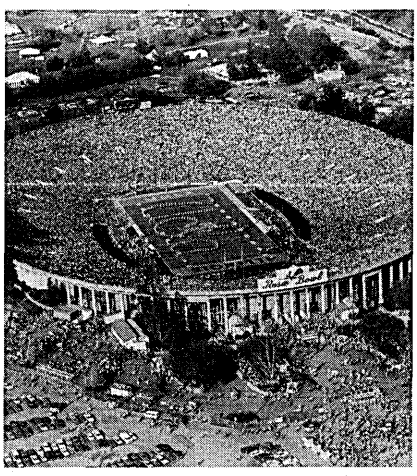
UTM President Describes Fierce Competitive Environment

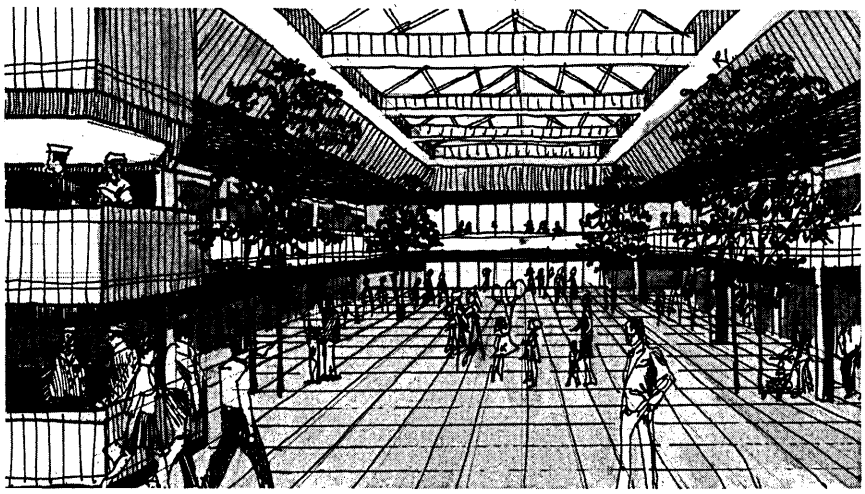
Warns Salesforce They Have "No Time for Naps"



☐ Pasadena, Calif.—UTM President Biff Thrutcote convened an eighth of the company's sales force in the Rose Bowl last week for an old-fashioned pep talk. Marketing employees on five other continents participated via satellite. The stadium rocked with the UTM fight song as Mr. Thrutcote took the field, and 11 verses later he had to ask for quiet so he could begin his speech.

The brilliant, well-crafted address, entitled "Complacency is the Enemy of Achievement," was interrupted over 30 times by applause, both domestic and foreign. There were frequent chants of "Quota! Quota!" and "We're Number One!"

Mr. Thrutcote told the *Juggernaut* that he was "pretty well satisfied" with the response he got.



Security Division's New Home to Be Ready by 1992

It's been a long wait for the 57,000 men and women of UTM Security. Though they were reorganized into a Strategic Business Unit back in 1987, management had been unable to provide them with an appropriate headquarters—until last month, that is. That was when the Real Properties Division announced it had concluded negotiations with the State of New York for acquisition of a property in the scenic Hudson River Town of Ossining. The historic, 425,000-square-foot structure should be ready for remodeling as soon as the state can arrange new quarters for the current occupants, many of whom have long-term leases. Shown above is an artist's conception of the refurbished atrium, which Security Chief Napoleon Truntian says "will have a real homey feel. It ought to be plenty big enough for me and my people, and any visitors we might have, if you know what I mean."

UTM Revenues Exceed 30% of U.S. GNP

Hectares Vows to Continue "Stable Growth"

☐ Hoboken, N.J.—UTM Chairman Rueben Hectares released the company's fiscal 1989 results to an auditorium packed with widows, orphans, and institutional investors today. They were overjoyed to learn that nearly a third of all the money spent in the U.S. last year went for UTM products and services. Mr. Hectares said he was "tickled pink" to be able to announce that revenues were up 30% over a year earlier, to $407 billion. Net earnings rose 32%, to $57 billion.

"We're not the majority of the economy yet," noted Mr. Hectares. "Frankly, that's easier said than done in a free-market situation. But we're working on it."

Breathlock Service To Go Companywide

☐ Universal Thinking Machines Security Chief Napoleon Truntian told the *Juggernaut* that the corporationwide cutover to UTM's Breathlock™ Security System would take place over the Founder's Day Holiday Weekend. "When employees return to work on Tuesday, they must use the Breathlock™ in order to enter their buildings, their offices, and their computer networks," said Truntian, who also heads up UTM's Perimeter Systems Division.

At the same time, UTM's Employee Relations Division will kick off a month-long informational campaign aimed at raising security awareness. The program, consisting of videotapes and hands-on demonstrations, will be called "In Your Mouth."

☐ Harald Hradcany, UTM senior vice president for Anthropomorphic Resources, put the program in a nutshell: "Loose lips may prove a barrier to continued employment at UTM: everyone must pucker up and blow." Mr. Hradcany also informed the *Juggernaut* that new superionizing mouthpieces on the Breathlock™ breathalyzer should allay employees' concerns about the spread of communicable diseases.

The Breathlock™ Security System is one of UTM's leading-edge products for the 90s, explained Security Chief Truntian. "Everyone's breath identifies him or her infallibly. When an employee seeks approval to enter a building or building area, or to use specific pieces of equipment, he or she breathes into the Breathlock™." The resulting breathprint is compared to a companywide database, and the employee is granted or denied access. "We are on the cutting edge of hot air research and development," added Truntian.

UTM has already shipped 912 complete Breathlock™ security systems. "And it has helped UTM's customers deal with a growing problem of substance abuse among their employees," said Mr. Truntian, pointing out that Breathlock™ notifies plant security as soon as it identifies a forbidden substance on the breath of an employee. "Of course, we at UTM have little need of this feature," said Mr. Truntian. "Our employees are high on work and need no stimulants."

Anthropomorphic Resources VP Hradcany also announced that an order has been placed with UTM's Thermal Interface division for micropeizo-warmers for the Breathlocks installed at exterior UTM locations. He added, "There have been rumors that a level-N employee working in the 6A239Z building at the Shady Grove software campus was found with his or her lips frozen to a Breathlock™ mouthpiece. Let me say this about that rumor. His or her lips were not adversely affected by whatever experience he or she might have had." Hradcany went on to say that he or she is already back at his or her job.

President Vows All-Out Assault on Consumer Market

☐ Declaring that he's "fed up to here" with the "perverse recalcitrance" of the consumer market, UTM President Biff Thrutcote says the company is now ready to "play super-hardball" in that arena.

"There will be no more Mr. Nice Guy," Mr. Thrutcote said, "when we start leveraging our inroads into the commercial credit business. We want to set things up so that if you've never visited a UTM Product Center, you get a little black mark on your credit rating."

"We're not talking about anything heavy-handed," Mr. Thrutcote cautioned. "There will be no requirement to purchase anything. But we do believe it's time we showed these so-called consumers that we know how to market."

UNION NEWS

Chairman and Mrs. ***Rueben Hectares*** invited a few close friends to their winter home in Tampa, and spent the weekend enjoying tapes of former President Reagan's State of the Union addresses. . . . After closing a whopper of a deal in a building shaped like a pyramid, account administrator ***Wendell Bray*** relaxed with some oysters at San Fran's nifty Union League Club. . . . UTM's Civil War buffs gathered for their annual chess match last month. The Rebs beat the Union 11 matches to 10. . . . President ***Biff Thrutcote*** returned from the U.K. with a valuable addition to his flag collection: an 1871 Union Jack. . . . Get 'em while they last: Promotions has announced free, company-logo union suits for UTMers seven and under.

MR. VINNIE'S
Account Control Corner

Dear Mr. Vinnie,
I've spent the last five years of my life waiting hand and foot on a major California bank. I've sold these people *everything*—mainframes, disk farms, massive database systems, you name it. They see more of me than my wife does. Now I find out they're planning to put a video game in the tellers' lounge, and it's going to be an *Atari*, for crying out loud. I feel I've been taken advantage of. What should I do?

High & Dry in L.A.

Dear High,
First, quit feeling sorry for yourself; your wife's probably seeing you as much as she cares to. Second, the decision-makers at the account may not be aware of the many fine video games available in the UTM environment—so tell them. Finally, find out who chose the Atari system, get him fired, and try to make sure he never works again.

Dear Mr. Vinnie,
I have got one tough account. It's a medium-sized operation in Davenport, Iowa, called the Hat-of-the-Month Club. They handle all their business on some crummy Japanese machine. They say it works fine and they don't want any more computers, least of all one of ours. How can I get them to return my calls?

Discouraged

Dear Discouraged,
What are we paying you for? To complain? If you're down in the dumps now, how do you think you're going to feel in two weeks when you have to tell me they still haven't bought anything? Get out there and sell, dammit!

Dear Mr. Vinnie,
I'm a Senior Marketing Rep in the Midwest. Recently, I had an amusing experience at a remote branch office of a large, diversified insurance firm that's famous for its devotion to UTM products. Casually walking in off the street, I was surprised to find the agent adding up some numbers on a pocket calculator—even though he was sitting next to a UTM PC. When I asked him why, he smiled and said that sometimes he even added numbers in his head. I just couldn't help laughing. That's okay, isn't it?

Jolly Fellow

Dear Jolly,
You're fired.

Chairman Hectares Explains Why UTM Is No Longer in the Computer Industry

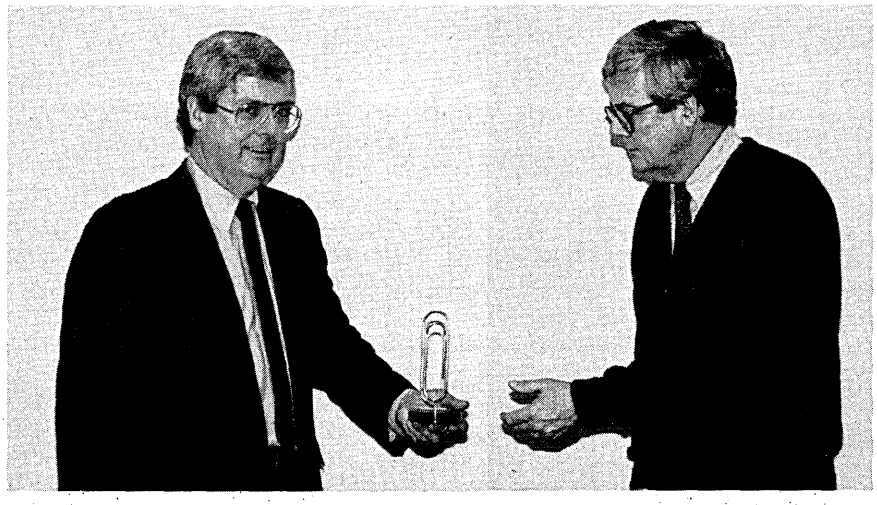
☐ *Last month, in an historic speech to some 8,000 senior UTM managers, Chairman Hectares explained the company's latest strategic posture. Following are excerpts from that talk.*

I'm sure you are all wondering why, after 35 years, UTM has left the computer industry. Well, the fact is—and I'm sure this will come as a surprise to many of you—that UTM has never actually been *in* the computer industry. For the simple reason that there isn't any such industry.

There never was and never will be. What UTM has been in all along, my friends, is the information industry. We just never realized it before.

Information is a dream come true. It is an unlimited resource that will permit limitless future exploitation. Entire universes of information exist right now and they are just waiting for a company like ours, a company with the right technology, the right attitude, and the right people, to make the most of them. We are a leader in the information industry now and we will be a leader tomorrow.

But for our company the most exciting aspect of the information industry is that it has so many competitors—thousands, maybe even millions. What company in the world—what *person* in the world—does not deal in information? Information is everywhere—in books, in speech, in the pattern of the stars, in the gentle strokes of a swimming ameoba. As a company that believes in truly free enterprise, we are thrilled to see such a broad range of competitors in our marketplace. Frankly, this degree of competition was one of our main reasons for choosing the information industry. It is the perfect place for a large company such as ours to find new challenges. All we ask is that we be permitted to compete freely and fairly, as we have always done. If that happens, I am confident that, 10 years from now, my successor will be standing here, redefining our basic business once again.



Walker Hamstrungg Wins Seriousness Award
Senior Marketing Rep Walker Hamstrungg was honored at the Market Share Society's annual dinner on February 22 for "singlemindedness in pursuit and support of the goals, objectives, policies, and strictures of Universal Thinking Machines." The 23-year veteran received the Watfather Gravity Plaque from President Biff Thrutcote, who praised him as a "tough-minded team player who has never laughed on company time."

TODAY THE WORLD

UTM Notes From All Over

UTM Credit Issues Own Currency
In a long-expected move, UTM's leasing arm announced last week that it was issuing a new international currency, the bit. Initially pegged at eight to the U.S. dollar, the specie is expected to rise steadily and ultimately supplant the deficit-wracked dollar in most commercial applications.

Quota Quota Exceeded by 32%
Congrats are in order for members of the UTM Quota Committee, which despite a sluggish economy managed to set 10,374 more quotas last year than management had insisted upon.

Chairman Rueben Hectares issued a special memo praising the group, which is made up of 79 go-getters and eager beavers representing each of UTM's Business Units. Singled out for special praise was Quota Committee Chairperson Heloise Akolite, since promoted to Corporate Buffer. The Chairman's memo also announced the formation of a new elite society of quota setters: the "132% Club."

Educators Briefed
Extending its list of action items to "impact the American educational system in a positive mode," UTM's board of directors last month approved the unbundling of student software fees at the MIT training division in Cambridge, Mass. Under the new educational unit pricing plan, students planning careers with the company will now pay monthly software fees only for those courses not directly applicable to their future jobs. An increase of about 5.6% was levied on the fees charged to other students.

Ms. Productivity
Junior Manufacturing Facilitator Cynthia Bainbridge-Smith has been awarded the 1989 Productivity Prize for her suggestion that UTM consolidate redundant activities and close two plants in Ohio. The move cut the company payroll by 3,200. Cynthia tells us she's delighted with her prize, a new UTM lapsize computer. "I'll use it on planes," she vowed. "Then I'll take it right up to my hotel room, hook it up to the phone, and upload data or read some EMail. I can take it to dinner with me, or even to the ballet. I love the ballet."

EEC Accord in Sight
UTM has been invited to become a full member of the European Economic Community. The EEC's new president, Baron Hugo de Ficit, explained to a session of the Luxembourg Parliament that UTM's gross international product "warrants recognition." As an inducement, the Community has offered UTM a PTT of the company's choice.

TECH TALK!

Field technician *Cosmo Farquart* in the Dismal Seepage, Ark., branch, shares this Tek-Tip of the Month with us: upgrading an 8X30 processor to the 8X32 requires only the clipping of one wire on the Dynamic Address Allocations card. Remember, says Cosmo, clip only the third green wire from the right; clipping the second green wire will upgrade the processor too much (to an 8X34, to be specific, for which the customer should pay an extra $10,000 a month!).

J.R. "BoB" Dobbs, subaccount manager in the Dallas Central branch, asks if it's possible to modify the 3457-9 Mod 11 with the extended bit bucket facility (UTM #45-78557/A.4) if the 1411 disk plunger isn't included under MVQ/SA-SP Rel. 4.02. The answer, BoB, is yes, but only if the customer has signed a lifetime lease.

An excited group of 500 top dp managers convened at the New Orleans meeting of the Seeing Eye users group last month, and heard UTM senior Vice President of Direction *Jack "Flash" Gordon* make UTM's most important Statement of Direction ever. "We fully intend to eventually let everything connect to everything else," Gordon told the wildly enthusiastic group. "This is evolution, not revolution." No further details were disclosed.

CLASSIFIEDS

For Sale

Telephone Switchmaker, based in sunny Santa Clara. Acquired on impulse, never really used. $400 million or best offer. Call Bob M. at corporate, ext. 2673.

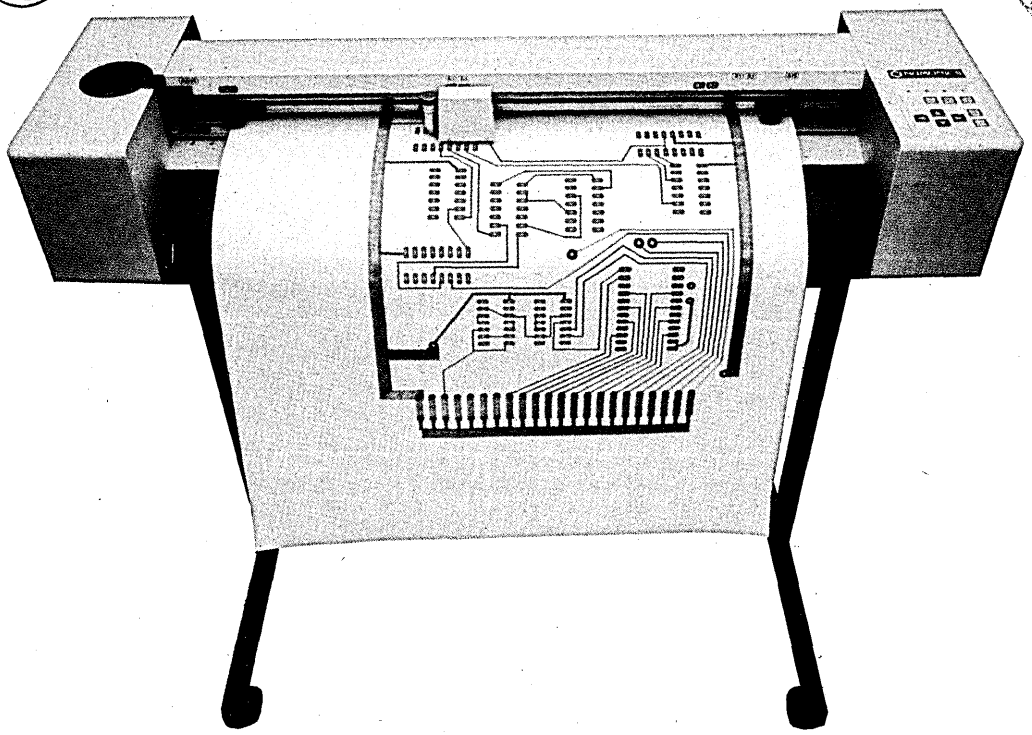
Satellite Transponders by the bushel! Hobbyist's delight, priced to move! PO Box 319, McLean, Va.

Hacker Heaven! passwords to all major timesharing svces. P.D. Ostrich, Boca Raton.

YOU WON'T BELIEVE IT but it's true: A natural-language implementation of UTM's hair-raising Job Command Language is available *now*. Send 8,000 floppies and stamped, self-addressed crate to Ernie in Supplies at the Shady Grove Software Campus.

LANS, LANS, LANS. More than 20 local networking schemes available, most never used. Call J. Johnson in Wiring Closet, Calif., for details.

COMPUTERVISION, take note.



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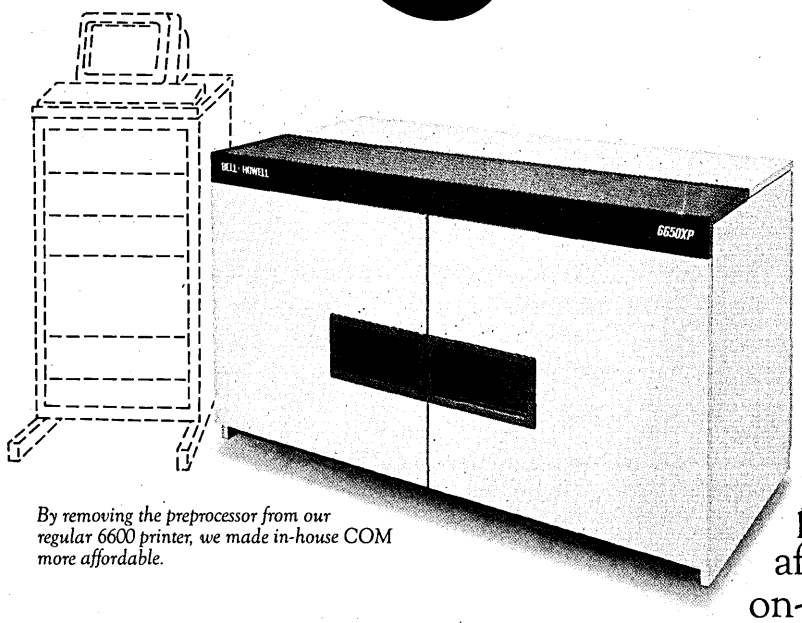

By removing the preprocessor from our regular 6600 printer, we made in-house COM more affordable.

Now get Bell & Howell quality and performance. And save over $25,000 in the process.

How? With our new 6600XP COM printer. By removing the preprocessor from our regular 6600 series printer, we've created a highly affordable COM system for on-line applications.

With the 6600XP, you'll find it cost-effective to run sysouts, financial reports, and other fast turnaround jobs that aren't appropriate to send to your service bureau.

And whether you're a large or small volume bureau customer, you'll find that the 6600XP has everything you need to make a clean, economical switch to on-line, in-house COM.

Like our top-of-the-line models, the 6600XP has: Complete formatting capabilities. Easy, high-speed production. And can now operate with an in-line duplicator.

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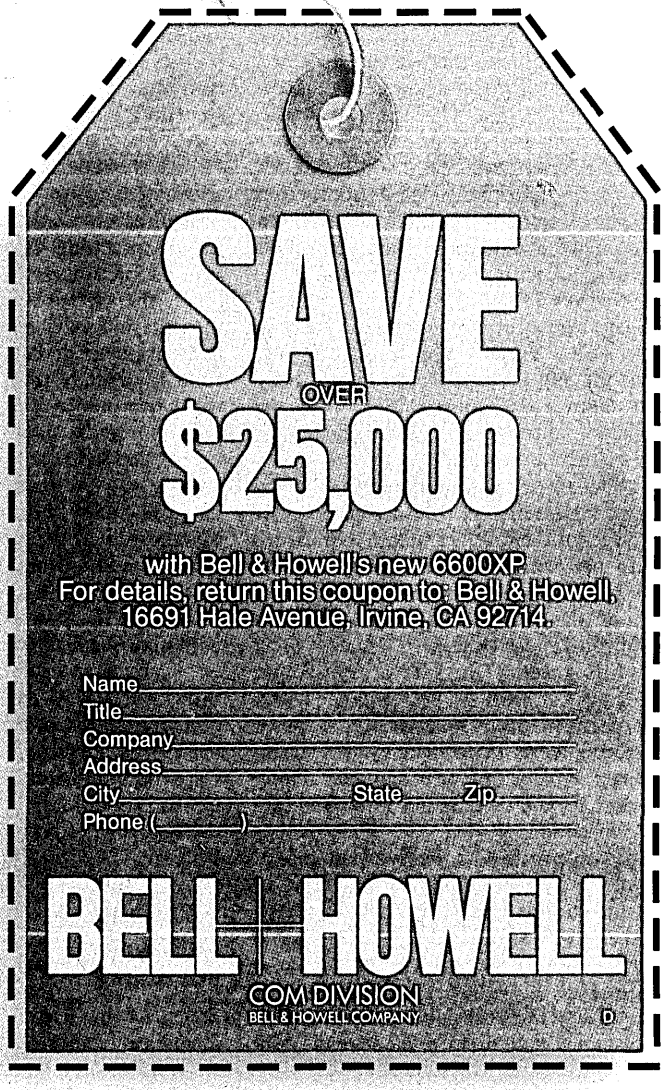


CIRCLE 25 ON READER CARD

System performance is especially difficult to quantify in the OLTP realm. Here's how the pros do it.

A MEASURE OF TRANSACTION PROCESSING POWER

by Anon. et al.

A measure of transaction processing power is needed—a standard means of quantifying and comparing the throughput and price/performance ratios of various transaction processing systems.

Vendors quote transaction per second (tps) rates for their systems, but because there isn't a standard transaction, it is difficult to verify or compare these claims. In addition, there is no accepted way to assess the price of a system supporting a desired tps rate. This makes it impossible to compare the price/performance ratios of different systems.

The performance of a transaction processing system depends heavily on input/output architecture, data communications architecture, and, most important, the efficiency of the system software. Traditional measures of computer performance—i.e., Whetstones, MIPS, MFLOPS, and gigaLIPS—focus on cpu speed. They don't capture the features that make one transaction processing system faster or cheaper than another.

This paper is an attempt by two dozen people active in transaction processing to record the folklore we use to measure system performance. The authors include academics, vendors, and users. A longer form of this paper appears as Tandem Technical Report TR85.2.

In general, we rate a transaction processing system's performance and price/performance as follows:

- Performance is quantified by measuring the elapsed time for two standard batch transactions and throughput for an interactive transaction.
- Price is quantified as the five-year capital cost of the system equipment exclusive of communications lines, terminals, development, and operations.
- Price/performance is the ratio of price to performance.

These measures also gauge the peak performance and performance trends of a system as new hardware and software is introduced. This is a valuable aid to anyone pricing, selling, or purchasing a system.

We rate a transaction processing system by its performance on three generic operations: a simple interactive transaction; a minibatch transaction that updates a small batch of records; and a utility that does bulk data movement.

This simplistic position is similar to Gibson's observation that if you can load and store quickly, you have a fast machine. (Gibson evaluates the performance of a computer by measuring its speed on an instruction mix described in "The Gibson Mix," IBM TR00.2043, June 1970.)

We believe our simple benchmark is adequate because

- the interactive transaction forms the basis for the tps rating. It is also a litmus test for transaction processing systems in that it requires the system to have at least minimal presentation services, transaction recovery, and data management.
- the minibatch transaction indicates the I/O performance available to the COBOL programmer. It shows us how fast the end-user I/O software is.
- the utility program is included to show what a really tricky programmer can squeeze out of the system. It tells us how fast the real I/O architecture is. On most systems, the utilities use special interfaces to achieve the raw I/O device performance with almost no software overhead.

In other words, we believe these three benchmarks indicate the performance of a transaction processing system because the utility benchmark gauges the I/O hardware, the minibatch benchmark gauges the I/O software, and the interactive transaction gauges the performance of the on-line system.

PROGRAMS PART OF FOLKLORE

The particular programs chosen here have become part of the folklore of computing. Increasingly, they are being used to compare system performance from release to release, and in some cases to compare the price/performance ratios of transaction processing systems from different vendors.

The following are the basic benchmarks.

Debit-credit. A banking transaction interacts with a block-mode terminal connected via X.25. The system does presentation services to map the input for a COBOL program, which in turn uses a database system to debit a bank account, do the standard double-entry bookkeeping, and then reply to the terminal. Ninety-five percent of the transactions must provide one-second response time. Relevant measures are throughput and cost.

Scan. A minibatch COBOL transaction sequentially scans and updates 1,000 records. A duplexed transaction log is automatically maintained for transaction recovery. Relevant measures are elapsed time, and cost.

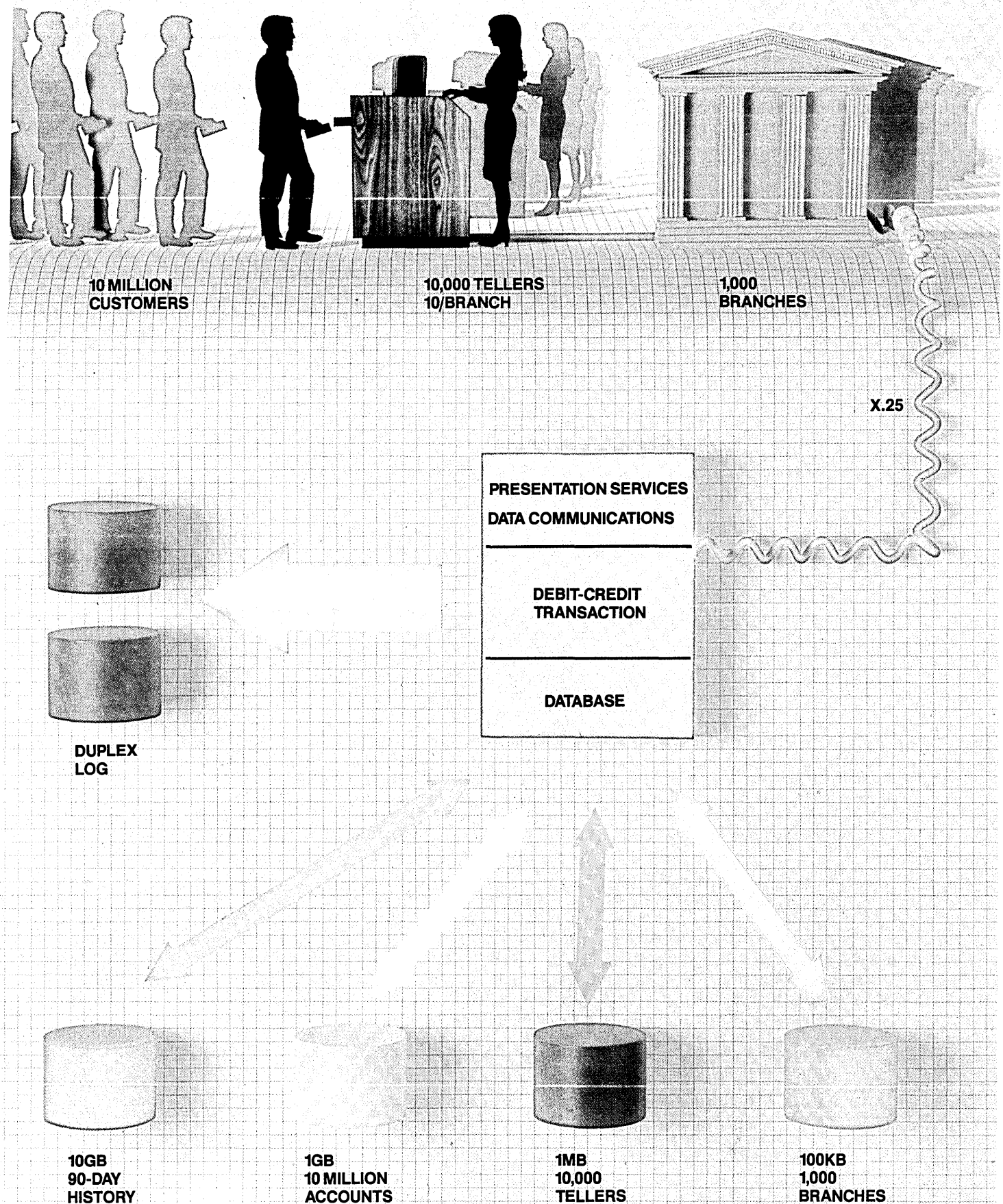
Sort. A disk sort of 1 million records. The source and target files are sequential. Relevant measures are elapsed time, and cost.

A word of caution: these are performance metrics, not function metrics. Simple systems are faster than fancy ones. Since most of us have spent our careers making high-function systems, it is painful to see a metric that rewards simplicity, but that's what we have here. The benchmarks make modest demands on the network—only X.25 and minimal presentation services—and require relatively little in the way of transaction processing (no distributed transactions), data management (no complex data structures), and recovery management (no duplexed or distributed data).

Surprisingly, these minimal requirements disqualify many purported transaction processing systems, but there is a very wide spectrum of function and usability among the systems that have these minimal functions.

Measuring performance and price. What is meant by the terms elapsed time, cost, and throughput? Before getting into any discussion of these issues, you must

DIORAMA BY JAMES NAZZ


10 MILLION
CUSTOMERS
10,000 TELLERS
10/BRANCH
1,000
BRANCHES
X.25
PRESENTATION SERVICES
DATA COMMUNICATIONS
DEBIT-CREDIT
TRANSACTION
DATABASE
DUPLEX
LOG
10GB
90-DAY
HISTORY
1GB
10 MILLION
ACCOUNTS
1MB
10,000
TELLERS
100KB
1,000
BRANCHES

Your actual performance may vary depending on driving habits, road conditions, and queue lengths.

have the right attitude. These measures are very rough, as are performance metrics in general. To paraphrase the Environmental Protection Agency, your actual performance may vary depending on driving habits, road conditions, and queue lengths; use them for comparison purposes only.

Elapsed time is the wall-clock time required to do the operation on an otherwise empty system. Although it is a crude performance measure, it is both intuitive and indicative. It gives an optimistic assessment—in a real system, things never go that fast, but someone got it to go that fast once.

Cost is more difficult to measure, as anyone involved with an accounting system can appreciate. What should be included? Communications lines, terminals, application development, personnel, facilities, maintenance? Ideally, the measure would capture the entire cost of ownership, but this is very hard to measure. For the purposes of this discussion, we take a myopic vendor's view: cost is the five-year capital cost of vendor-supplied hardware and software in the machine room. It does not include expenditures for terminals, communications, application development, or operations. It does include hardware and software purchase, installation, and maintenance charges.

This cost measure is typically a fifth of the total cost of ownership. We use it because it is simple. One can count the boxes and packages (software and hardware). Each has a price in the price book. Computing this cost is a matter of inventory and arithmetic.

A benchmark is charged for the resources it uses rather than the entire system cost. For example, if the benchmark runs for an hour, we charge it for an hour. This in turn requires a way to measure system cost per hour rather than just system cost. Rather than get into discussions of the cost of money, we simply ignore interest and imagine that the system is straight-line depreciated over five years. Hence an hour costs about 2E-5 (that is, 2×10^{-5}) of the five-year cost, and a second costs about 5E-9 of the five-year cost.

FIG. 1

COST OF A ONE-HOUR SORT

PACKAGE	PACKAGE COST	PER-HOUR COST	BENCHMARK COST
Processor	$80,000	$1.80	$1.80
Memory	15,000	.30	.30
Disk	50,000	1.10	1.10
Software	50,000	1.10	1.10
			$4.30

Add up the five-year software and hardware costs, compute the hourly cost, and the answer is $4.30 per sort.

FIG. 2

THE LOGIC FOR THE SCAN BENCHMARK

```
Open file Shared, Record Locking
Perform Scan 1000 Times
        Begin—Start of Scan Transaction
        Begin—Transaction
        Perform 1000 Times
          Read file Next Record record With Lock
          Rewrite record
        Commit—Transaction
        End—End of Scan Transaction
Close File
```

OVERHEAD PAID PER BENCHMARK

Utilization is another tough issue. Who pays for overhead? The answer we adopt is a simple one: the benchmark is charged for all operating system activity. Similarly, the disk is charged for all disk activity, either direct (e.g., application input/output) or indirect (e.g., paging).

Fig. 1 shows a specific computation of the cost of a sort benchmark. The people who run the benchmark are free to configure it for minimum cost or minimum time. They may pick a fast processor, and add or drop memory, channels, or other accelerators. In general the minimum-elapsed-time system is not the minimum-cost system. The minimum-cost Tandem system for sort is a one-processor, two-disk system. Sort takes about 30 minutes at a cost of $1.50. On the other hand, a 16-processor, two-disk Tandem system with 8MB per processor could do sort within 10 minutes for about $15—six times faster and 10 times as expensive. In the IBM world, minimum cost generally comes with model 4300 processors (where MIPS are cheaper) and minimum time with 308X processors.

The macho performance measure is throughput—how much work the system can do per second. MIPS, gigaLIPS, and MFLOPS are all throughput measures. Tps is the throughput measure of transaction processing systems. All that is required to make the tps metric concrete is a standard unit transaction. We use the debit-credit for this purpose.

To normalize the tps measure, most (95%) of the transactions must have less than a specified (one second) response time. To eliminate the issue of communication line speed and delay, response time is defined as the time interval between the arrival of the last bit from the communications line and the sending of the first bit to the communications line. This is the metric used by most teleprocessing stress testers.

Hence the transactions-per-second unit is the peak debit-credit transactions per second, with 95% of the transactions having less than one-second response time.

Having defined the terms elapsed time, cost, and throughput, we can now define the various benchmarks.

The sort benchmark. The sort benchmark measures the performance possible with the best programmers using all the mean tricks in the system. It is an excellent test of the input/output architecture of a computer and its operating system.

The definition of the sort benchmark is simple. The input is 1 million 100-byte records stored in a sequential disk file. The first 10 bytes of each record are the key. The keys of the input file are in random order. The sort program produces an output file containing the input sorted in key order. The sort may use as many scratch disks and as much memory as it likes.

Implementers of sort care about seeks, disk I/O, compares, and such. Users care only about how long it takes and how

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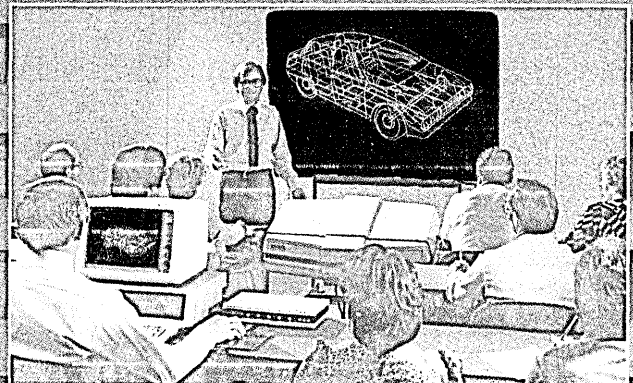

9:45 a.m. Data processing training room. Training session for new CAD/CAM system.

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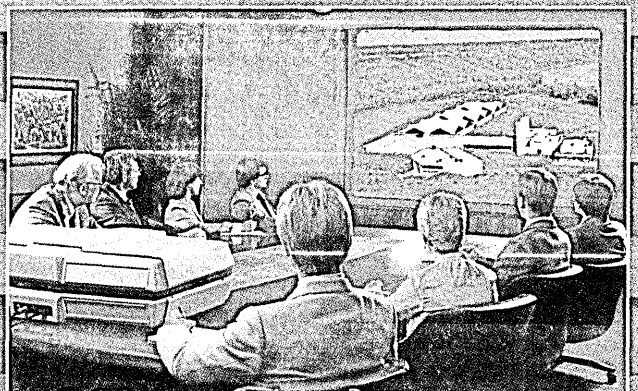

3:30 p.m. Conference Room: Board of Directors review quarterly results and video of new production facility.

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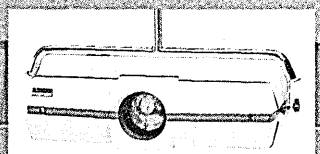

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much it costs. From the user's viewpoint, relevant metrics are

- elapsed time—the time from the start to the end of the sort program, and
- cost—the time-weighted cost of the sort software, and the software and hardware packages the sort uses.

In theory, a fast machine with 100MB memory could do the job in a minute at a cost of $20. In practice, elapsed times range from 10 minutes to 10 hours, and costs vary between $1 and $100. A one-hour $10 sort is typical of good commercial systems.

The scan benchmark. The sort benchmark indicates what sequential performance a wizard can get out of the system. The scan benchmark indicates the comparable performance available to end users: COBOL programmers. The difference is frequently a factor of five or 10.

The scan benchmark is based on a COBOL program that sequentially scans a sequential file, reading and updating each record. Such scans are typical of end-of-day processing in on-line transaction processing systems. The total scan is broken into minibatch transactions, each of which scans 1,000 records. Each minibatch transaction is a scan transaction.

SCAN MUST BE GOOD CITIZEN

The file is a sequential file of 100-byte records stored on one disk. Because the data are on-line, scan cannot get exclusive access to the file and cannot use old master-new master recovery techniques. Scan must use fine granularity locking to permit concurrent access to other parts of the file while it is running. Updates to the file must be protected by a system-maintained, duplexed log, which can be used to reconstruct the file in case of failure.

Scan must be written in COBOL, PL/1, or some other end-user application interface. It must use the standard I/O library of the system and otherwise behave as a good citizen, with portable and maintainable code. Scan cannot use features not directly supported by the language. Fig. 2 gives the transaction flow for scan.

The relevant measures of scan are

- elapsed time—the average time between successive begin-transaction steps, (if the data are buffered in main memory, the flush to disk must be included), and
- cost—the time-weighted system cost of scan.

In theory, a fast machine with a conventional disk and flawless software could do scan in .1 second. In practice, elapsed times range from one second to 100 seconds, while costs range from $.001 to $.1. Commercial systems execute scan for a penny, with a 10-second elapsed time.

The debit-credit benchmark. The sort and scan benchmarks have the virtue of simplicity. They can be ported to a system in a few hours if it has a reasonable software base—a sort utility, COBOL compiler, and a transactional file system. Without this base, there is not much sense considering the system for transaction processing.

The debit-credit transaction is a more difficult benchmark to describe or port—it can take a single day or several months to install, depending on the available tools. On the other hand, it is the simplest application we can imagine.

A little history explains how debit-credit became a de facto standard. In 1973 a large retail bank wanted to put its 1,000 branches, 10,000 tellers, and 10,000,000 accounts on-line (see illustration). They wanted to run a peak load of 100 transactions per second against the system. They

FIG. 3

THE DEFINITION OF THE DEBIT-CREDIT DATABASE AND APPLICATION

The Database

* 1,000 branches	(100KB	random access)
* 10,000 tellers	(1 MB	random access)
* 10,000,000 accounts	(1 GB	random access)
* a 90-day history	(10 GB	sequential)

Debit-credit

Begin-Transaction		
Read	Message from Terminal	(100 bytes)
Rewrite	Account	(random)
Write	History	(sequential)
Rewrite	Teller	(random)
Rewrite	Branch	(random)
Write	Message to Terminal	(200 bytes)
Commit-Transaction		

FIG. 4

THE PERFORMANCE OF SEVERAL COMMERCIAL SYSTEMS ON THE DEBIT-CREDIT BENCHMARK.

	K-INST	I/O	TPS	$K TPS	PACKETS
Lean and Mean	20	6	400	40	2
Fast	50	4	100	60	2
Good	100	10	50	80	2
Common	300	20	15	150	4
Funny	1,000	20	1	400	8

The units in the table are:

K-inst: The number of thousands of instructions to run the transaction. You might think that adding $10 to your bank account is a single-add instruction. Not so; one system uses a million instructions to do that add.

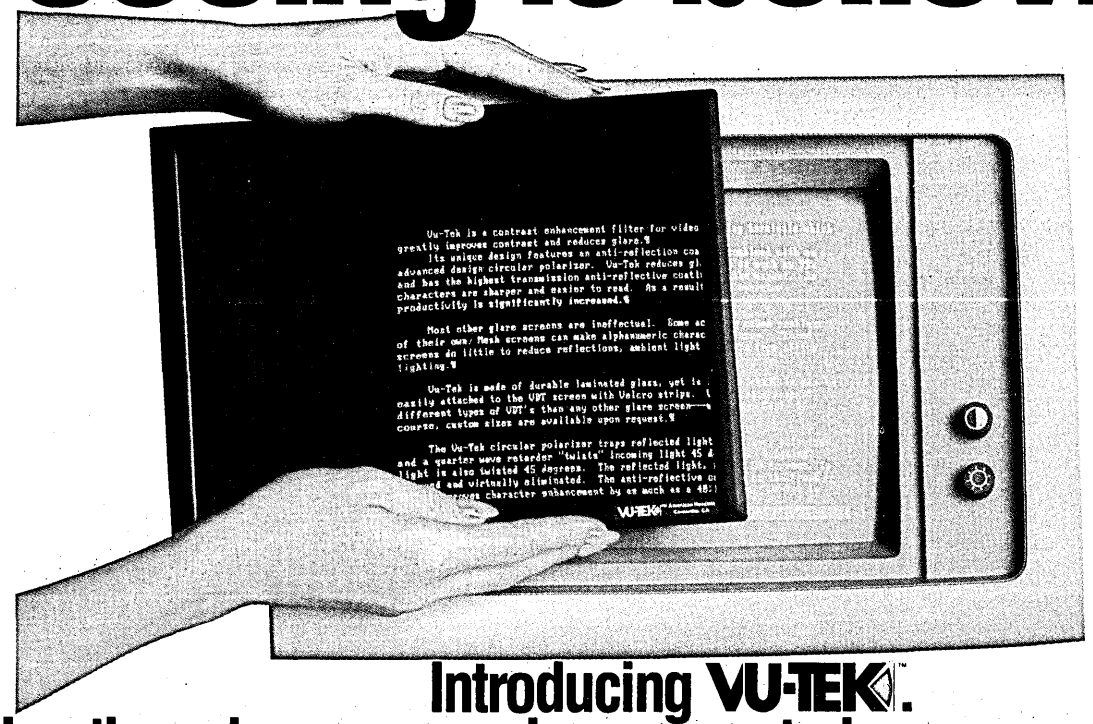
Disk I/O: The number of disk I/O required to run the transaction. The fast system does two database I/O and two log writes.

TPS: Maximum transactions per second you can run before the largest system saturates (response time exceeds one second). This is a throughput measure. The good system peaks at 50 TPS.

$K/TPS: Cost per transaction per second. System cost divided by TPS. It is a simple measure to compute. The funny system costs $400,000 per transaction per second. That is, it costs $400,000 over five years and can barely run one transaction per second with one-second response time. The cost/transaction is .5E-8 times the $K/TPS.

Packets: The number of X.25 packets sent per transaction. This charges for network traffic. A good system will send two X.25 packets per transaction. A bad one will send four times as many. This implies larger demands for communications bandwidth, longer terminal response times, and much higher costs. X.25 was chosen because it is standard and it allows one to count packets.

Seeing is believing.



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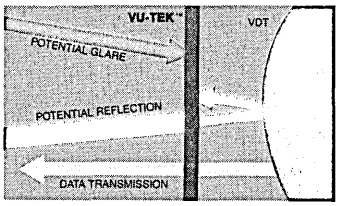

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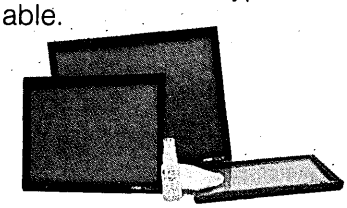

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Computer performance is difficult to quantify. Different measures are appropriate for different application areas.

also wanted high availability (central system availability of 99.5%), with two data centers.

The bank got two bids, one for $5 million from a minicomputer vendor and another for $25 million from a major computer vendor. The mini solution was chosen and built. It had a $50K/tps cost, whereas the other system had a $250K/tps cost. This event crystallized the concept of cost/tps. A generalization (and elaboration) of the bread-and-butter transaction to support those 10,000 tellers has come to be variously known as the TP1, ET1, or debit-credit transaction.

In order to make the transaction definition portable and explicit, we define some extra details, namely the communication protocol (X.25) and presentation services. The debit-credit application has a database consisting of four record types. History records are 50 bytes, others are 100 bytes.

Fig. 3 outlines the debit-credit database and transaction. A few more things need to be said about the transaction. Branch keys are generated randomly; then a teller within the branch is picked at random. Then a random account at the branch is picked 85% of the time, and a random account at a different branch is picked 15% of the time. Account keys are 10 bytes, the other keys can be short. All data files must be protected by fine granularity locking and logging. The log file for transaction recovery must be duplexed to tolerate single failures; data files need not be duplexed. Ninety-five percent of the transactions must give at least one-second response time. Message handling should deal with a block-mode terminal (e.g., IBM 3270) with a base screen of 20 fields. Ten of these fields are read, mapped by presentation services, and then remapped and written as part of the reply. The line protocol is X.25.

TELLERS' AVERAGE TPS FOUND

Benchmark scales as follows. On average, tellers perform one transaction every 100 seconds. So at 10tps, store only a tenth of the database. At 1tps, store one hundredth of the database. At one teller, store only one ten thousandth of the database and run .01tps.

Typical costs for debit-credit appear in Fig. 4. These numbers come from real systems; hence the anomaly that the lean-and-mean system does too many disk I/Os. We have given these systems names that correspond to their capabilities; identifying them makes an interesting parlor game.

The numbers in Fig. 4 are achieved by vendors benchmarking their own systems. Customers rarely achieve these numbers. Typical customers report three to five times these costs and small fractions of the tps rating. We suspect this is because vendor benchmarks are perfectly tuned, while customers focus more on getting the system to work at all and dealing with constant change and growth. If this explanation is correct, real systems are seriously out of tune and automatic system tuning will reap enormous cost savings.

The relatively small variation in costs is surprising—the tps range is 400 but the $K/tps range is 10. In part, the narrow cost range stems from the small systems being priced on the minicomputer curve and hence being much cheaper than the mainframe systems. Another factor is that disk capacity and access are a major part of the system cost. The disk storage scales with tps and disk accesses vary by only a factor of five. Perhaps the real reason for the small variation is that few people will buy a system that costs 400 times more than a competing one.

There are definite economies of scale in transaction processing: high-performance systems have very good price/performance ratios.

It is also surprising to note that a personal computer with appropriate hardware and data management software supports one teller, scales to .01tps, and costs $8K—about $800K/tps! Yes, that's an unfair comparison. Performance comparisons are unfair.

Computer performance is difficult to quantify. Different measures are appropriate for different application areas. None of the benchmarks described here use any floating point operations or logical inferences. That's why MFLOPS and gigaLIPS are not helpful on these applications. Even MIPS is a poor measure, because one software system may use 10 times the resources of another on the same hardware.

Cpu power measures miss an important trend in computer architecture: the emergence of parallel processing systems that are built out of modest processors and deliver impressive performance by using a large number of them. Cost and throughput are the only reasonable metrics for such architectures.

Moreover, input/output architecture largely dominates the performance of most applications, and conventional measures ignore input/output completely.

The three benchmarks we've outlined here—sort, scan, and debit-credit—combine to allow performance and price/performance comparisons of online transaction processing systems. We remind readers of our necessarily casual attitude toward this. The measures described are useful, but far from perfect. Put more bluntly, there are lies, damn lies, and then there are performance measures. ◉

"I'm sorry, but we're looking for someone with a bigger bag."

CARTOON BY TOM MASON

This article was put together by 24 computer professionals. Eight are academics, two are end users, and 14 work for various vendors.

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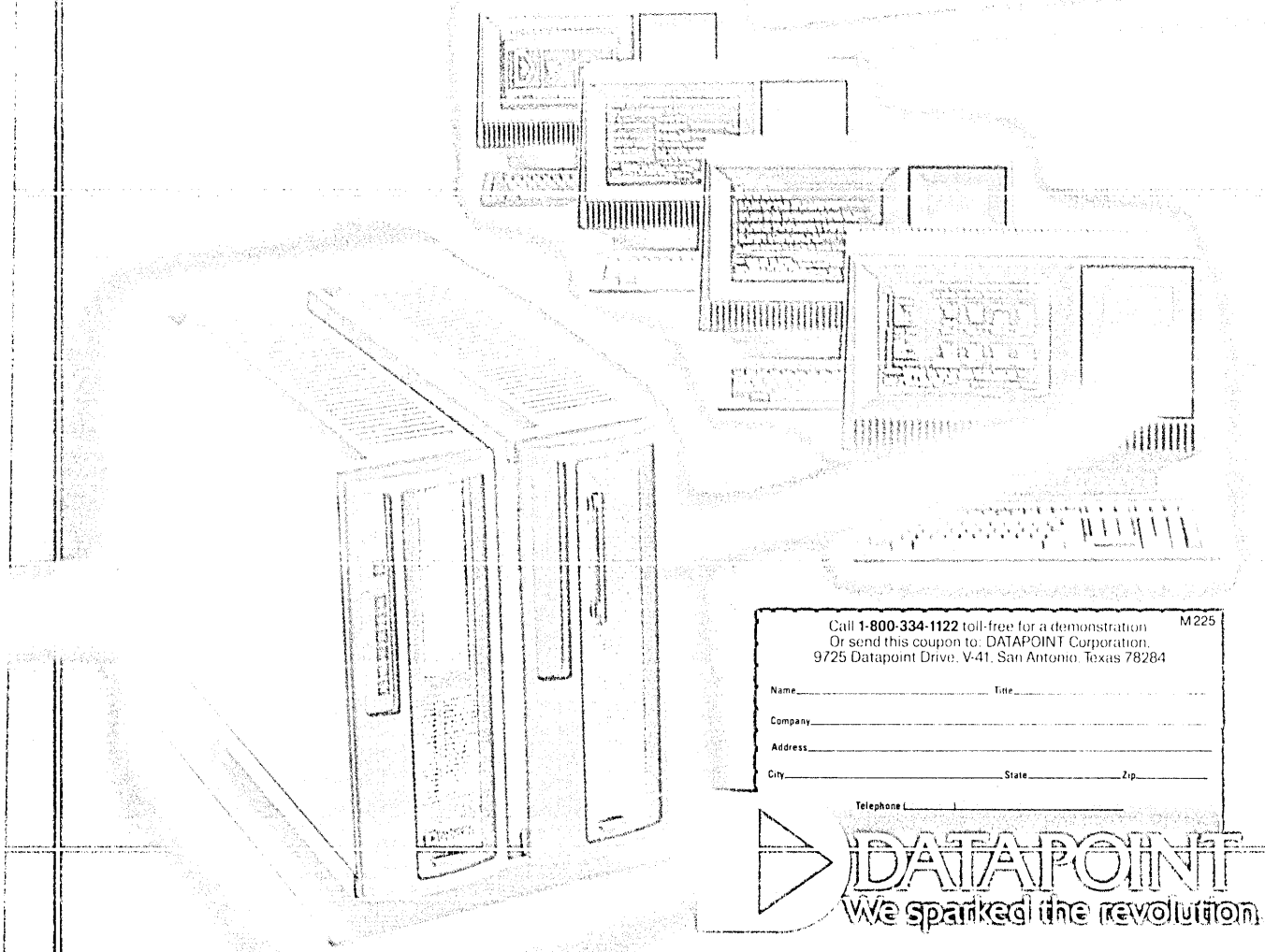

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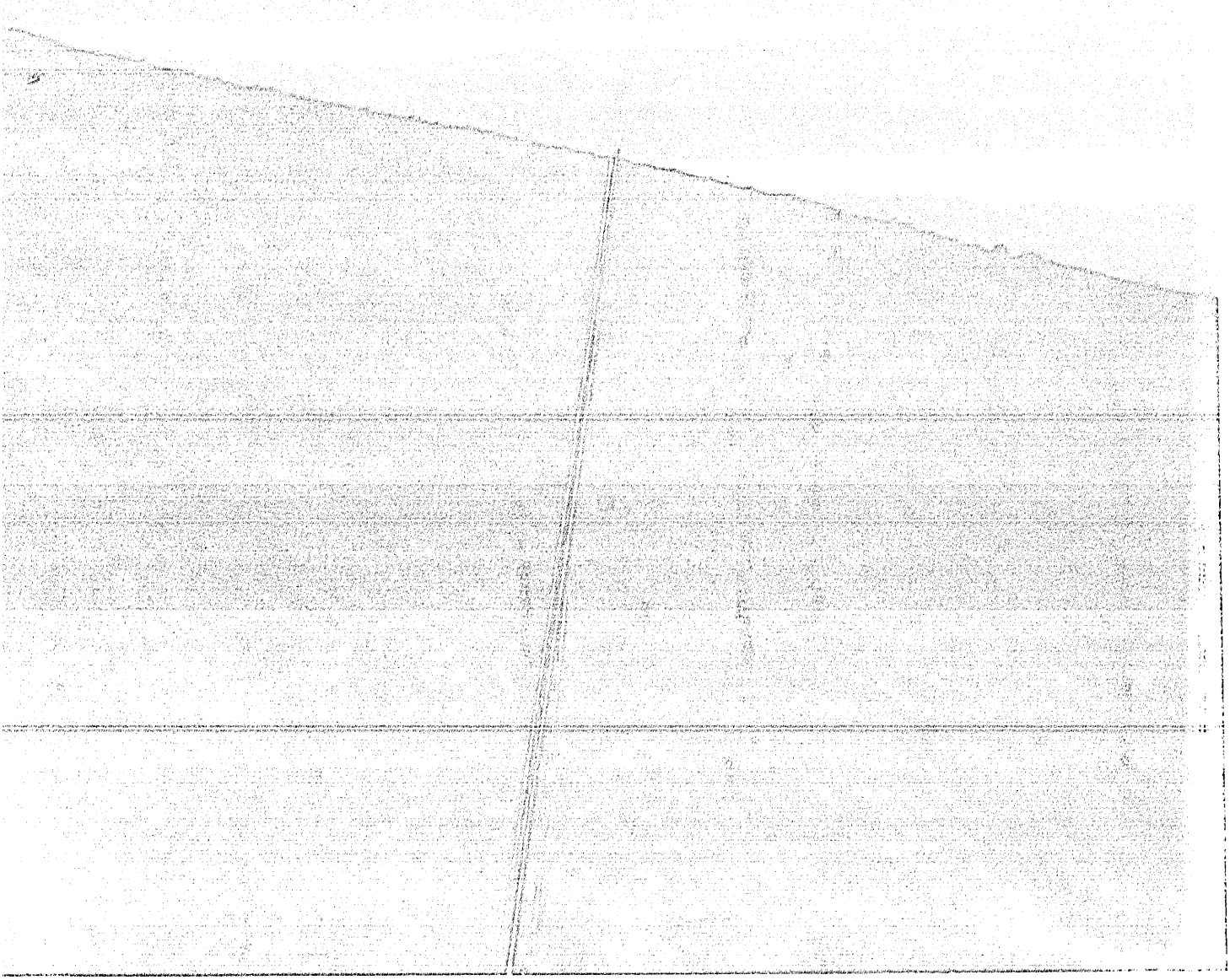

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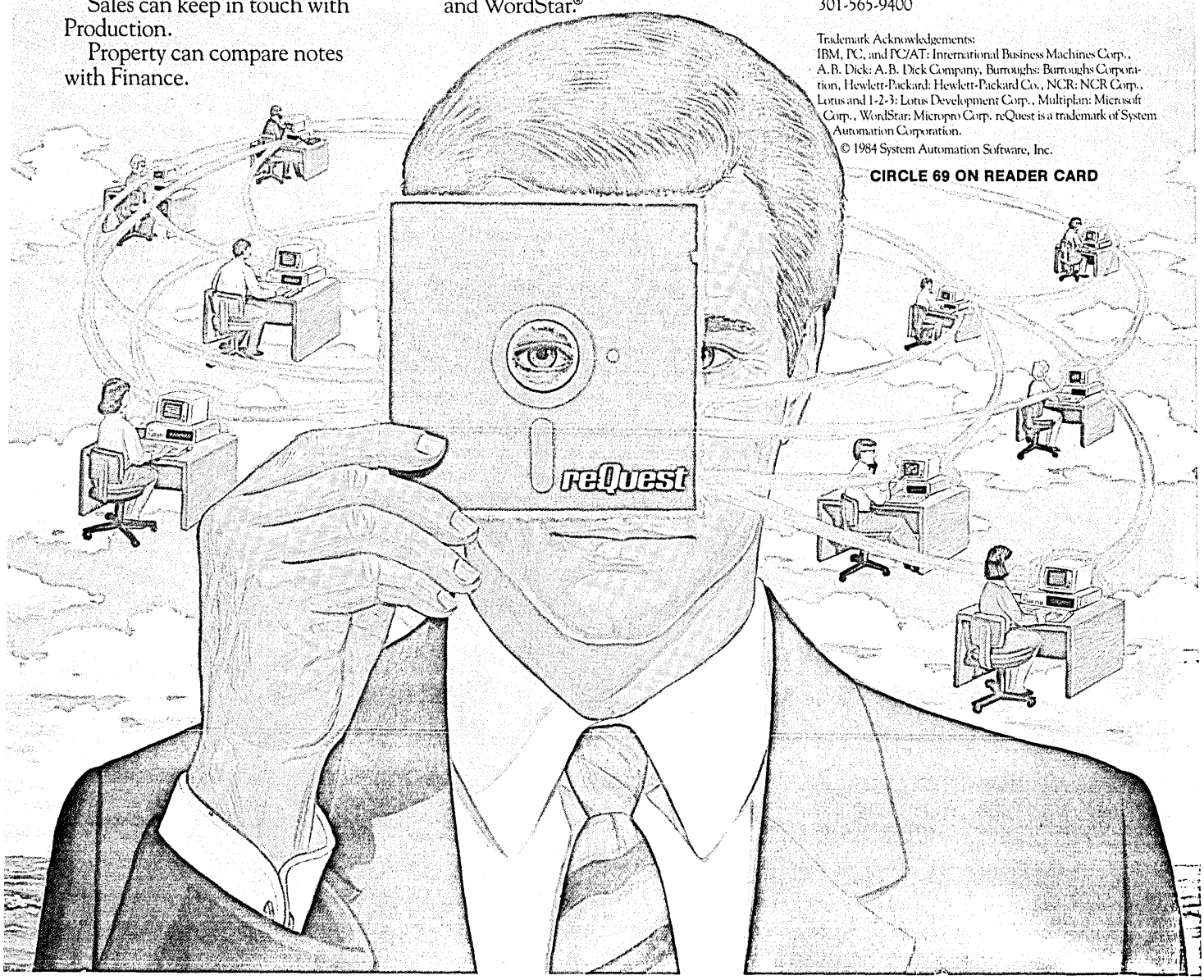

In the software factory of the future, the application development process will be an intellectual assembly line.

TWENTY-FIRST CENTURY SOFTWARE

by F.J. Grant

Within the past few years, a number of writers have pointed out that the pace of technological change is, at the very least, frightening. New terms such as techno-stress and techno-shock have been coined to define the psychological manifestations of a public overwhelmed by everything from microwave ovens to home Pac-Man games. Unfortunately, these terms do not accurately describe progress within the data processing industry as it pertains to software development. For many data processing professionals, techno-stress is better defined as frustration with the slow pace of change in software development methods, in the face of ever-increasing demands for dp services.

While there is no question that some progress toward better systems development methods has been made during the last 30 years, there is equally no question that, overall, any process of change is relatively slow and discontinuous. Speaking from an historical perspective, it seems that for true progress to be realized, there must be a periodic, collective rethinking of basic ideas. The periods between each great leap forward can be tens of years to hundreds of years.

Frederic W. Taylor's *Scientific Management* (Harper & Row, New York, 1947) for example, was by and large a compendium of basic truths that had been established during prior periods of history; some can even be found in the Bible. The breakthrough offered by scientific analysis of business activities was the realization that there is a conceptual congruence between problem-solving approaches from one field to another. One could argue that a return to scientific management, particularly with regard to software development, might produce systems just as quickly as some current methods produce them—if not faster.

During the nineteenth century, only a few manufacturing enterprises produced products cheaply and rapidly enough to meet the demands of large and growing markets. The industrial revolution brought forth a number of concepts that transformed the ability of entire industries to meet these demands. In real terms, however, the revolution was preceded by several hundred years of invention.

Most observers of the data processing industry anticipate an analogous revolution with regard to computerization. Three events must first take place, however:

1. An industrywide simplification of application development methods to support a greater division of labor;
2. Fundamental changes to dp organizations to support repetitive job assignments; and,
3. An increased industrywide standardization of hardware and operating software.

Given that systems development is principally an intellectual endeavor, the current failure to develop applications on schedule and within budget is principally an intellectual failure. Systems are an end product of a manufacturing process. And in any manufacturing process, technique can mean everything.

As illustrated in Fig. 1, the software development process—in its current mode of production—closely approximates that of art and of piecework. Mass production, on the other hand, is the ability to replicate in quantity that which was previously considered art.

The efficient production of any product implies that there is a conceptual simplification of work. Software development remains a surprisingly complex process despite the fact that most software artisans (analyst/programmers) recognize the enormous similarity among all application programs. Considering this similarity among programs, a large part of systems development efforts should be purely mechanical.

LOOK AT JAPANESE TECHNIQUE

With what is known about manufacturing technology, it ought to be possible to recognize and circumvent certain software development approaches. The current interest in Japanese management methods represents such a thrust. As stated previously, however, we are not facing a management problem, per se. The current failure to produce software rapidly and cost-effectively is a failure to conceptualize technique. Current organizational structures are but a symptom of this impotency.

A general study of manufacturing principles reveals that a division of labor creates a division of authority. Unfortunately, the American approach to data processing management does not take this into account. The result is that there is no generally accepted standard organization for data processing, despite the fact that the functions of systems analysis and programming are common to most businesses. Given this lack of uniformity, inconsistency in software production efforts is not unexpected.

Fourth and fifth generation languages have been touted as offering the potential for tremendous productivity increases. But considering the current char-

While vendors have certainly contributed to the confusion, they are not responsible for the problems of the industry.

FIG. 1

MANUFACTURING CONTINUUM CONCEPTUAL VIEW

Art & Piecemeal Production				Mass Production	
"Unique Items" 10,000 B.C.	Division of Labor 3,000 B.C.	Interchangeable Parts 1700s	Assembly Line 1800s	Automation & Robotics 1970s	"Unique Items" 1980s

CHARACTERISTICS OF ART & PIECEMEAL MANUFACTURING	CHARACTERISTICS OF APPLICATIONS SOFTWARE DEVELOPMENT	CHARACTERISTICS OF MASS PRODUCTION
1) Manpower/Training		
Highly skilled artisan required.	Skill requirements are often peculiar to application. Often no clear-cut division of labor.	Skill requirements peculiar to job assignment on assembly line.
Long periods of apprenticeship are typical.	Length of apprenticeship is generally one year. Job assignments vary and are often peculiar to software end product and the system on which it is being developed.	Specialization of job assignments results in lesser periods of apprenticeship.
Knowledge of total end product required by each artisan.	Knowledge of total end product may or may not be required by each individual.	Knowledge of total end product is not required.
Job assignments vary for each artisan during the production of each item.	Job assignments are not repetitive and vary for each programmer/analyst during the production of the application.	Job assignments are repetitive.
Job assignments and requirements may vary with each article to be produced.	Job assignments and requirements will depend on each application to be produced.	
2) Management		
Artisans manage themselves.	Management structure may vary based upon project assignments; however, some division of management responsibilities is usually present.	Well-defined management structure required. Division of management responsibilities is a product of the division of labor.
Organizations are typically small.	Organizations, small or large, are complex.	Organizations are typically large and complex.
Self-management may be subject to "inspirational factors."	Management establishes performance measurement. Schedule is established (may be negotiated) and tracked often with an incomplete knowledge of components that make up end products.	Management establishes performance measurement standards. Schedule is established and tracked based on a detailed WBS (work breakdown structure).
Estimation of time to produce and schedule is highly variable depending upon "inspiration schedule."	Estimation of time to produce is highly variable and does not necessarily depend on component schedules.	Estimation of time to produce is fixed and depends on component schedules.
3) Costs/Profits		
Production costs vary with each article produced.	Production costs tend to vary widely even within the same organization. Standards are often not known or employed. Management may periodically reestimate based on reassessment of talent.	Production costs tend to be fixed within established standards. Exceptions are immediately known and reported to management.
Profit varies with article produced.	Payback tends to be application dependent.	Profit tends to be fixed and volume dependent.
Article is priced after production.	Real costs are known only after production. Some costs may never be identified.	Article is generally priced prior to production.
Article price is variable.	Cost of system may be dependent on volume of production, i.e., individual workloads.	Article price is fixed and/or dependent on volume of production.

FIG. 1 continued

CHARACTERISTICS OF ART & PIECEMEAL MANUFACTURING	CHARACTERISTICS OF APPLICATIONS SOFTWARE DEVELOPMENT	CHARACTERISTICS OF MASS PRODUCTION
4) Materials		
Costs vary depending on materials.	Costs vary depending on functional components. Components are generally not standardized nor cataloged.	Costs vary depending on materials; however, materials are standardized and inventoried.
Amount of material required varies by artisan.	Amount of resources and time required is variable. Standards are difficult to enforce.	Amount of material required is fixed within standards.
Individual selection of raw materials by artisan.	Only a few standardized subroutines are provided from libraries; however, programs are usually "cloned" from prior applications.	Standard raw materials are provided from inventory.
Stock inventory is minimal or piecemeal.		Stock inventory is determined in advance based upon volume requirements.
5) Machines/Automation Tools		
Components unique—not interchangeable.	Components unique—not interchangeable.	Interchangeable, standard parts.
Subassemblies unique or nonexistent.	Subroutines and subprograms are generally unique to each application.	Subassemblies are nonunique and may be inventoried.
Fixed patterns (jigs) may be unique to each article of production.	Fixed patterns ("clones") may or may not be standardized.	Fixed patterns (jigs) standardized for product model.
Fixed patterns (jigs) disposed of after production.		Fixed patterns (jigs) are reusable.
6) End Product		
Product is relatively unique.	Product is highly variable.	Product is relatively uniform.
Quality varies with article produced.	Quality is highly variable.	Quality is relatively uniform.
Delivery schedule affected by "inspiration schedule."	Delivery schedule is determined by time to analyze, program, and test application—plus unplanned modifications to design.	Delivery schedule is determined by manufacturing of subcomponents and final assembly time.
Art is oblivious to technological change (by choice).	Technological change (by choice) results occasionally in higher productivity, less time to produce, or other benefits.	Technological change (by choice) results in higher volumes, less time to manufacture, or other benefits.
Art is generally not documented.	Documentation of all phases is seldom accomplished and carried forth into the end product.	Prior documentation of all phases is generally a requirement.
Artist signs his name.	Versions may be released and rereleased. Each individual analyst/programmer has often "signed his name" stylistically.	Company stamps product name and model.

acter of most data processing organizations, it is doubtful this potential can be realized. Giving a programmer a 4GL amounts to the same thing as giving an artist a power tool. It enables an individual artist to be more productive; it does not necessarily allow a large and complex application development organization to be productive in relation to its scale of operations.

In part, the dp industry's failure to rapidly standardize on well-proven development methods is a result of the vendor-dependent strengths and weaknesses of each product in the marketplace.

And what effect has the factor of Japan Inc.? Some argue that competition has resulted in software development methods that are vendor dependent. Competition has resulted in a social cost more significant than what would have been caused by monopolization.

In my view, increased socialization of the industry would be disastrous. While vendors have certainly contributed to the confusion, they are not responsible for the problems of the industry. Vendor offerings are currently fragmented because the application development process itself is disjointed. Even within individual companies,

Ninety percent of the time required to produce the final end product will be in the engineering phases.

FIG. 2

21ST CENTURY SOFTWARE FACTORY*

1) ENGINEERING	2) ASSEMBLY	3) FINAL INSPECTION
Repetitive actions		
Review/clarify application requirements	Replace logical data references with physical data references using the integrated software assembly facility	Data-driven test of application
Define screens, reports, and navigation		Application requirement checkoff
Define transactions by screen		
Define special class computational servers.	Add new physical data items as required	
Generative products		
Detailed design package (on-line standardized representatives of all screens, reports, and transactions)	Dynamic restructure of relational database	Results of data-driven test
		Performance measurements
Logical data dictionary	Dynamic generation of requester/server process parameters	Projected resource requirements
Working logical prototype		Impact on existing application delivery resources
Application work breakdown structure (WBS)	Dynamic generation of special-purpose computational servers	
Detailed schedule		
Projected costs		

*Data-Driven Model

standardization of software development methods is not generally practiced.

Vendors will no doubt respond if the needs of the dp marketplace become appropriately crystallized. You can bet money on this; Wall Street does.

Modern manufacturing is often described as a three-legged stool, consisting of space to perform work, interchangeable parts, and repetitive job assignments. Remove one of these legs and mass production is impossible.

In the twenty-first century, a software manufacturing environment will likewise consist of three elements. The place to perform the work will be in the database design, the interchangeable parts will be database definitions, and the repetitive job assignments will be embedded within the operating system. Remove one of these legs and you have variations upon the current dp situation.

Fig. 2 sets forth a simplified view of application development work in the next century. The essence of twenty-first century software factory methods is that through the preselection of product features and capabilities, a prototype is established that can be rapidly transformed into a unique, yet standardized, end product. The software development process is mechanical and repetitive. Most applications have a high degree of functional similarity—only the operational databases vary.

Twenty-first century software production is data driven. Data structures are relational. Ninety percent of the time required to produce the final end product will be in the engineering (analysis and design) phases, and only 10% of the effort will be expended during the "make" phases, including rework. In short, the application development process will be an intellectual assembly line. Computer-based resources will be in place to dynamically amplify the results of design work. In this sense, all software design work of the future will be generative.

SOFTWARE IN NEXT CENTURY

Fig. 3 is a look at the hypothetical facilities needed to support software manufacturing in the twenty-first century. Some radical departures from current thinking are present. These departures concern the way systems are developed and delivered.

Software development is expected to consist of three primary steps:

- definition of the user interface products (screens and reports);
- definition of the operational database;
- definition of the operational transactions, including computational requirements.

These steps are supported by an integrated software assembly facility that provides and maintains a relationship among the components that constitute steps. Job assignments are functionally repetitive; the real repetition of work, however, has been moved into the architecture of the system supporting development and delivery.

The application is delivered by interpreting the product definitional parameters in relation to the database and then assembling requester and server processes at run time. There are no compliers and the like, but the system is fast—very fast. It is fast because the hardware has been modified to support application staging in RAM at product definition time. Transaction handling and other operations, including the generation of audit trails, volume statistics, and the control of database consistency processes are not part of the application code, but are built into the operating system.

Under the twenty-first century manufacturing concept, production software and its associated database(s) reside in a central processor complex. A well-integrated communications network supports the requirements of the user community. Intelligent terminals, minicomputers, microcomputers, and devices yet unnamed

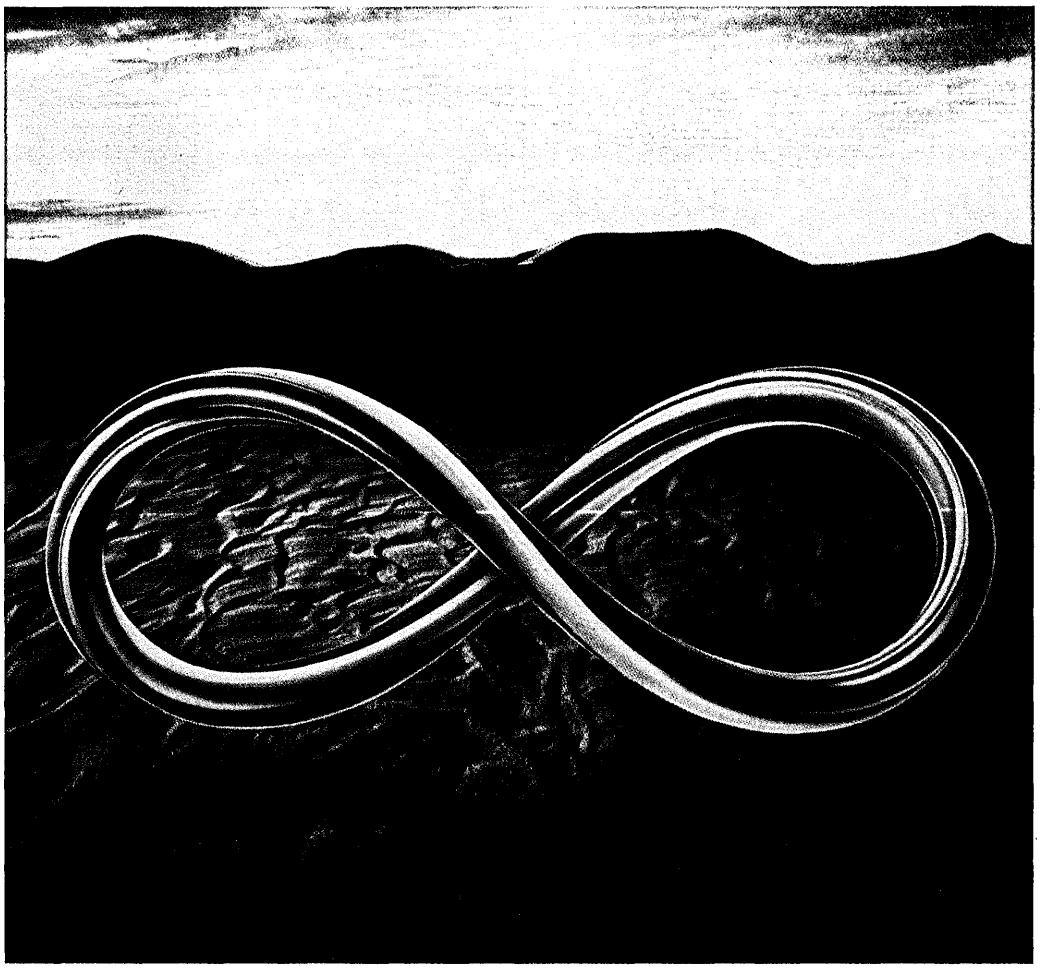

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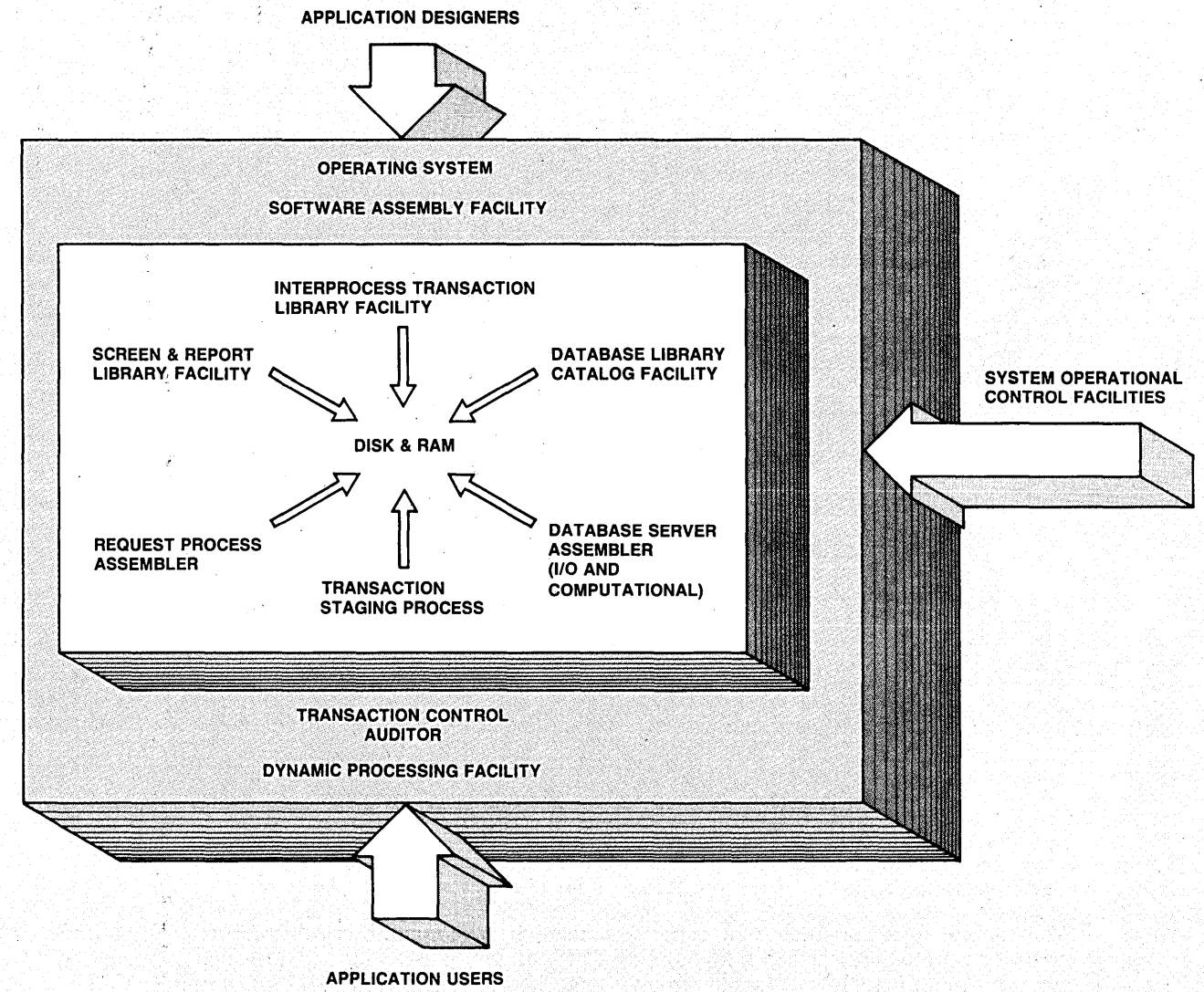
FIG. 3

21ST CENTURY APPLICATIONS DEVELOPMENT & DELIVERY ENVIRONMENT



are introduced into the network for the purpose of reducing the contention for resources. The information these devices access and create flows back to the central complex, which ensures the management, shareability, and integrity of data resources.

The factory of the future and its accompanying network provide facilities to

- eliminate data interchange incompatibilities between systems;
- eliminate terminal application dependencies; and
- minimize end-user skill requirements.

Such facilities recognize that all business activities will have a common thread in their need to access and manage data.

In speculating about data processing in the future, some predictions concerning jobs and titles are in order. Software engineers will replace systems analysts. This change reflects the fact that the conceptualization of computer-based systems is more of an engineering, or even architectural, function. Systems analysts, if they do exist, will be part of customer organizations.

Most programmers will be systems programmers. Their job will be to develop and maintain the generative components of the system.

End-user programmers and decentralized operations—contrary to many predictions—are not likely to exist. Data will be an increasingly important soft asset. To maximize the return on investment of this asset, they will exist in an accessible central location and be controlled in a manner that ensures their integrity. In the next century, applications that are fundamental to the conduct of business will be controlled from

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a central corporate site.

Blue-collar work in the twenty-first century is likely to be in the form of data librarian tasks. The data librarians' training and duties will be centered on the clerical and repetitive tasks of maintaining data catalogs with their considerable associated entries.

Dp management, a by-product of the division of labor, will be involved in the system development and delivery process. Unfortunately, its role will be substantially diminished by other more historical, traditional management roles. The manager of the future is principally a finance type. The ability to use a computer to produce planning and operational information will be sine qua non for any employment opportunity.

PROBLEMS IN THE PRESENT

Regardless of the scenarios of the future, several things are apparent. We as a profession are not taking full advantage of the development tools currently at our disposal. Further, our intellectual facilities are more specialized than the work we are performing, i.e., we tend to discourage some types of change in order to obtain immediate results.

Advice for surviving the present? Seek standardization of hardware, software, and development methods. Resist giving up control of data to user organizations—particularly if you represent a large organization. Spend more time reading and thinking. Communicate more frequently with top management, if top management lets you.

It is an irony borne out by history that generalists are often the only individuals that can synthesize simpler ways of doing things. Unfortunately, the development of good dp generalists runs contrary to current industry trends. Given the relatively high dp turnover rate for most companies, it is within our best interests to convince management that it should devote special efforts to developing a core of career professionals who can recognize and manage the transitions.

In my usage, techno-shock is the realization that it might take the data processing industry several score of years to collectively generalize common, simpler methods of developing systems. Can your organization afford to wait that long? ◉

F.J. Grant is an independent consultant based in Marietta, Ga. He has extensive experience developing software both domestically and internationally.

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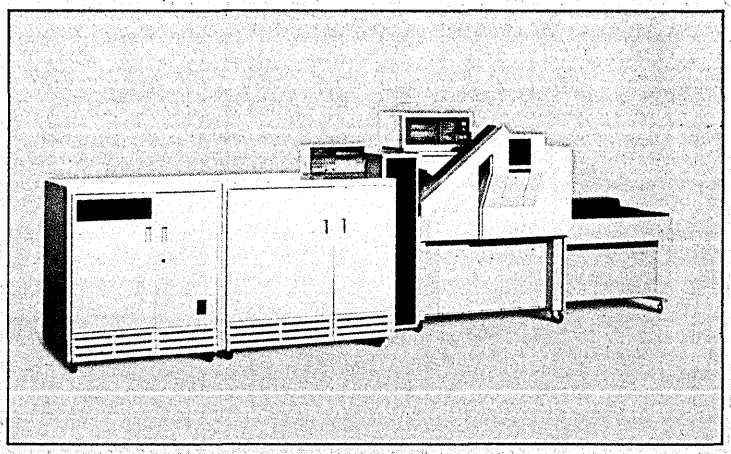

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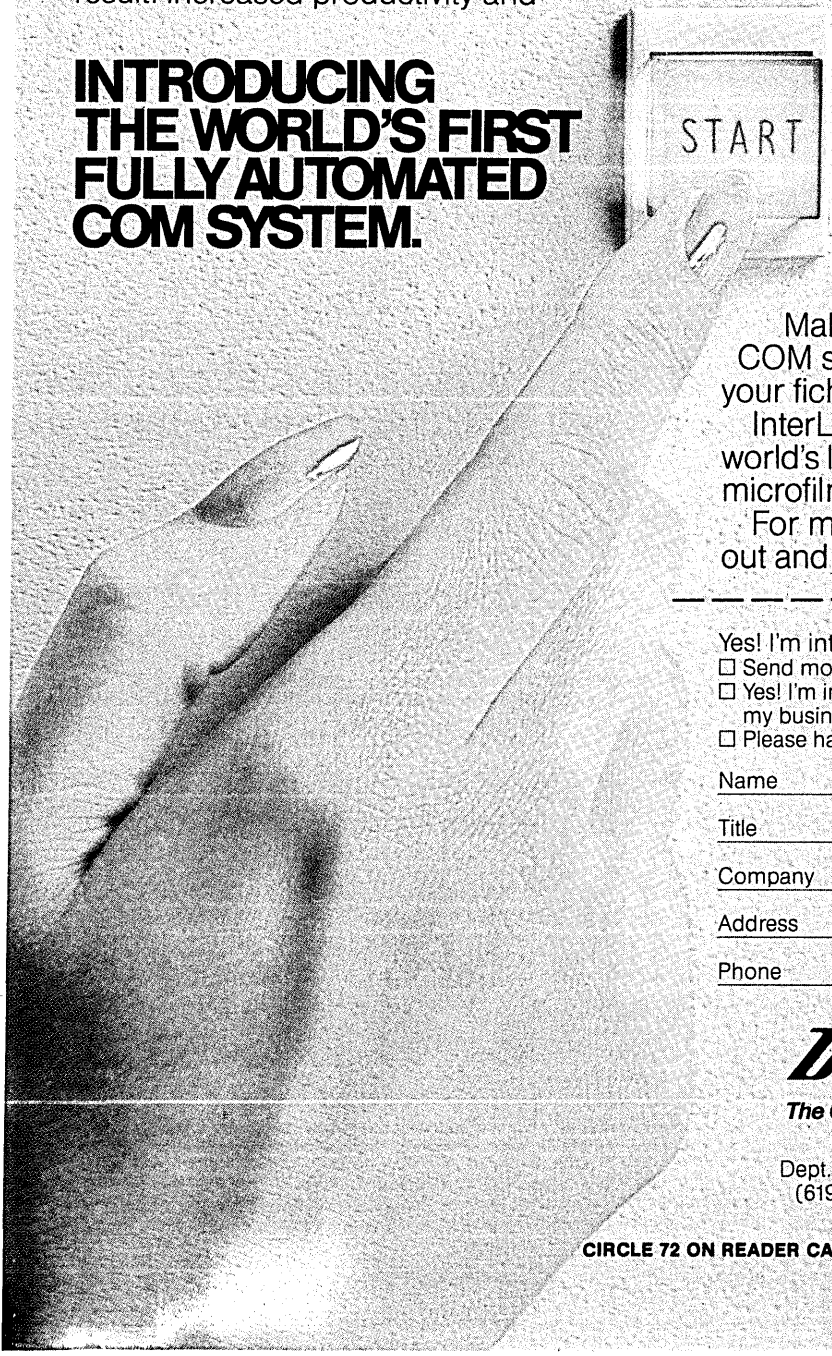

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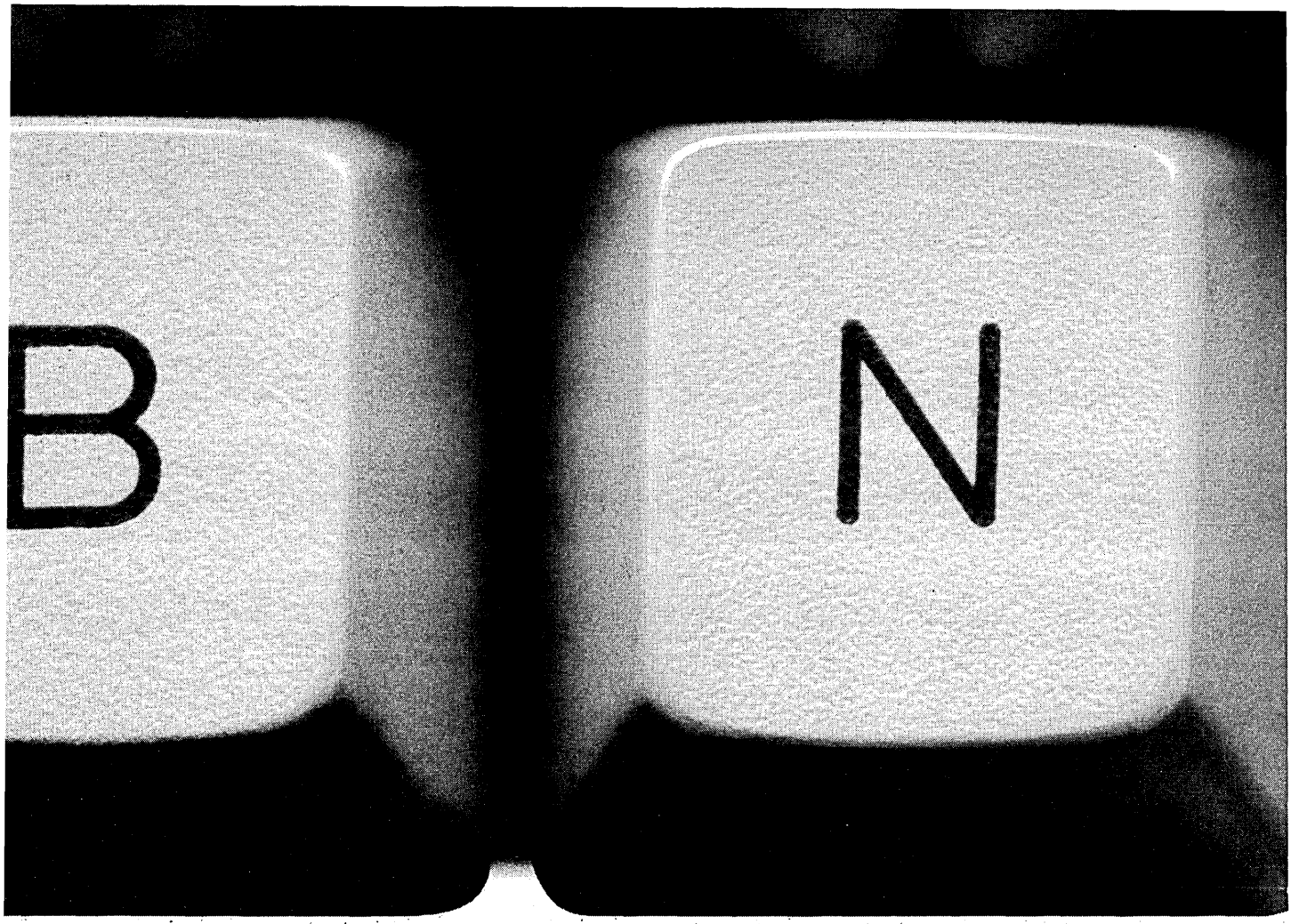

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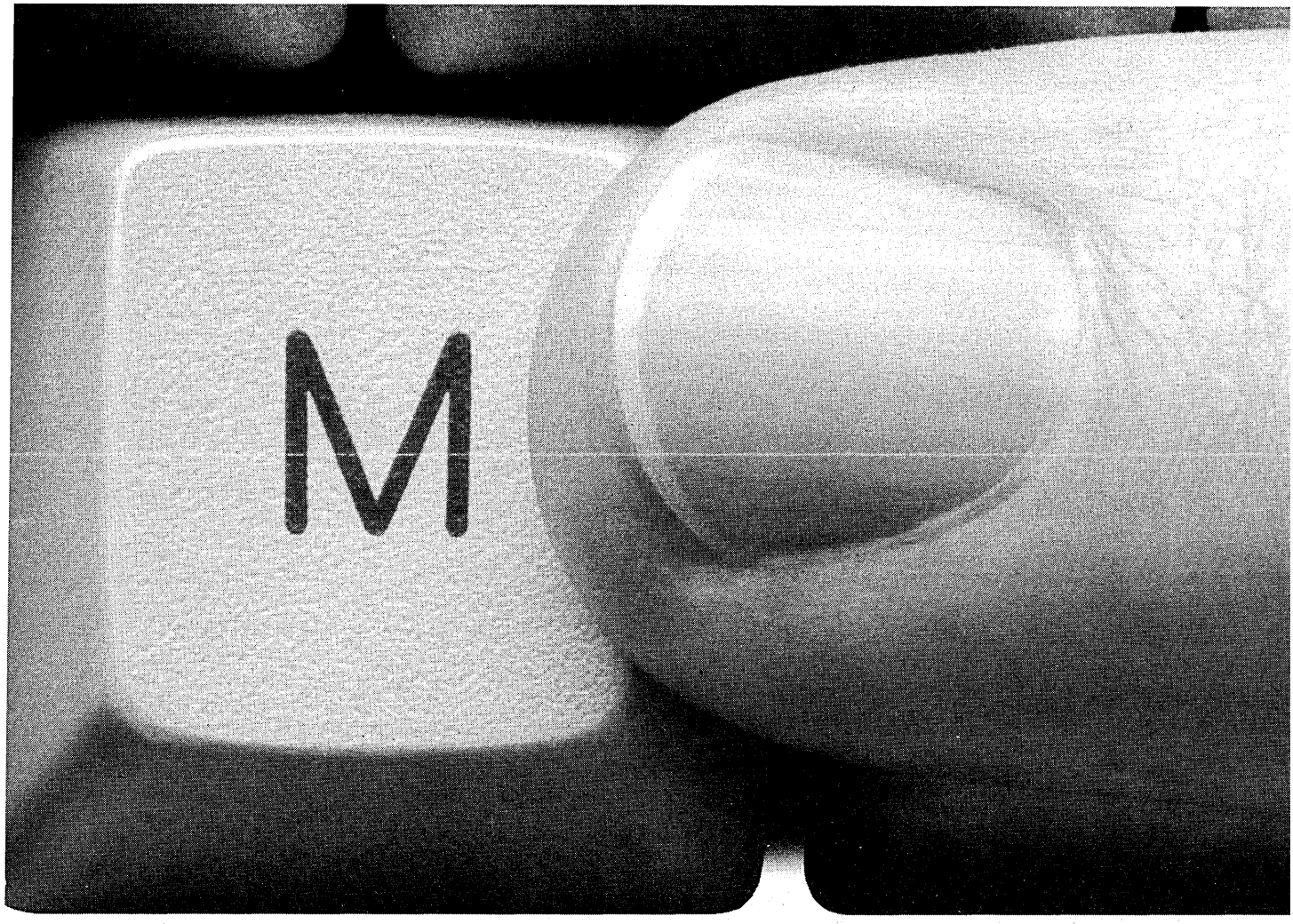

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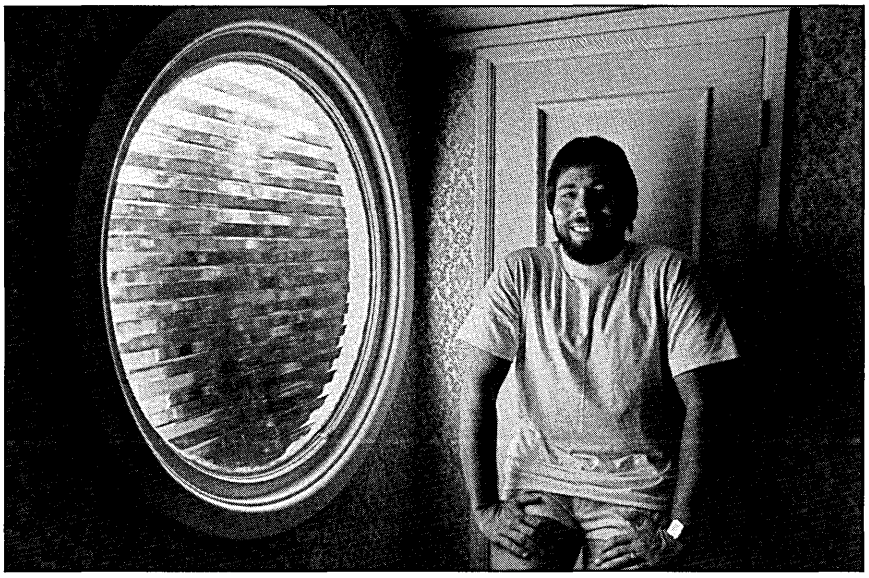
DREAMER DREAMS AGAIN

Stephen Gary Wozniak can't stand still. After a 30-month absence, he rejoined the company he'd cofounded six years earlier. But after a year and a half, Apple Computer's prodigal son has again struck out on his own, with a spirit similar to that which drove him from Hewlett-Packard way back when. This time, Woz has left the computer business to start a company, called CL9, that will offer a new kind of home electronics equipment.

Although Woz continues to work for Apple as a management consultant, he believes he can no longer satisfy his creative urge within Apple's walls. "It would be suicide to introduce my new products at Apple," he says. "Apple has become a one-product company. Or, at least, it wants to see itself that way." That new product, in case you weren't noticing, is the Macintosh.

Wozniak and the Mac were never the best of friends. He was, after all, the inventor of Apple's "other" product, the original Apple II pc. That machine, now manifested in various forms, is still providing two thirds of the company's revenues, which totaled over $1.4 billion in 1984. Yet the product has been thoroughly overshadowed by the Mac.

While the company's 1984 annual report points out the original product's success ("The Apple II has always been the backbone of Apple," it notes) Wozniak maintains that "the Apple II people didn't get any credit. I've never seen morale so low." (In all fairness, the annual report devotes a full page to a photo of the Apple II team, and another page to a prose description of the computer's role in the company's strategy.)



STEPHEN G. WOZNIAK: "Today, innovation and Apple Computer are contrary ideas. The company has become stodgy with success."

About the only thing Wozniak's new company has so far is a name—and even that has changed once already. In late January, when Wozniak first told colleagues he was leaving Apple, he planned to call his new company MBF, for "my best friend." As of Feb. 12, Wozniak had changed the name to CL9. "It could stand for cloud nine," he says.

The new company will have its offices in Los Gatos, Calif., and will employ some familiar faces. Wozniak's partner and cofounder, Joe Ennis, was one of the key engineers of the Apple IIc. Wozniak describes him as a "contrary thinker" and "one of those free-spirited types." Another possible team member is Laura Roebuck, who worked as Wozniak's secretary at Apple.

Much less clear right now is just what Wozniak's new company will sell. Wozniak, for his own reasons, is keeping that pretty much a secret. About all he'll say is that he plans to invent "a new product that doesn't exist today, [which] will have something to do with the compatibility between equipment that you use in your home that is not designed to be compatible," like tvs, VCRs, satellite dishes, and digital equipment. "It will also allow you to fix a lot of things about your equipment that bothered you in the past."

So much for what it is. As for what it's not, Wozniak says, "It is not a network. And it's not a computer, either."

Greater ventures have been built from lesser plans, and Wozniak expects to spend between $500,000 and $1 million over the next year on salaries, laboratory equipment, supplies, and other, as-yet-unspecified items. He hopes to raise the money from the venture capital commu-

PEOPLE

nity. "It's not because I need the money," he explains, "but because I think venture capitalists could prove helpful further down the road if I go public." He intends to give the venturists no more than 10% of CL9, and hopes to go public within a few years' time.

This flurry of activity does not mean, however, that Wozniak and Apple have forever parted ways. He's still one of the company's largest shareholders for one thing, with nearly 2 million shares worth approximately $50 million. Also, as a management consultant he will still earn a salary, although it's somewhat less than the $20,000 a year he most recently received.

It is with more that a little bitterness that Wozniak makes his move. "In the beginning, everything at Apple was great," he says. "Things were very innovative and unique until the company went public. Then everything changed. Today, innnovation and Apple Computer are contrary ideas." He feels the company has become stodgy with success. "Apple wants stable products to put on the market. It wants guaranteed safety."

IBM is Apple's biggest fear," he continues. "If we're ever put out of business, we'll be blaming IBM." And, to some extent, that is rightly so. "Apple's problem is that the value of Apple innovation [in products like Macintosh] is weighed against IBM's reputation," Wozniak says. Since Steven Jobs, Apple's chairman, is "Macintosh-aligned," according to Wozniak, the Mac is the basis of all Apple plans. Still, "Apple will let the Apple II continue supporting the company, as it has for a long time."

In addition to criticizing Apple's neglect of the Apple II team, Wozniak disapproves of other elements of Apple's corporate direction. One market that Wozniak says "deserves very serious attention at Apple" is the education market. "If I had one bit of say around here, the education market would become a priority, both in terms of dollars and research," Wozniak says.

By limiting itself to restricted markets such as America's largest businesses, Wozniak feels Apple is stifling creativity and innovation, which may present problems for the company when it needs to attract talent in the computer field. "The big problem is that Apple is so tightly restricted to the pc market," he says. "There isn't so much that innovative and creative people can do in that market now."

Whatever Wozniak does, he'll be taken seriously. In 1975, when he worked with calculators at Hewlett-Packard, he attended meetings of the Homebrew Club, which at that time had a membership roster that included Adam Osborne, Steven Jobs, Nolan Bushnell, Jim Warren (host of the first West Coast Computer Faire) and others who later became members of the high-tech establishment. It was at that time that he built his first "computer," really a circuit board powered by a 6502 microprocessor.

It was crude, but it was the humble beginning of what would become the world's biggest microcomputer company. Trouble was, nobody could see that far ahead. When the 25-year-old Wozniak offered his handiwork to management at HP, he was repeatedly turned down. Their reasons were numerous: HP wasn't interested in the hobby market; if the computer sold, that might hurt sales of other HP products; and so on.

From that discouraging beginning, Wozniak embarked on a long, exciting road. He teamed up with Jobs in 1975 and sold about 175 of those first Apple boards for about $550 apiece. A year later, he met Mike Markkula, late of Intel, and the troika made Apple Computer into a real company. In 1980, the company went public, raising millions of dollars and making Wozniak and Apple's other founders rich.

But early in 1981, the excitement came to a temporary halt. Wozniak, his girlfriend, her brother, and her brother's girlfriend were all hurt when a small airplane they were flying crashed. Wozniak put his career on hold. And when he did, Apple stumbled. As he recovered in the hospital and at home, Apple was struggling with its ill-fated Apple III model.

Wozniak was unable to help; his injuries (and those of the others in the plane) were serious and slow to heal. And even after he had recovered, Wozniak had little desire to rejoin Apple right away. Instead, he earned the engineering degree he had always wanted, attending U.C. Berkley under an assumed name.

In 1982, Wozniak financed and hosted a high-tech rock concert, the Us Festival. Despite lots of good music and computers, the concert was a bust. Some accounts placed Wozniak's losses at as much as $15 million. But while the festival rocked on, a rally in Apple's stock increased the value of his holdings by something like $18 million. "I think the fans got their money's worth," he was quoted as saying. "I know I got mine."

Less than a year later, in July 1983, Wozniak returned to Apple as the firm's principal engineer, charged with inspiring the company's other engineers. Eighteen months after that, Woz said he was leaving, even though he and Apple will maintain a formal, if tenuous connection.

"I'm not necessary here anymore," he says.

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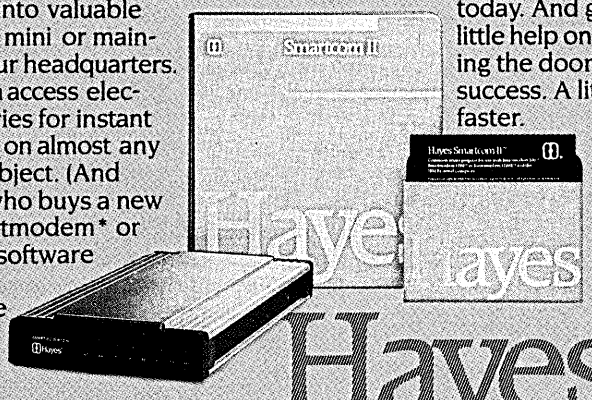

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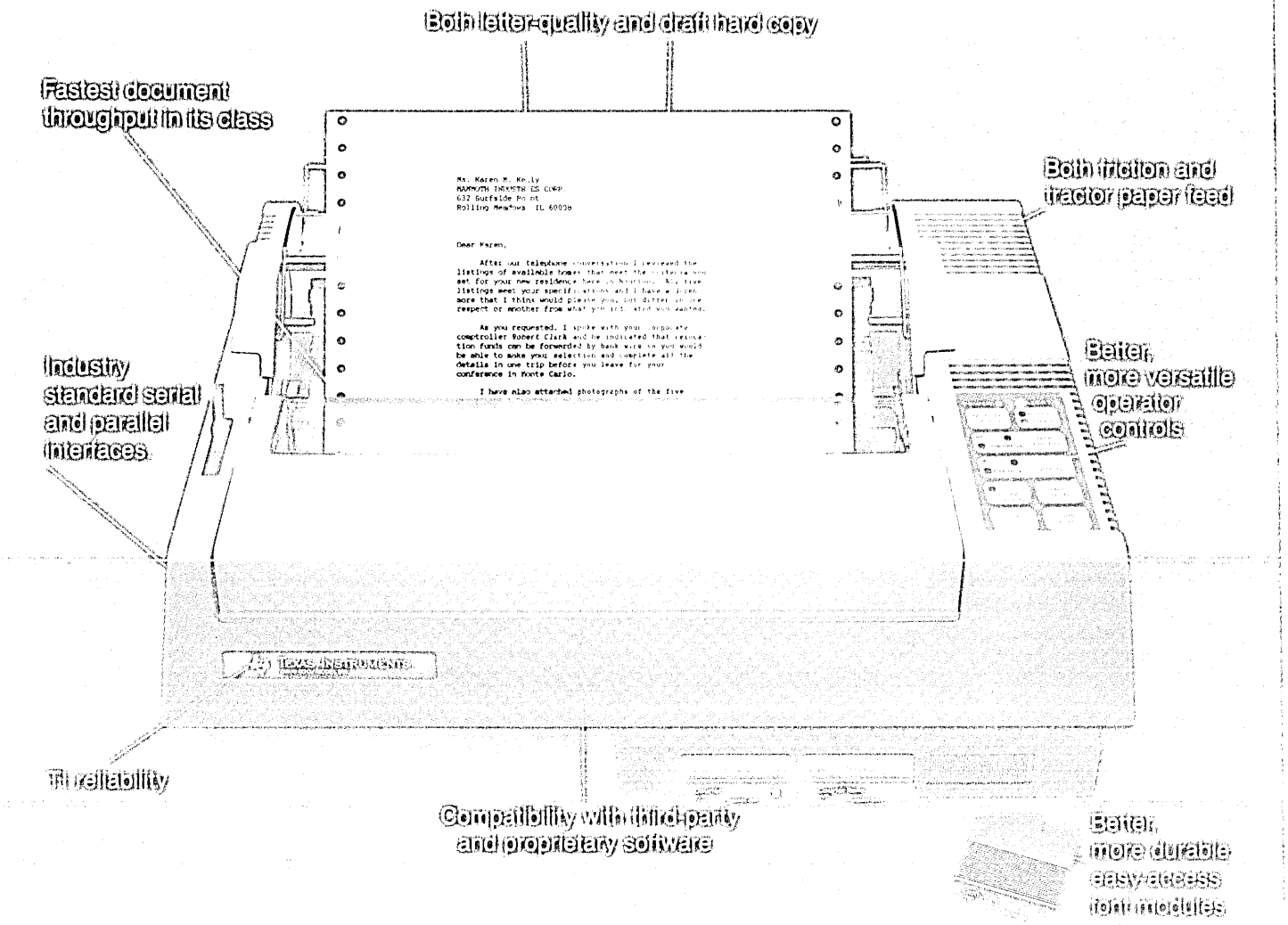

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Tough Font Modules For Quick Character Change. Three font modules can be inserted into the front of the printer at one time, and are accessed individually. Each contains both draft- and letter-quality character sets. They're easier to use, more reliable and more durable than traditional metal or plastic daisy wheels.

More Productivity Than Any Other Microprinter. The 855 offers both friction and tractor paper feed, to handle all types of word and data processing applications. A quick-change snap-in cartridge ribbon. Raster and mosaic graphics. And intelligent printing which maximizes document throughput — regardless of format.

Get the printer that makes for better information systems. For more information, visit your nearest TI authorized dealer or write Texas Instruments Incorporated, PO Box 809063, Dept. DPE-00000, Dallas, TX 75380-9063, or call toll free 1-800-527-3500.

TEXAS INSTRUMENTS

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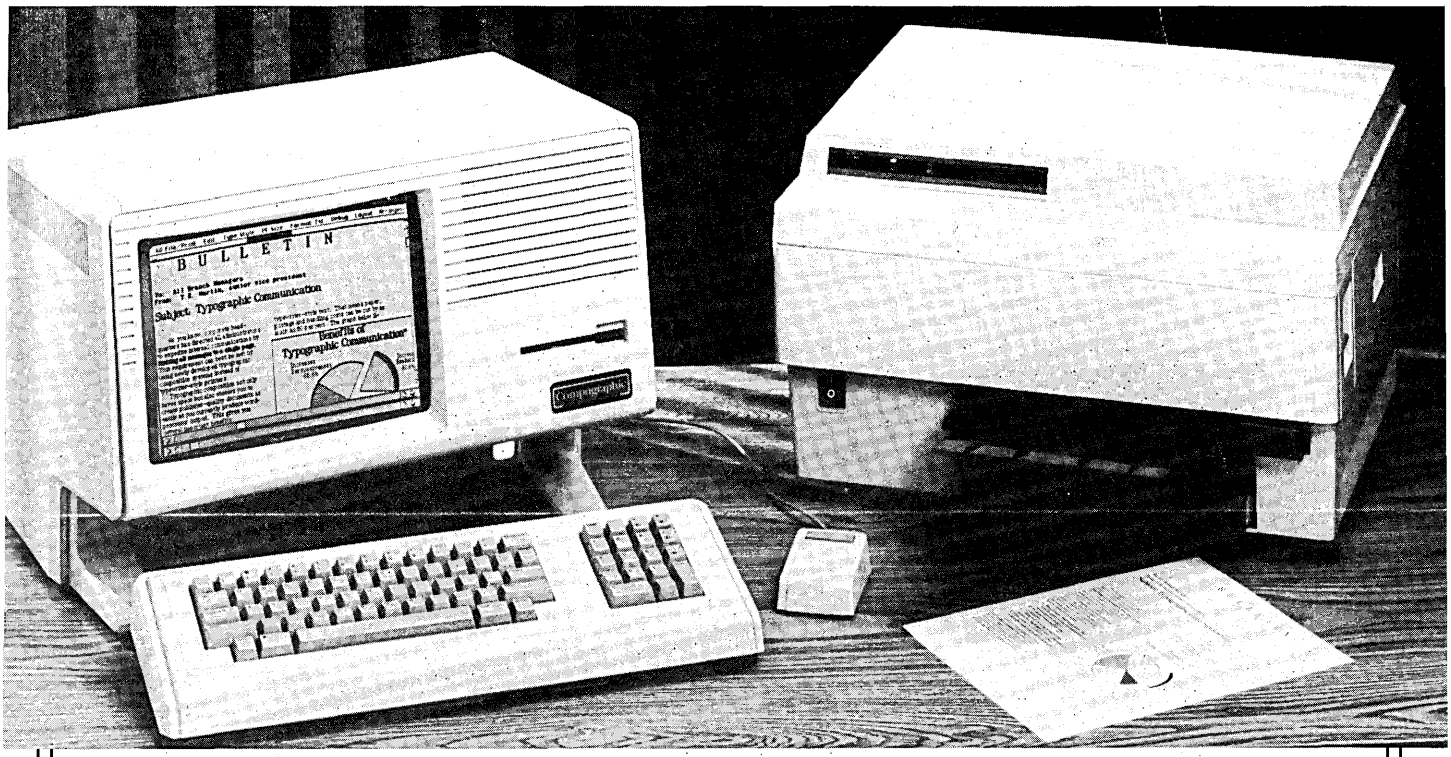

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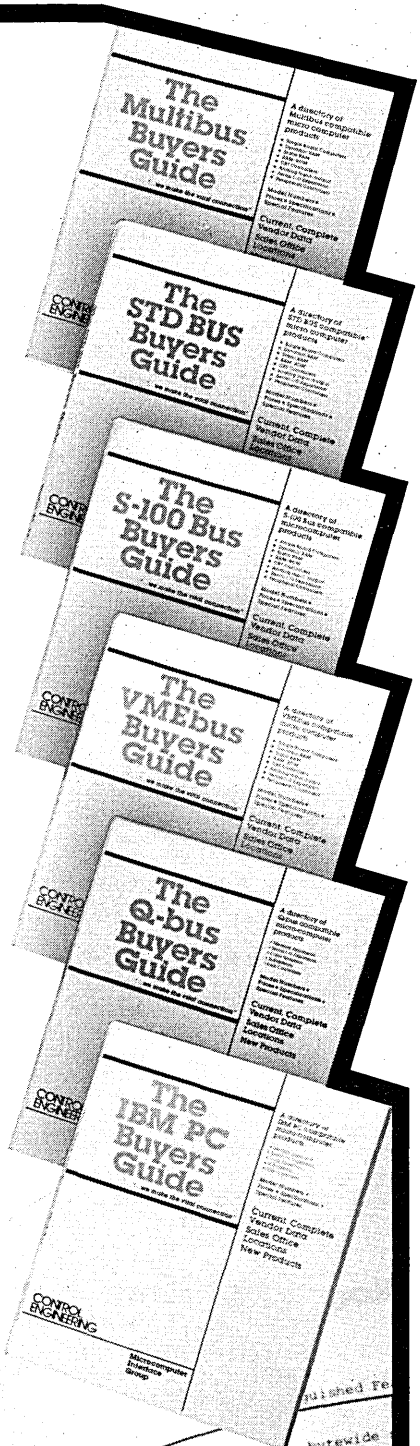

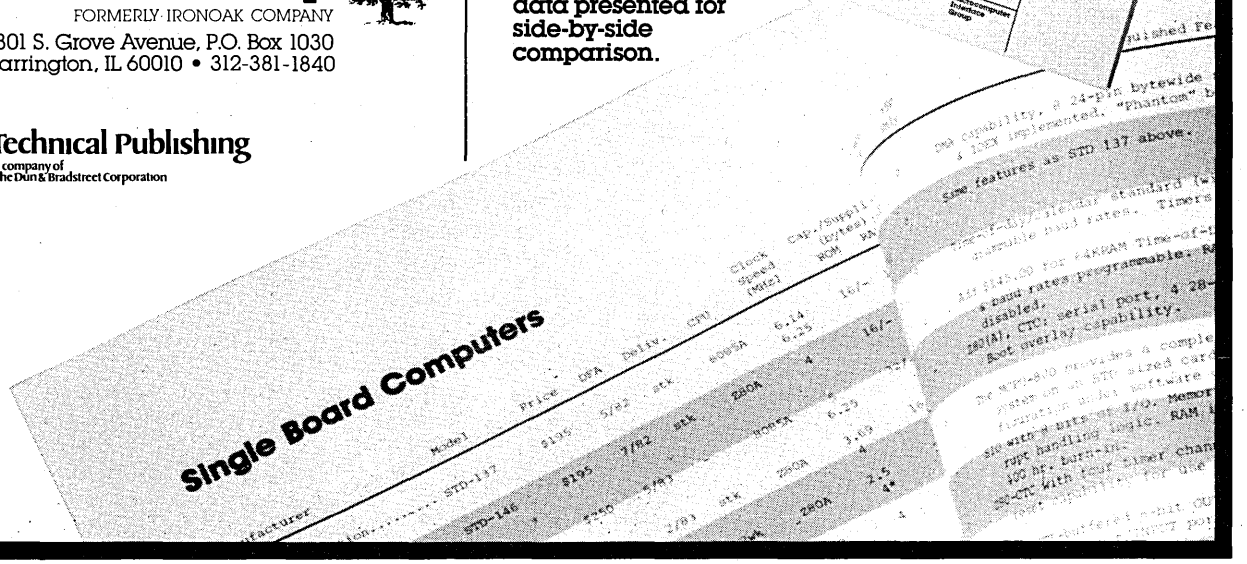

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HARDWARE

OFF-LINES

Four years ago, Harris Corp. of Melbourne, Fla., embarked on a small shopping spree. First, Harris acquired a telephone equipment company called Digital Telephone Systems Inc., then located in San Rafael, Calif. Fewer than two years later Harris made the much publicized acquisition of Lanier Business Products Inc. of Atlanta. Now, Harris had a business products company and a telephone switch manufacturer in addition to its minicomputer, communication, and chip product lines. What the company did not have was direction.

Since buying Lanier, Harris had not done a whole lot with its acquisitions. No significant product introductions were annonced and it was business as usual in the Harris fold -- until now. The major problem Harris faced was integrating its entities into some kind of homogenous and cohesive product line with an overall strategic direction. Now, the vendor is attempting to do just that, at least in the office automation arena, with its recent across-the-board product introductions. It rolled out three lines of products for the information management systems market. The systems cover the areas of dp (Harris minis), OA (Lanier), and communications (from the former Digital Telephone Systems). The company is linking these systems together in its own networking products called Harris Net for networking and communications management.

The new products include the Harris 9300 departmental mini, designed to interconnect pcs and mainframe terminals; the Lanier Concept 6000 OA system, a network controller that can tie together up to 28 workstations or mini controllers in an office work group environment; and the Harris 20-20 integrated network switch, designed for voice and data communication. Harris is planning to make inroads into the departamental computing market. A $2 billion company, it has its foot in the door with Lanier's installed base of word processors and office products.

And when Harris begins making sales calls to tout its integrated office solution, the salespeople may very well find a crowded waiting room filled with representatives from Hewlett-Packard, Digital Equipment, Data General, Wang, and IBM, all very eager to explain the merits of their own product lines. DG, DEC, Wang, and IBM have been fighting it out in the OA market for some time. Throw in HP, which shares many of the Harris aspirations, and you have one crowded market regardless of the poor attendance noted at the last two Office Automation Conference shows.

The one thing most of the vendors have in common is their spiel about how much better, faster, cheaper, and prettier their products are than IBM's comparable offerings. On almost every comparison chart, the non-IBM vendors boast of their relative merits, at least on paper and slides (computer-generated, of course). So why do these vendors, with fairly sophisticated new offerings, lose out to old, used IBM System/34s running RPG?

MULTIPLE EMULATION

The XPERT Packet Terminal System simultaneously emulates four terminals. It is also designed for X.25 networks and allows terminal users access to packet switching networks. The terminal can interact with up to four different host computers at the same time. It emulates an IBM 3270, DEC VT100, and graphics and ASCII devices while attaching directly to an X.25 network. With a couple of keystrokes the user can flip back and forth between multiple data sources and applications. The terminal requires no PAD or protocol converters because the X.25 and terminal emulation functions reside in the terminal.

Local hosts, terminals, personal computers, and dial-in ports can connect to the packet network through the product. Error protection is provided for all transactions. Terminals can be configured individually or in clusters. Remote diagnostics, integrated into each terminal, separate operator errors from system malfunctions, then pinpoint real faults to a specific component for replacement. It operates on Telenet, Tymnet, Accunet, and other public and private networks. The XPERT Packet Terminal System sells in oem quantities for $3,000. ATLANTIC RESEARCH CORP., Alexandria, Va.

FOR DATA CIRCLE 301 ON READER CARD

COMMUNICATION PROCESSOR

The Amdahl 4705T communication processor is a front-end processor with a high-speed bandwidth of 1,554Kbps for the U.S. or 2,048Kbps for Europe. It is designed to take advantage of lower tariffs for these lines, now offered by the common carriers. This is accomplished by partitioning the resources of the front-end processor to simultaneously handle multiple applications for voice, video, and data.

The unit, which operates 3705 communications software, is compatible with ACF/NCP. It supports up to 1,024 bytes of storage, six cpu attachments to block or byte multiplexor channels, 352

half-duplex communications, and line interfaces to BSC, SDLC, X.25, and start/stop protocols.

An X.21 interface is also available as an option for European users. Extended line connectivity now permits 64 line addresses per communications scanner, and the connection of 32 full-duplex or 64 half-duplex synchronous or asynchronous externally clocked lines with speeds up to 9,600bps. The 4705 and 4705E can be field upgraded to a 4705T.

Also announced were offerings in the vendor's 4400 series of data communication systems. Additions include the 4460 concentrator, which handles asynchronous and bisynchronous data simultaneously; the 4404E administrator, which quadruples both disk storage and memory size, and triples network configuration capacity; and the 4410E and 4410F processors, each of which double the number of X.25 links that can be attached to a single processor.

The basic purchase price for the 4705T with 1MB of storage, two channel adapters, and support for six high-speed lines to the host computer and one trunk line at 1,544Kbps is $91,000. Prices for the 4460 start at $15,000. The 4404E costs $50,000. Both the 4410E and 4410F processors support over 100 links per node through additional packet processors; prices start at $120,000. Purchase price for the 2211 starts at $10,000. AMDAHL CORP., Sunnyvale, Calif.

FOR DATA CIRCLE 302 ON READER CARD

REVAMPED STAR

Xerox Corp. has updated its Star product line with the 8010 Star Information System. Features include a new display, low-profile keyboard, an optical mouse, and enhanced software for the Star system and for the Ethernet local area network on which it operates. This is the fifth major software release, the vendor says.

The 8010 replaces previous models at no increase in price. Hardware changes include revised designs for the display module and keyboard. Basic characteristics of the previous model are continued without change. The modified display module has a nonglare screen mounted on a swivel base. The software enables direct connection of the system to a DEC VAX via Ethernet. VT100 emulation is provided for the Star system and for networked IBM PCs. Users can now access up to six different documents, programs, and IBM or DEC host computers. Document Interchange Format conversion software allows exchange of information among Star workstations and word processors from other vendors. Other software features include interactive terminal service, increased file capacity, X.25 communication protocol, spelling checker, Chinese language software, and extended mail services. Purchase price of a network model or remote Star 8010 workstation is $10,000. A standalone 8010 costs $9,000. XEROX SYSTEMS GROUP, El Segundo, Calif.

FOR DATA CIRCLE 303 ON READER CARD

COMPACT MODEMS

The IBM 3833 and 3834 are compact modems that convert data for transmission over leased lines between terminals and host computers. According to the vendor, the shoebox-sized devices have detachable cables and troubleshooting aids.

The 3833 operates at 2,400bps and the 3834 at 4,800bps in networks using synchronous data transmission. The modems are compatible with IBM communication management and problem determination programs. The diagnostic function is an optional feature and alerts the central computer operator to remote modem problems and permits remote diagnostic tests. The 3833 is priced at $1,700 and the 3834 costs $2,600. IBM CORP., Rye Brook, N.Y.

FOR DATA CIRCLE 304 ON READER CARD

MANAGES PAPERWORK

PaperFlo is a microcomputer-based system that incorporates bar code technology to track and manage documents. The system allows purchasing, personnel, financial organizations, and other departments with high-volume paper processing to improve productivity and efficiency without adjustments to existing office procedures, the vendor says.

The system is fully integrated and combines lapsize computers with a specially configured microcomputer-based station for central management capabilities. The lapsize computers are supplied by NEC and have bar code reading wands attached to them. Users can locate any document instantly, record its movements, check its schedule, and route it automatically from either a distributed workstation or from the vendor's central computer.

When a document reaches an office, a bar code label is attached to it. Information about the document and its processing route is entered into the system. Whenever a processing activity occurs in the office, a user runs a bar code reading wand over the label on the document and enters information about the disposition of the document into the lapsize, which is uploaded to the supermicro.

In addition to on-line inquiry capabilities, the unit generates management reports and issues reminders and workload schedules.

The system runs under Unix and its software is based on a relational DBMS. The system uses a specially configured and programmed AT&T 3B2 supermicro. A typical system configuration with 20 distributed workstations (including the 3B2) costs $75,000. A single PaperFlo system can support up to 50 workstations. INFOCEL, Rockville, Md.

FOR DATA CIRCLE 305 ON READER CARD

—Robert J. Crutchfield

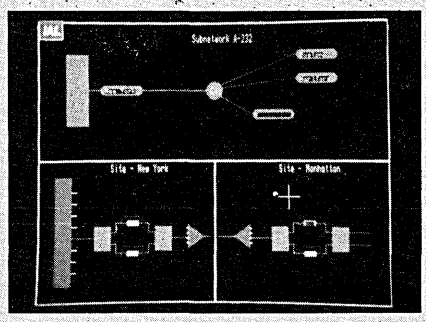
HARDWARE SPOTLIGHT

NETWORK MANAGEMENT

The Medius Network Management System manages medium- to large-scale communications networks and offers automatic fault detection and analysis using interactive color graphics. In addition to providing automatic pinpointing of locations and causes of communications faults without operator intervention, the system can manage and control large and complex networks via a centralized facility. It has a proprietary diagnostic processor, incident handling and management reporting, extensive database and decision support facilities, continuous network monitoring, and interactive color graphics displays.

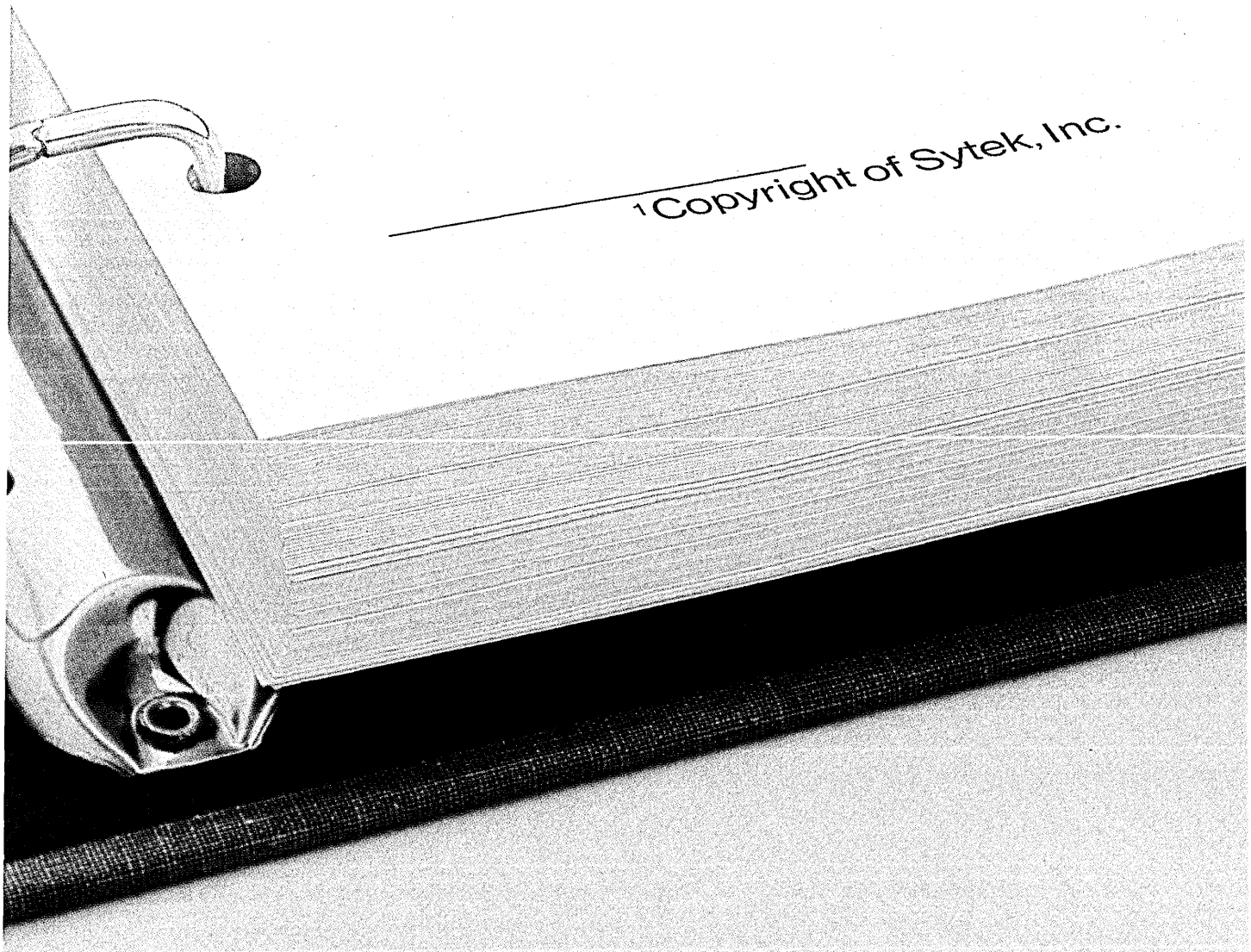
Hardware includes a DEC VAX supermini to act as the network management computer, a logging printer, and an operator workstation. A basic system also employs network diagnostic units dispersed throughout the network for automatic monitoring.

Software includes facilities for automatic fault detection and analysis and an interactive color graphics display of system and subnetwork status. The



software also has the ability to track faults as incidents that can be monitored until corrected. Centralized control of a full range of diagnostic tests, control of local and remote switches, trouble ticket management, collection and display of network performance, and an operator interface are other features of the system. A 96-circuit configuration sells for $135,000. Optional hardware includes color graphics processor and monitor, digitizing tablet and document printer, plus a range of network switching and access cards. OCEAN DATA SYSTEMS INC., Rockville, Md.

FOR DATA CIRCLE 300 ON READER CARD



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The Displayphone-Plus Terminal

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Inside the Displayphone-Plus terminal is a 212A compatible auto answer modem with selectable 300/1200 BPS transmission rates and full automatic log-on. So it can meet the needs of managers and other occasional data users, while emulating such terminals as the Digital Equipment Corporation VT-100™ and VT-52,™ ADDS Viewpoint,® Regent 25,® and many more.

On the outside is a full-stroke keyboard and easy-to-read amber screen which allows the Displayphone-Plus terminal to match the performance of large, conventional terminals. Its sophisticated telephone capabilities allow it to surpass them with a 90-number directory, automatic dialing, and handsfree speaking. And it's as easy as a telephone to use.

To find out more about the Displayphone-Plus terminal, call 1-800-328-8800, or write to Northern Telecom Inc., Advanced Communications Terminals Division, P.O. Box 202048, Dallas, TX 75220-9990.

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CIRCLE 81 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

The late King Gillette learned that the real money was in razor blades and not in the safety razor. Ever since, companies have used giveaway technology as a marketing ploy to promote commodity products. It was not uncommon for a soft drink vendor to supply free soda fountains to help their customers sell more sugar water to the masses whether they were thirsty or not. Yet until recently, about the only real giveaway loosely associated with high tech had been back in the 1940s, when RCA doled out a free portable 45rpm record player to customers who bought a certain number of 45rpm records.

Of course, in all three examples, the companies mentioned held a virtual monopoly on the delivery systems and products. It was to their advantage to distribute the technology at almost no cost, and make the profit on the product. Federal Express Corp. of Memphis is testing this marketing strategy with its ZapMail two-hour electronic transmission service. The company wants to see its ZapMail machines firmly entrenched in the mailrooms and hallways of corporations. Instead of giving away razors, the Cinderella company with the great tv commercials will let its customers use the ZapMail equipment free of charge. Users will not have to pay leasing fees or telephone bills associated with the unit because ZapMail terminals are directly linked to the vendor's own communications network. FedEx makes its money by charging users for its version of the razor blade -- the printed page -- subject to a minimum charge, with discounts available based on the service agreements and the number of terminals installed.

The terminal, oemed from NEC of Japan, scans, sends, receives, and prints copies of documents on plain bond paper. The documents are reproduced either at another ZapMail unit in the recipient company or at a Federal Express office with delivery by courier to the recipient. The document is transmitted over the vendor's own packet switched network. Until now, Federal Express has only offered the service through its own centers, but with customer premises equipment the company is positioning ZapMail directly against facsimile and telex machines. With overnight ZapMail, a document can be sent from office to office without ever going through a courier at comparable overnight prices -- cutting into the market share of the overnight couriers as well.

ZapMail is only one indication of Federal Express's intent to move into electronic delivery, and it makes sense. Besides the company's own network, it has large IBM dp centers in Memphis and Colorado Springs that can handle the expansion. But this new endeavor is a departure from its overnight air delivery service, maybe even a bit of a gamble. Fred Smith, who started the $2 billion company in 1973 with a $3 million inheritance, could be considered a gambler. Back in 1974, when Federal Express was losing money, Smith won enough money at the gaming tables in Las Vegas to meet a $27,000 payroll.

DIAGNOSTIC DISKETTE

RID (Recording Interchange Diagnostic) is a diagnostic diskette that informs users of the status of their disk drives. When inserted into a disk drive, RID automatically performs a series of tests that gauge seven critical parameters affecting interchangeability and data protection. The screen informs users whether the drive has passed or failed each of the seven tests and recommends remedial action in the event of failure. The tests are drive speed, noise tolerance, write/read, track alignment, positioner backlash (hysteresis), disk clamping (eccentricity), and erase crosstalk. It completes all its tests in less then 25 seconds, and no specialized skill is required to use the device. Users are informed of what tests the drive passed and failed. DYMEK CORP., San Jose.

FOR DATA CIRCLE 326 READER CARD

VOICE MAIL SERVICE

This vendor provides a voice mail service to businesses as an alternative to buying voice mail equipment. According to the vendor, the Async Voice Message Service virtually eliminates telephone tag. Users of the service communicate with each other through voice messages that are stored, forwarded, and retrieved within the user's organization. Security includes account numbers for each user. The service is suited for companies whose employees frequently use the telephone and travel often, such as those firms with a field sales force. The vendor offers voice mailboxes on its systems for $35 per month per user with unlimited local usage. For out-of-town callers, 800 service is available. There is no capital investment, just a month-to-month service contract. The voice mail service is available on a national basis. ASYNC CORP., Atlanta.

FOR DATA CIRCLE 327 ON READER CARD

SNA CONNECTION

Prime/SNA is a line of three software subsystems that allows Prime 50 series computers to communicate with IBM host

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CIRCLE 82 ON READER CARD

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computers within SNA-based networks. It supports both interactive and remote job entry (RJE) subsystems and operates concurrently with other Prime data communications software.

The product allows users to transmit data to and from IBM mainframes as if they were using 3270 terminals. The subsystems include the Interactive Subsystem, the SNA RJE Subsystem, and the Server Subsystem, which is a platform for the other two and is capable of supporting simultaneous sessions over multiple communications lines.

The software lets users suspend and recover multiple SNA sessions without disconnecting from the IBM host. According to the vendor, by offloading communications tasks, the Server Subsystem reduces Prime host overhead. In addition to the PRIMOS operating system, the product requires the vendor's Intelligent Communications Subsystem Model 2 (ICS2) controller with synchronous capability and a synchronous line adapter card (LAC). Interactive 3278 IBM terminal emulation also requires the vendor's PT200 terminal, which has microcode support for this product. The initial release supports MVS/SP, ACF/VTAM, ACF/NCP/VS, NCCF, NPDA, CICS/OS/VS, and TSO/ISPF/PDF. Support is also planned for IMS and VM/CMS. Prime/SNA is available by separate subsystem. The Server Subsystem is priced at $6,000 with a $100 monthly maintenance fee. The Interactive Subsystem costs $5,500 with a $70 monthly maintenance fee. The SNA RJE subsystem sells for $5,500 with a $65 monthly maintenance fee. PRIME COMPUTER INC., Natick, Mass.

FOR DATA CIRCLE 328 ON READER CARD

UPGRADED TRACKING SYSTEM

The RCA Cylix Communications Network has initiated a Customer Resource Team (CRT), an integrated personal service approach to the management of users' network service needs. RCA Cylix has also installed the Network Information Problem Solution (NIPS) system, a company-wide, on-line tracking and routing system for the vendor's satellite-based, value-added data communications network that provides medium- to high-speed data communications.

The service was created by aligning company operations and responsibility for customer host sites into east, central, and western regions. Each region is assigned a CRT of specialists from customer service, network control, field engineering, customer relations, order processing, and sales, comprising what RCA Cylix calls a virtual work group. A toll-free 800 number automatically routes customer calls to the appropriate team.

NIPS gives instant access to current and trouble tickets and generates reports and statistics. Statistics can be broken out by customer, micronode, vendor, and repair code. All areas of RCA Cylix have on-line access to NIPS. When a problem is reported, the system automatically assigns a number to the trouble ticket, which can also be cross-referenced by the user's name or network identifier. RCA CYLIX COMMUNICATIONS NETWORK INC., a wholly owned subsidiary of RCA Communications Inc., Memphis.

FOR DATA CIRCLE 329 ON READER CARD

DBASE III REPORT WRITER

Quickreport is a report writer that can produce simple or complex reports for dBase III. It requires no programming and can combine up to six dBase III databases into one report. Reports can include user-defined calculations on data and can perform group breaks on up to 16 different fields. The product selects data using criteria entered by the user. A high-speed sort is also built into the product. Quickreport sells for $300 and runs on IBM and compatible personal computers with 256KB of memory. FOX & GELLER INC., Elmwood Park, N.J.

FOR DATA CIRCLE 330 ON READER CARD

ENHANCED VERSION

Unify 3.2 is an enhanced version of Unify Corporation's Unix-based relational database management system. Its features include a one-step database creation procedure, improved menus, improved transaction-logging capabilities, and new documentation.

It enables users to create a database in one step by consolidating four separate operations, including define database, create database, define screens, and define menus. The menus are more understandable to nontechnical users and permit them to move between functions without having to exit the Unix shell. The optional transaction logging process keeps track of logical transactions for greater security, the vendor says.

In addition to tutorial and reference manuals, three levels of documentation are being offered with the product. The Unify DBMS provides a wide range of applications development tools including a menu handler, screen painter, query-by-form, report generator, and a structured query language. The single-copy price for Unify 3.2 ranges from $1,500 to $14,500. UNIFY CORP., Lake Oswego, Ore.

FOR DATA CIRCLE 331 ON READER CARD

—Robert J. Crutchfield

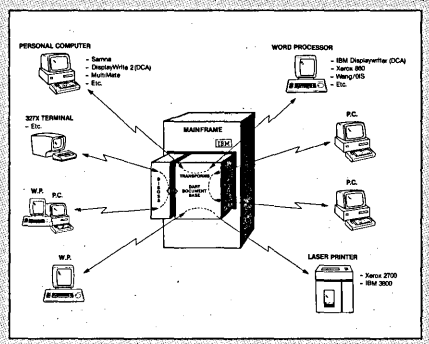
SOFTWARE SPOTLIGHT

TRANSFORMS DOCUMENTS

Samna/DART (Document Archival Retrieval and Transformation) is a line of mainframe computer software products that allows dissimilar word processors and personal computers to exchange editable documents and to drive high-speed laser printers.

The software lets users create documents and store them in a document manager on a mainframe computer. Once in the document manager, documents can be accessed by any authorized user linked to the mainframe via IBM 2780/3780 communications. When a user requests a document created on a different machine, the product transforms the document into the style and format of the receiving machine. Once transformed, the document can be edited just as if it were originally created on the receiving machine.

According to the vendor, this product differs from other document-transfer technologies in three ways. First, it handles not only text but also the formatting instructions that are unique to each piece of hardware or word processing software. As it interprets those formatting instructions, the product draws inferences and the meaning the originator intended when the document was set up. Second, the product provides a document management system that improves access to information while at the same time



providing security. Third, it works with high-speed output devices.

The product provides compatibility among IBM Displaywriters, Wang OISS , and Xerox 860 word processors; personal computers with Samna I, Word II, or Word III; IBM Displaywrite II, or MultiMate word processing software, and Xerox 2700 and IBM 3800 high-speed laser printers. Additional transform modules under development include WordStar and dedicated word processors from Philips Information Systems, Lanier, and NBI.

The product runs on IBM mainframe computers with MVS operating system software. Samna/DART is priced from $35,000 for a basic package including document management for a specific machine format. Transform modules are $15,000 each. SAMNA CORP., Atlanta.

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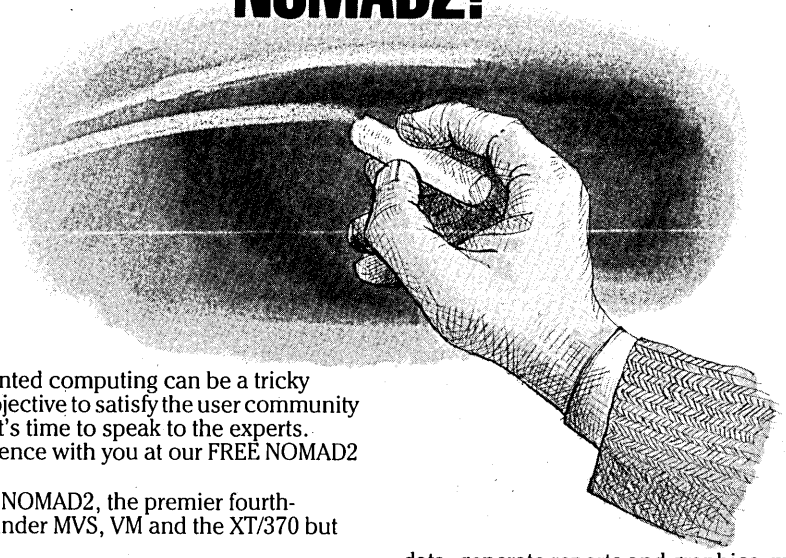

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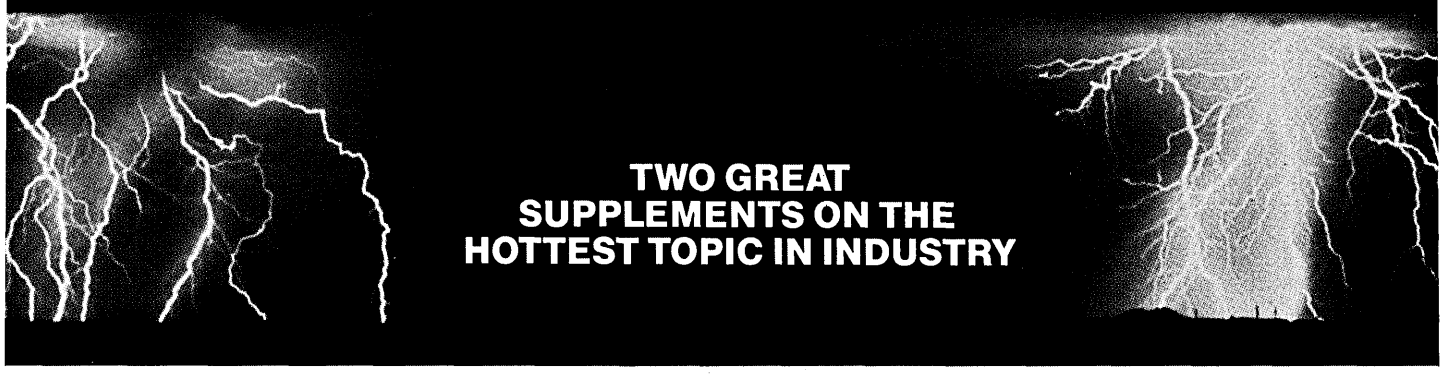

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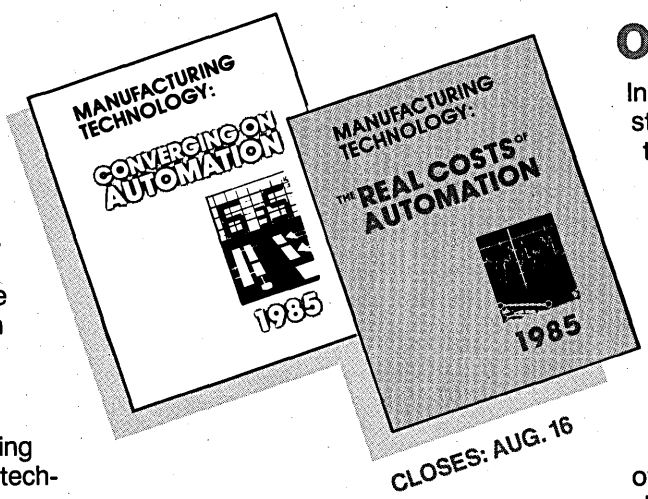

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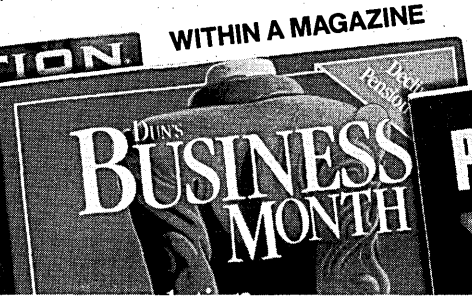

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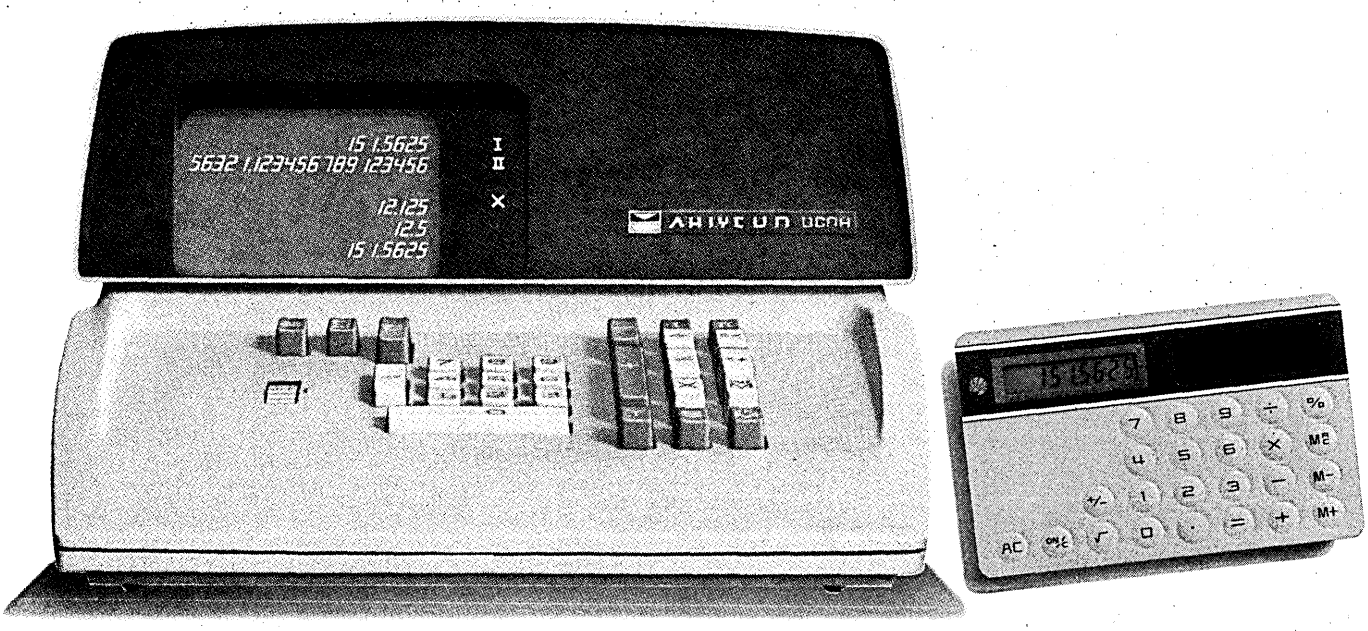

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In the beginning there was the calculator.

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BOOKS

THE CULTURE OF TECHNOLOGY by Arnold Pacey

Here indeed is a joy of a book. Precise and eclectic, *The Culture of Technology* should endure among histories and studies of technology.

Arnold Pacey's previous work, *The Maze of Ingenuity*, was used as a textbook. *Culture* is more of a chapbook. It doesn't pretend to be comprehensive, and presumes its readers will arrive with some baggage of their own.

Pacey is versatile: he can write with equal facility about rural sanitation and Francis Bacon. His scholarship is impressive and his conclusions are encouraging. Of the thousands of technology books written annually, Pacey's effort stands out as particularly sensitive and discerning.

The central point of *Culture* is that technology is not "culturally, morally, or politically neutral." Technology, as Pacey elucidates using the snowmobile as an example, comprises more than tool or machine. It is part of life, "not something kept in a separate compartment." Technology is not value-free. When the Wisconsin sportsman uses the snowmobile, he does so differently from the Eskimo trapper. How a tool is used depends on local culture. "A machine designed in response to the values of one culture," writes Pacey on the subject of snowmobiles, "needed a good deal of effort to make it suit the purposes of another." Thus, in Pacey's view, the argument that technology is amoral is specious.

Pacey is no glad-handing believer in progress as trumpeted by chambers of commerce. So it follows that he doesn't have much faith in statistical indicators of progress. He scorns the linear view of progress typically espoused by those who think physical resources will last, if not indefinitely, at least until kingdom come. Pacey also carries a few other unpopular beliefs. He has little faith in technique (by itself), or in the market's innate ability to correct imbalance.

Technological determinism holds that technology cannot be stopped; it is an irresistible and autonomous trend. To fight it would be like John Henry battling the steam drill. Technologies are seen as dominant and independent of human values. This view of society (and its future) is held by many technologists, but not by Pacey.

"Views of the future," Pacey quotes Stephen Cotgrove, "are rooted in systems of meaning that are social constructs and lack any firm objective certainties. They are faiths and doctrines." Thus, the technological imperative is nothing more than faith and doctrine.

Such technological misdirection drives "the impulse to go on inventing, developing, and producing, regardless of society's need. The result is that we create systems of organized waste in electricity supply, consumer goods, and food production, and, above all, in the arms race."

Just as technology is not only toggle switches and voltameters, it is not, as Pacey sees it, solely the domain of venture capitalists or eggheaded engineers. The author recognizes virtue in the indigenous technologies of Asia and Africa, contrary to the belief that "traditional communities outside the industrialized world have no technology of their own." Third world cultures are viewed as "vast refugee camps." Indigenous agriculture suffers as farm output declines in West Africa (while food-aid kitchens proliferate), because external directions conflict with long-standing cultural and economic conditions. Yet while local, alternate technologies are ignored, technical fixes persist.

Pacey shows that technical fixes are inadequate when not accompanied by an understanding of user demands. He cites hand pumps used in village wells in India. There were 150,000 by 1975, but two thirds were broken. The breakdowns were not solely an engineering problem; arrangements for maintaining pumps were ineffective. Correcting this improved the efficiency of the pumps.

Pacey also points to Indian efforts to control malaria during the 1950s and 1960s. In conjunction with parallel mosquito control and public health measures, dwellings were sprayed with DDT. The results were good, and experts thought the key to their success was DDT. This meant a continuing reliance on insecticide, and no other measures, which meant mosquitoes eventually developed immunity to DDT. In the 1960s there were fewer than 1 million cases of malaria a year. By 1977 there were 30 million.

This reluctance to view technology as something more than tools concerns Pacey. Technology's organizational structure may be its most insidious aspect. It is used to centralize and secure political and economic hierarchy.

Pacey shows how this organizational development leads to new technology, and not vice versa. Institutional changes must accompany specific inventions and innovations for economic expansion to occur. It was the development of the factory organization that gave James Watt the opportunity to perfect the steam engine. Richard Arkwright's spinning jenny was less significant than his achievement of "devising and administering a successful code of factory discipline." Hand workers in cottage industry could set their own pace and hours, while factory workers had to observe the procedures established by the capitalist.

Pacey acknowledges the engineer's aspiration toward a sort of mystical grace, toward a striving to dominate nature and assert order. This desire to overcome nature has been cited as one of man's highest functions. It is the heroic technology of I.K. Brunel and Gustave Eiffel. While such thrall is occasionally rewarded with noble and invigorating structures, it can get diverted toward less vaulting concerns. It is not always a benign expression of man's salient ability to transcend the limits of his environment. Pacey quotes C.S. Lewis: "Man's power over Nature often turns out to be a power exerted by some men over other men with Nature as its instrument."

Pacey doesn't like being dominated by boards of directors, think tank

ponderers, or visionary engineers. These have become "hijackers of power" rather than the servants they claim to be. Pacey sees in the actions of these leaders a move toward totalitarianism, but he does not succumb to mouthing lame slogans.

He wants a dialectic to challenge master values, to combat the tendency to think there's always one best answer to any technical problem. He doesn't look to Hegel or Marx, however, he looks to Jefferson, who praised the agrarian society while envisioning a bucolic nation of farmers. But Jefferson was also an avid supporter of science, technology, and industrialization, which would ultimately supplant his pastoral vision. He let both values simultaneously inform his actions, "his goals were progressively redefined in the light of events, and as values interacted." This is what Pacey means as dialectic: the ability to embrace seemingly heterogeneous beliefs. This ability might be what Keats meant with his theory of negative capability, "when man is capable of being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason."

What we are told in *Culture* is beguilingly simple. Conclusions uttered by scientists and technologists must be considered in light of their interests. Agronomists view the loss of topsoil as the most pressing problem of modern times, while geologists worry about the sustained extraction of bauxite and uranium. Pacey warns us to look at the hat the apologist is wearing. "Technical fact and engineering design," writes Pacey, are "expressions of world views and values, not of neutral rationality."

Scientists, like other people, are wont to express their virtuosity. As with product design (Pacey quotes designer Victor Papanek, who sees this exploited field as the "creative individual expressing himself egocentrically at the expense of the consumer"), creativity is encouraged at the expense of simpler, less stirring solutions.

In addition to whatever manipulations the technologist might undertake for economic, political, or egotistical purposes, he protects his turf as territorially as the blue jay. Particularly in large bureaucratic endeavors, it behooves the technologist to overstate his predicament to ensure funding.

There is also a supply-fix mentality that corrects a problem by enlarging supply but pays no attention to end use. This may result in overdevelopment in energy, water, and agriculture. We get what professionals supply, not what we need.

Technocratic experts view their fields as closed systems. Consultation with other fields is considered unnecessary, and consultation with the public is ludicrous. Alternate opinions are dismissed as incomplete or, worse, irrational, thus "ensuring that ideas, innovations, and doubts can only be expressed through the institution's own bureaucratic channels." This further encrusts the technology and diminishes the likelihood of finding innovative solutions.

One nice thing about Pacey's book is that it answers many of its own questions: What to do about the ascension of experts? Question them, establish contrary dialogs, look to nontraditional sources for solutions. Recognize the content of technological decisions.

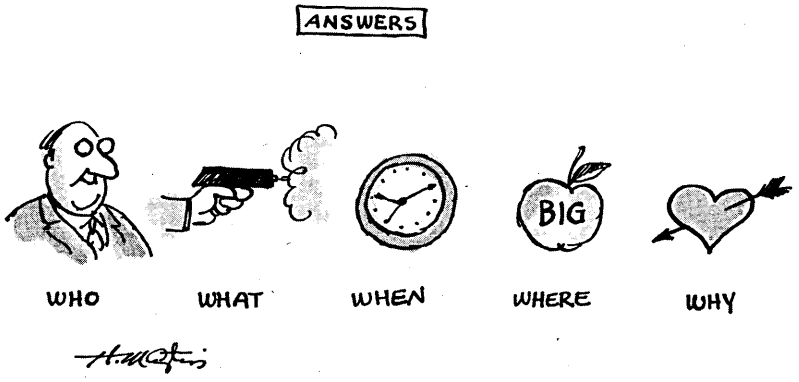
How better to manage processes? Challenge master values (like economic growth) that are imposed on the public. Encourage user/need values. How? Technocratic experts must learn to tolerate ambiguous or divergent views and stop the tunnel-visioned pursuit of rational efficiency that is carried to the point of irrationality. Reassess the "conventional view of technology as being primarily concerned with the engineering of inorganic matter."

Experts get short shrift in *Culture,* but they deserve it. "Experts from different backgrounds are notoriously in disagreement about many other technical questions." That should tip us off. Pacey says we must submit experts to rigorous, skeptical appraisals.

But Pacey doesn't merely lament the sour state of affairs, he attempts to redress some grievances. He thinks the proper role of man is not the mastery of nature, but to be in harmony with it. He considers himself an advocate of political ecology, "clearly a radical movement." But materialist economic values, the antithesis of Pacey's, are dominant in our industrial culture. Pacey, for believing that economic growth is not of paramount importance, could be branded as the type of idle lunatic who follows August Blanqui, Sergei Nechaev, Wavy Gravy, or Prince Kropotkin. But he isn't actually all that wild-eyed.

Alas, most experts won't bear Pacey in mind anyway—they don't have the time to read such non*specificae.* In a pessimistic scenario, Pacey may go unheard, a wan voice in a deforested wilderness, while experts busily assert their virtuosic master values on all of us. MIT Press, Cambridge, Mass. (1983, 210 pp., $17.50).

—by Leopold Froehlich



CARTOON BY HENRY MARTIN

BOOK BRIEF

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Here's a good book to pick up when your system's gone down and you feel like some light reading to lift your spirits. In *Sing a Song of Software,* Leonard J. Soltzberg gives his readers a sense of déjà vu. It's that familiar feeling that brings to mind a disgruntling experience but makes you laugh at the thought of it.

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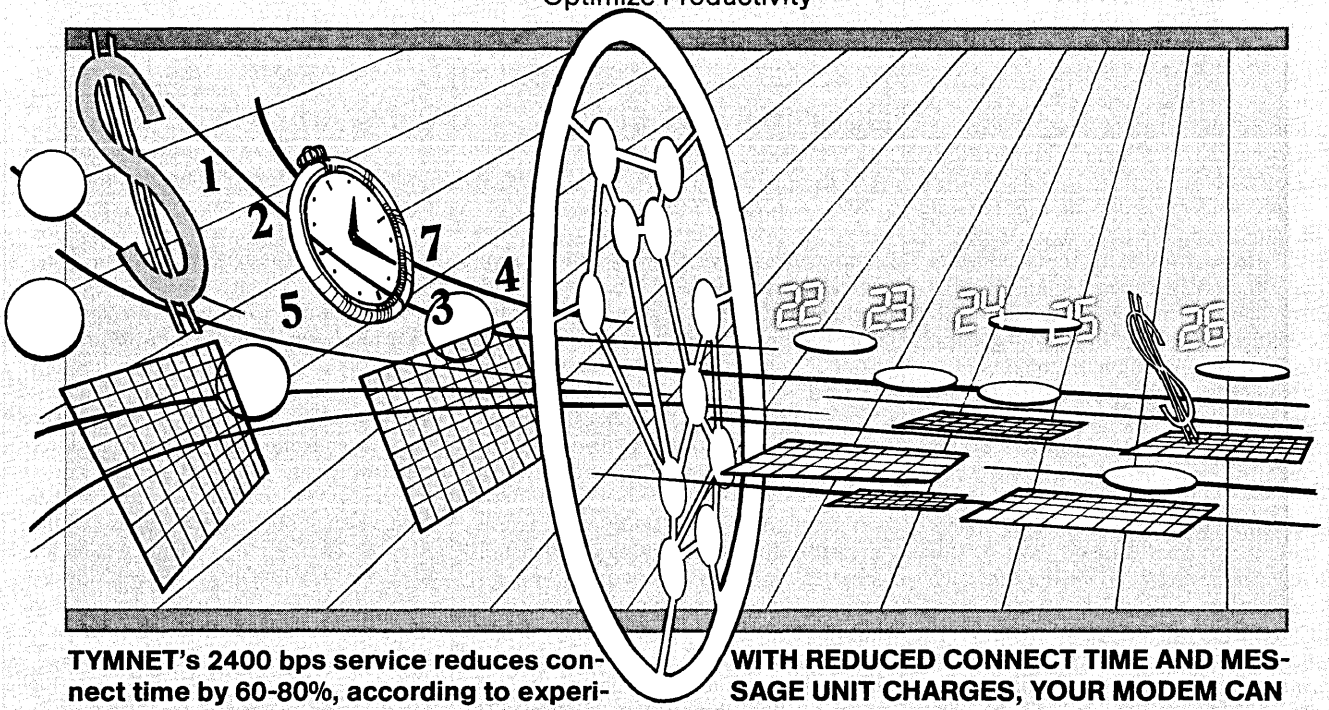

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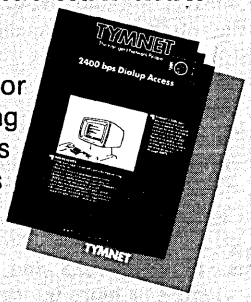

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To aid the buyer in making product comparisons and selections, descriptions of software packages include details on cpu compatibility, operating systems, language, memory required, and pricing information. The 1985 *Data Processing & Communications Security Buyers' Directory* is available for $10 from Assets Protection Publishing, P.O. Box 5323, Madison, WI 53705, (608) 231-3817.

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FOR DATA CIRCLE 350 ON READER CARD

PRIVACY AND SECURITY

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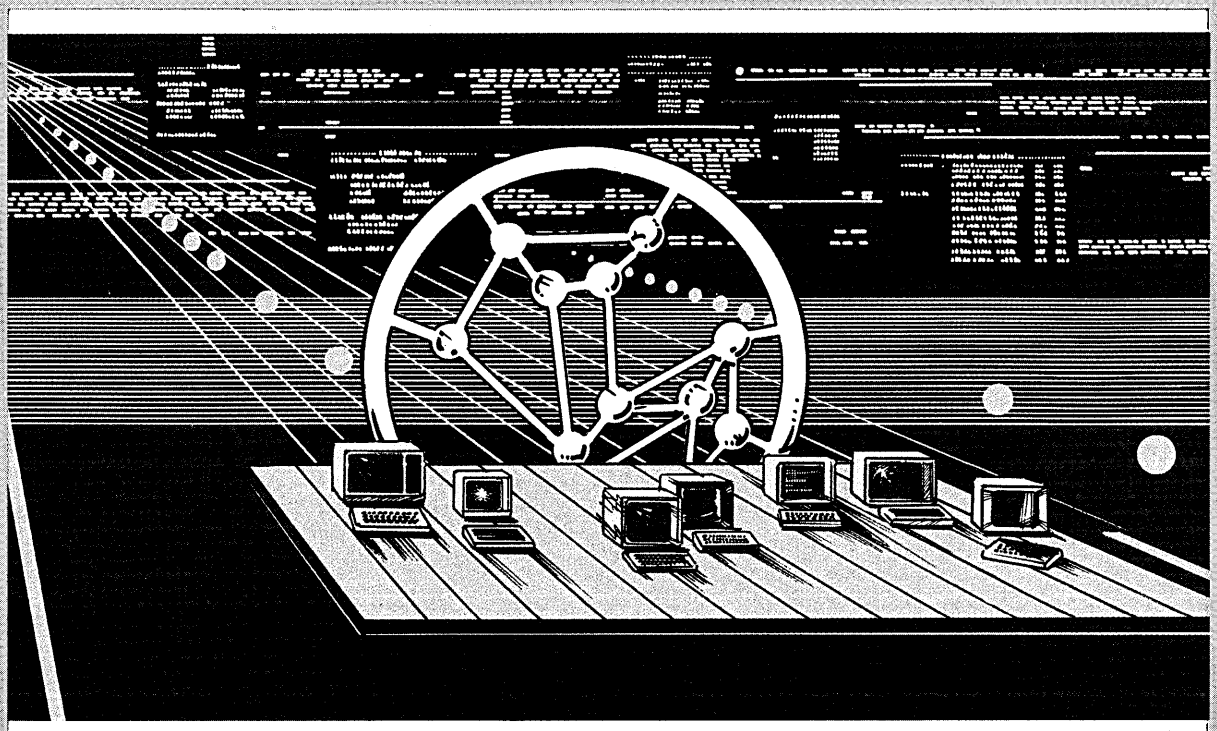

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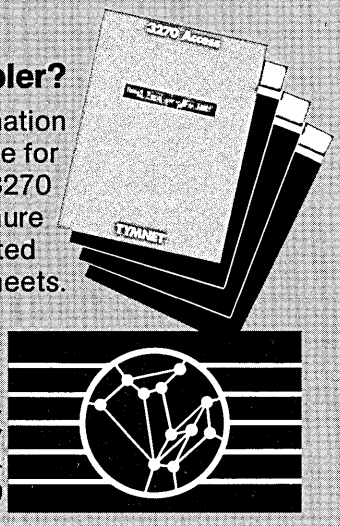

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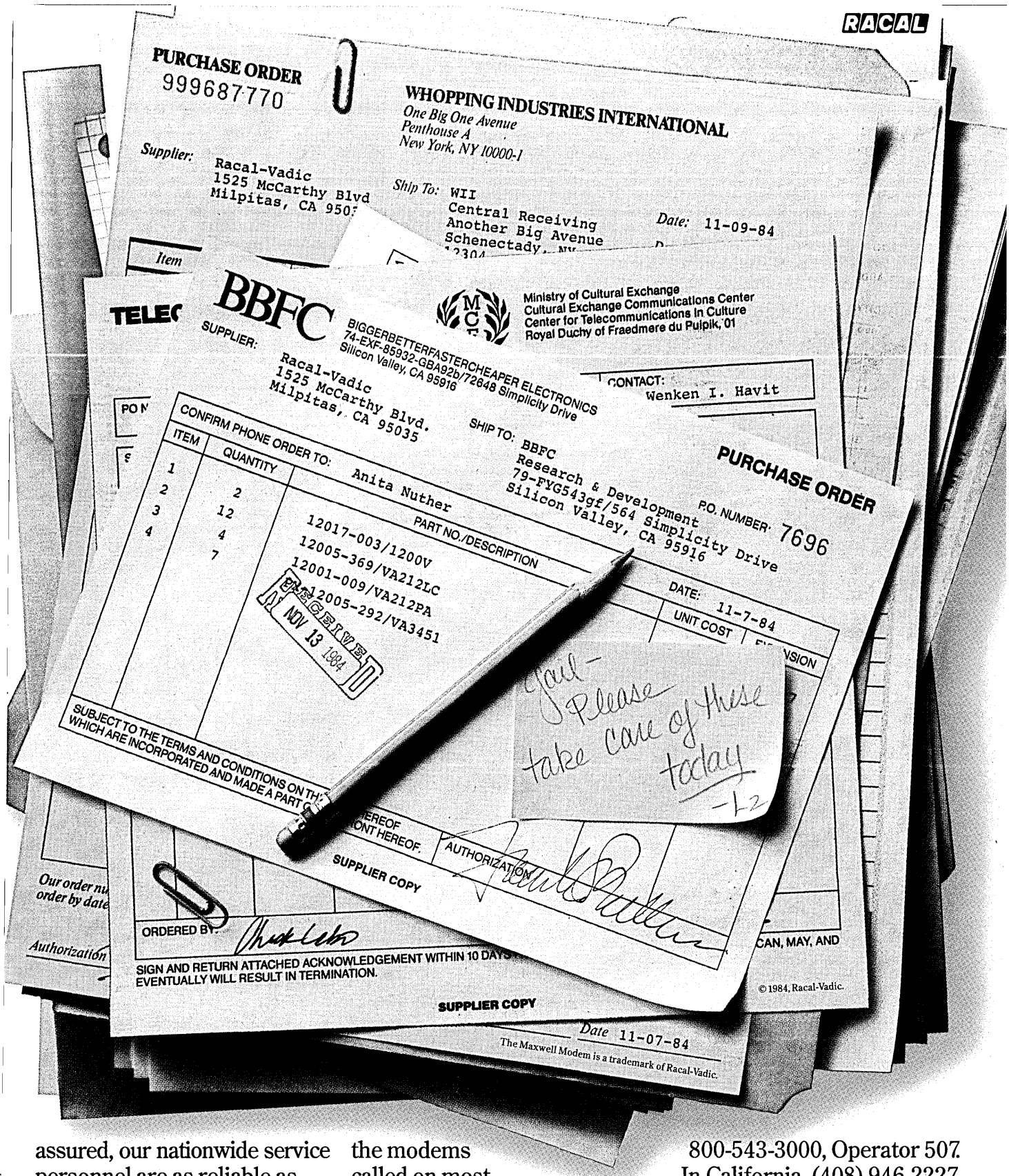

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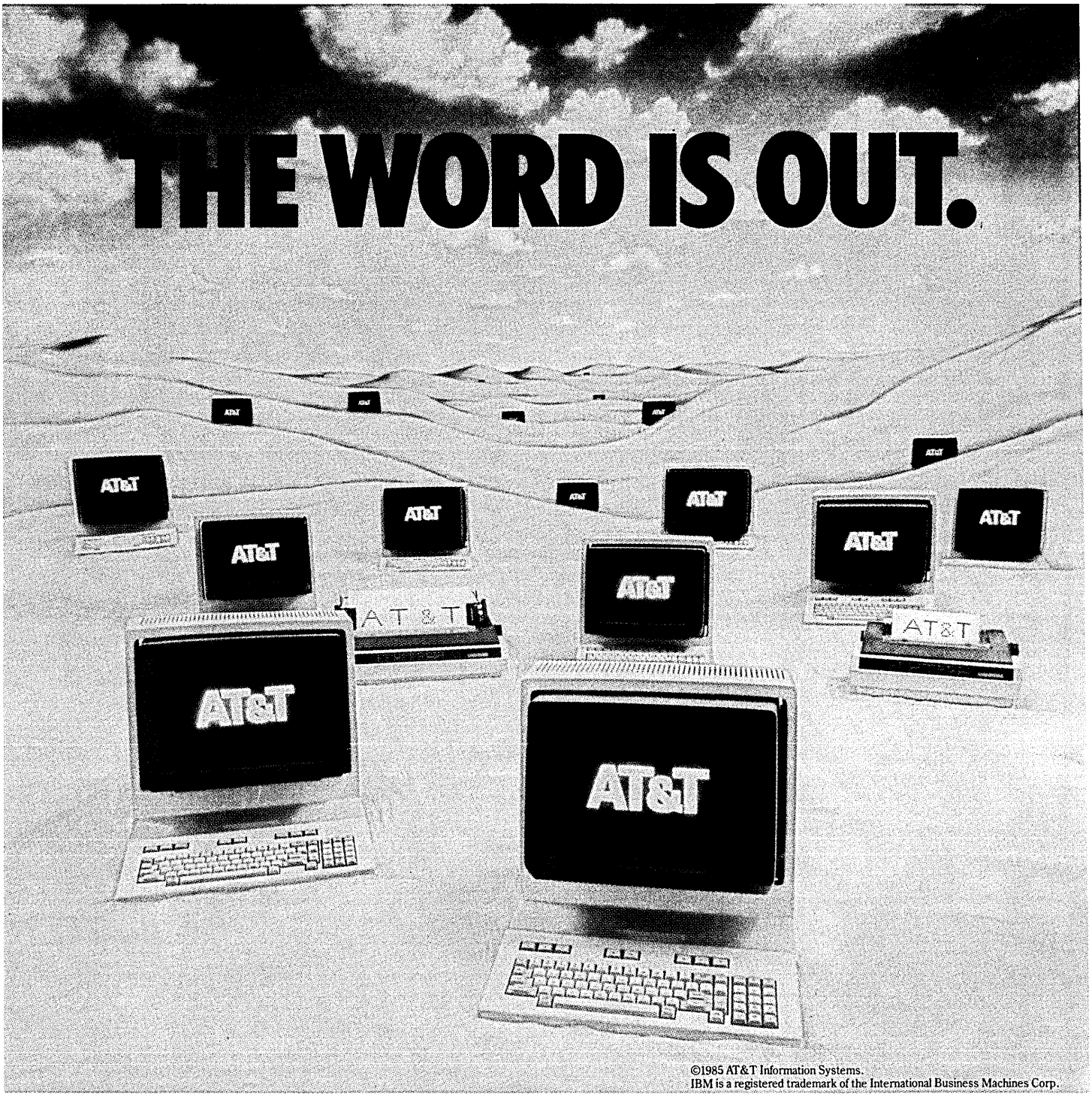

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READERS' FORUM

HACKER MEETS STAR WARS

The new Strategic Defense Initiative (SDI), Star Wars, represents a plan to put 10 million lines of code into orbit. The goal is to find, recognize, and destroy alien missiles before they destroy us. Feasibility studies are scheduled for delivery in 1990. In the meantime, it is probably premature to guess what the outcome of these studies will be, although many people are trying to do just that.

SDI relies heavily on artificial intelligence. Pattern recognition, image processing, speech recognition, user-forgiving interfaces, and the magically reassuring presence of expert systems (as if expert systems were a solution to the problem, rather than another way of stating it) will also contribute to the plan. AI will be part of the software production process too. To meet SDI's goals, AI systems are going to have to increase programmer productivity by 100 to 1,000 times its present level. I doubt this means that a programmer, who may now write five lines of code a day, will begin churning out 5,000 lines a day. More likely what they have in mind is automatic code-generation systems, driven by very, very, very high level languages.

The error rate for all this code is going to have to drop. A reasonable tolerance of three errors per 1,000 lines of code would mean 30,000 errors in the SDI as a whole, which wouldn't exactly be reassuring to the folks at home.

The real world of industry, commerce, business, and defense wants to use AI, but it wants some assurance that the expensive new expert systems it installs will actually work. Even if we choose to ignore Star Wars completely, the problem is not going to go away: the real world wants to use AI, and its demands include software quality. Look at air traffic control. It would be dandy if some bright, new expert systems could take over the job of scheduling and controlling takeoffs and landings at our biggest airports. But they can't make mistakes. Nobody would be happy with three crashes in every 1,000 takeoffs.

The real world has been working on its own answers to software quality problems for the past 20 years, beginning with IBM's billion-dollar disaster of timesharing software for the System/360. At first the answer was called structured programming. Eliminate GOTO statements and your code will always run right the first time. This also meant adding chief programmer teams, program libraries, structured walkthroughs, and something called egoless programming, which says you shouldn't take pride in your work.

Then came software engineering, which included everything from program design languages to software metrics, all intended to increase programmer productivity and improve the quality of programs. SE is taken very seriously by people in the real world. It means actually thinking about a program before you start writing it, letting other people read and perhaps understand what you have written, and, above all, writing programs that do useful things well—from the customer's point of view, not necessarily your own.

SE emphasizes such qualities as reliability, maintainability, and transportability in commercial software. It looks on programs in the same way that you look on a new car; it should run well, rarely break down, and be easy to repair and cheap to operate. To obtain these nice things, you need design specifications, supervision, and inspections. Then you need some way to maintain the finished product.

Values like these have never really penetrated the AI laboratory. Words like reliability never show up in the AI literature. The problem is that the hacker's point of view is totally opposed to that of the blue meanies, who expect order, responsibility, and correctness at the expense of beauty. Could any hacker submit to "egoless programming?"

The answer is yes, of course. But only by trading his or her soul for money. Since hackers are our best programmers, they shouldn't have any trouble writing programs in Ada. They shouldn't have any problems providing specification statements, detailed system designs, program documentation, software trouble reports, or any of the rest of the materials required by software engineering. They shouldn't, but they will.

An interesting observation resulted from an internal research project conducted at the IIT Research Institute, Rome, New York (part of the Illinois Institute of Technology), where I am a research data analyst. It became painfully clear that AI programmers are not likely to accept software engineering requirements gracefully. The reason is simple: you don't write AI programs in general purpose languages, and you don't develop AI systems the way that you develop large commercial systems. The two worlds—the world of the hackers and the world of the straights—are heading for a major crash when the SE people find they cannot buy AI systems that fit their role models.

Perhaps we can avoid that crash by calling attention to the danger it presents to both worlds. First, it is clear that the real world needs and intends to use AI. Expert systems are mentioned most often, although not always with enthusiasm, but other AI areas are also included in plans for the future. The whole range of AI technology, with the possible exception of chess-playing programs, is gleaming in the eyes of commerce.

Second, research has shown that the real world wants programs that work right every time, and they think SE is the way to get them. SE means a disciplined programming environment, with supervision, reports, and automated counts of the number of lines of code that each programmer produces. SE is Ada, Pascal, COBOL, and FORTRAN, not Lisp, Prolog, or POP-2.

Third, the AI community is being pulled in two directions. The lure of big money and the hope of working on a

project that has some really useful purpose are pulling one way. Our antiestablishment, proaesthetic hackers' souls, which may be the real genius of AI, are pulling the other way. And we are all hackers under our business suits.

But the conflict is mostly imaginary. It is possible to write AI programs that function reliably. Most of the computer games were written by hackers, not establishment types, and a game has to meet reliability requirements that are at least as high as those for an airliner's control system. Did you ever see Pac-Man crash with a software error?

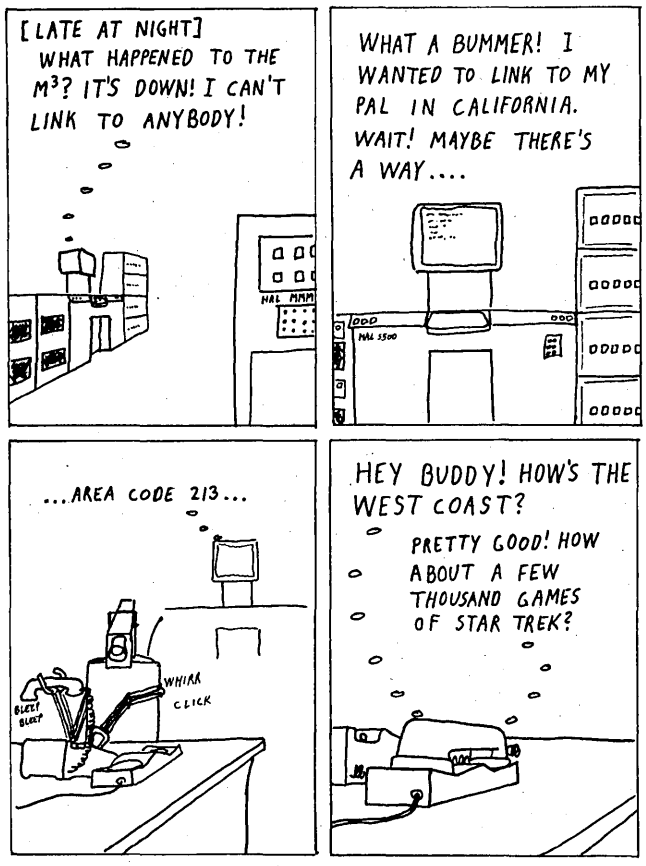
Lisp programming environments are beautiful, integrated, and comprehensive, although they don't include any of the reports required by the software engineers. They are capable of producing very large systems efficiently and correctly. They should also be capable of producing the reports and schedules that commercial managers demand. If you want to do business with the real world, you must do it in a businesslike way, and Lisp environments can be very businesslike when they want.

The AI world has never had a shortage of salespeople. Self-puffery is a hallmark of the big names in AI. What it has not had is a sense that AI systems can be reliable, maintainable, portable, and genuinely useful, and that these qualities can and must be demonstrated in the language of the real world. That language is the language of software engineering.

The IIT project has developed a set of software metrics—measurements of such things as the complexity of programs—for use with Lisp programs. It has also shown how the usual software development cycle must be modified in order to apply it to AI systems. But most important, we found that AI programs can meet commercial software standards without neglecting the hacker's creative, artistic spirit.

—John M. Morris
Rome, New York

DIGITS BY ROY MENGOT



ROTTEN TO THE CORE

With the introduction of the PC Brat, programmers will have to change their ways of thinking. No longer can they say smugly to the layperson, "Oh yes, layperson, the computer is like an idiot child; it will do only what you instruct it to." Not anymore! This child will do what you code (sometimes), but it will also do what it chooses, unless told not to. To manage the PC Brat, you'll need to use some of these new commands:

DONT	used in DONT loops DONT 25, I = 1,1000 (If I told you once, I told you a thousand times, no!)
STAY AWAY FROM	equivalent to DONT GO TO IF (SCHOOL.EQ.OPEN) STAY AWAY FROM VGAMES
FINISH	used after a DO loop to make sure it gets done FINISH 25, I = 1,1000
OR ELSE	usually follows a FINISH command
DONT INTERRUPT	to prevent output during input DONT INTERRUPT WHILE (E.EQ.OUTPUT)
GET OFF	to clear telecommunications line for priority GET OFF DAT.TCOM
WRITE NOW!	often used to modify GET OFF
CLEAN UP	combination clear and sort CLEAN UP ROOM [WRITE NOW!]
INPUT/OUTPUT	essentially a NOP, normally ignored INPUT EAR(1)/OUTPUT(OTHER)
TURN OFF	to clear random and spurious noise TURN OFF DAT.NOISE [WRITE NOW!]
ONE MORE BIT/CHARACTER/ WORD OUT OF	usually used in WORD mode ONE MORE WORD OUT OF . . . .
KEEP IT UP	equivalent to CONTINUE, but more sarcastic
ASKYOUR n	direct inquiry to device n ASKYOUR FATHER (direct inquiry to remote device)
WAIT TILL	delay GETIT until designated task completed WAIT TILL (YOURFATHER.GETS.HOME)
GETBACKHERE	equivalent to RETURN AND—used before FINISH

Following are some programming hints:

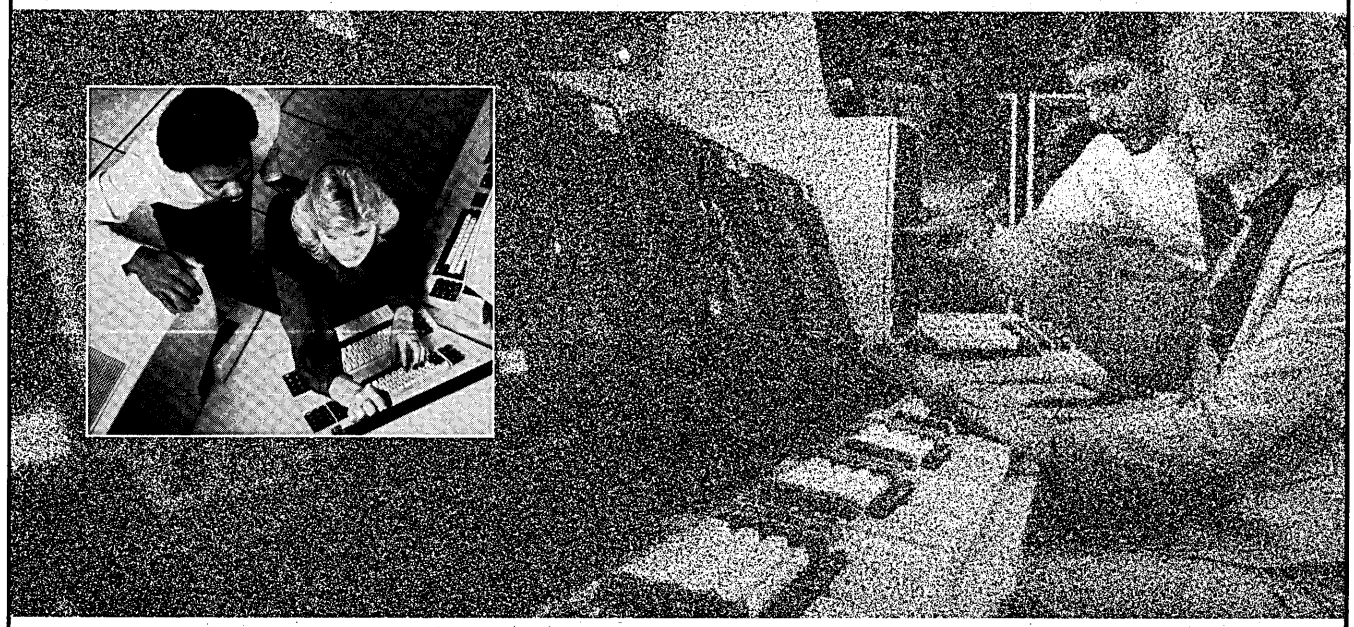
The PC Brat runs best in NAG mode.

DO loops should be followed by the GETBACKHERE and FINISH commands. Put all this code inside an outer loop until task completed. Further nesting may also be used, depending on the programmer's maternal instincts.

Verify all output, but not in front of Brat. If problems persist, consult a specialist like Brats' Town. They, of course, will say, "There's no such thing as a bad Brat. It just needs tender, loving (soft) ware." What's a programmer to do?

—Edmund Conti

REAL-TIME INNOVATION



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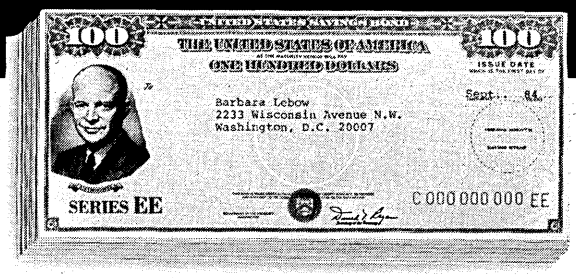

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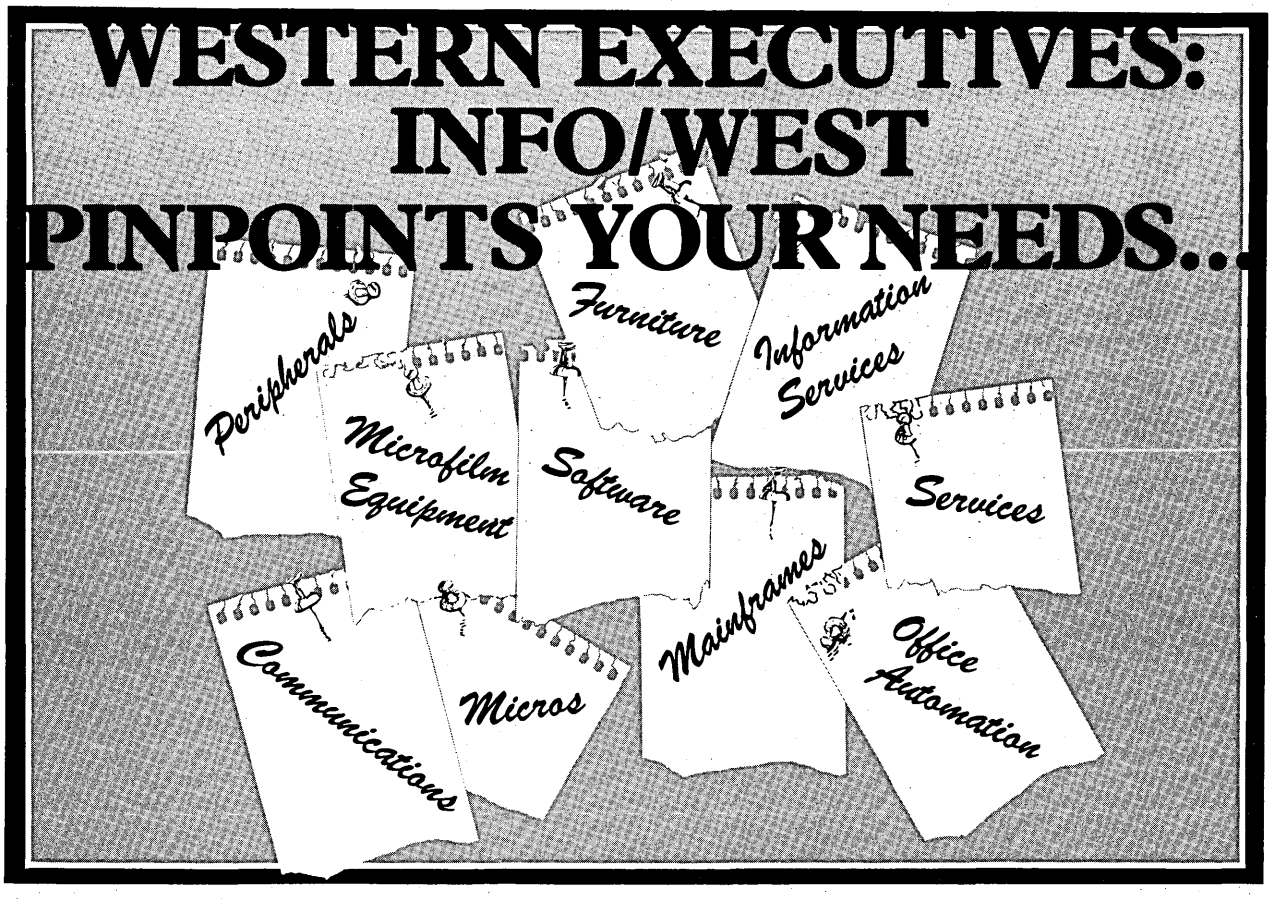

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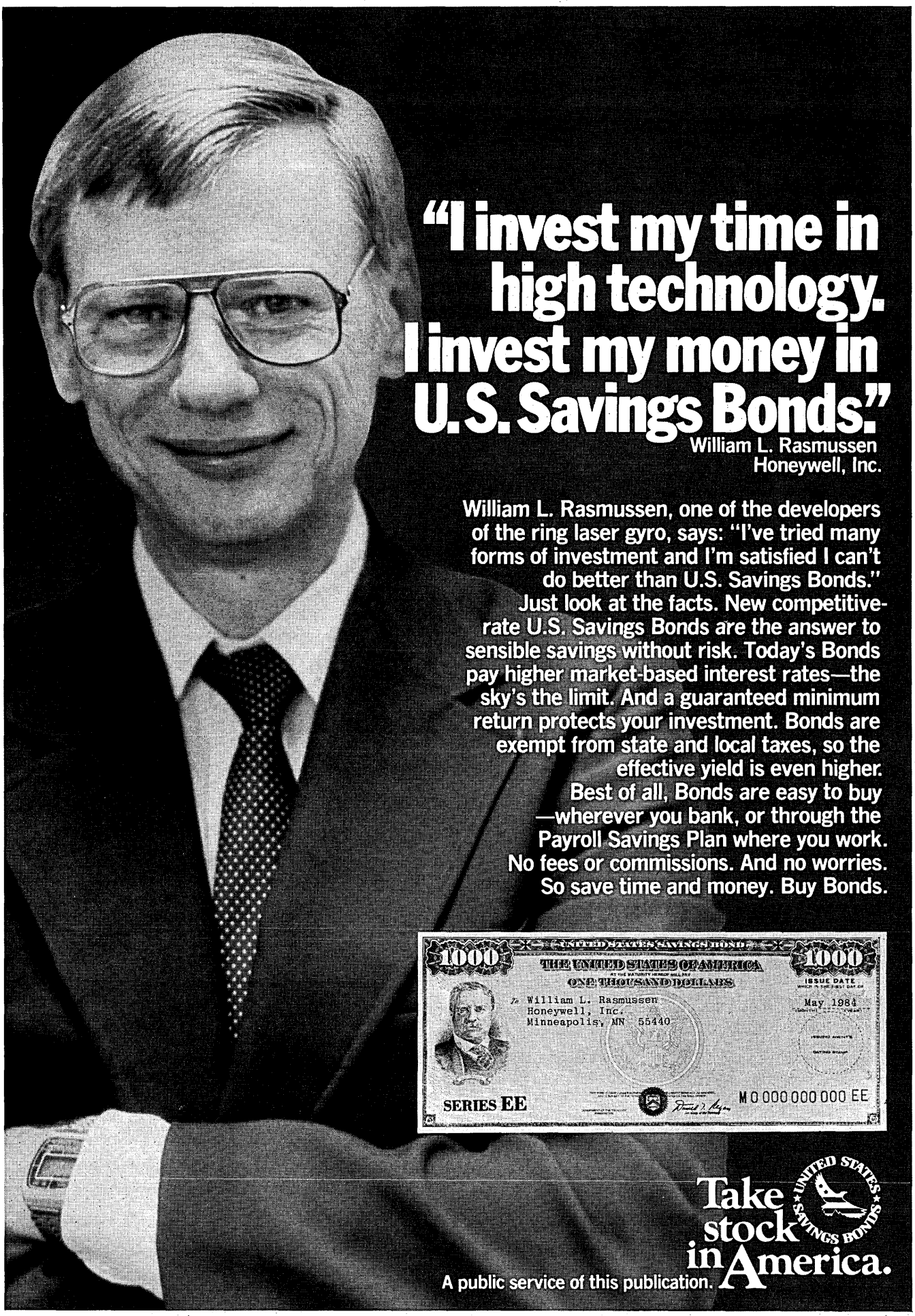
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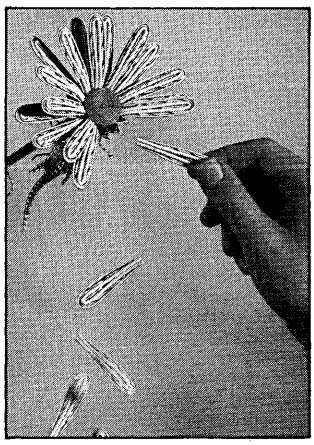

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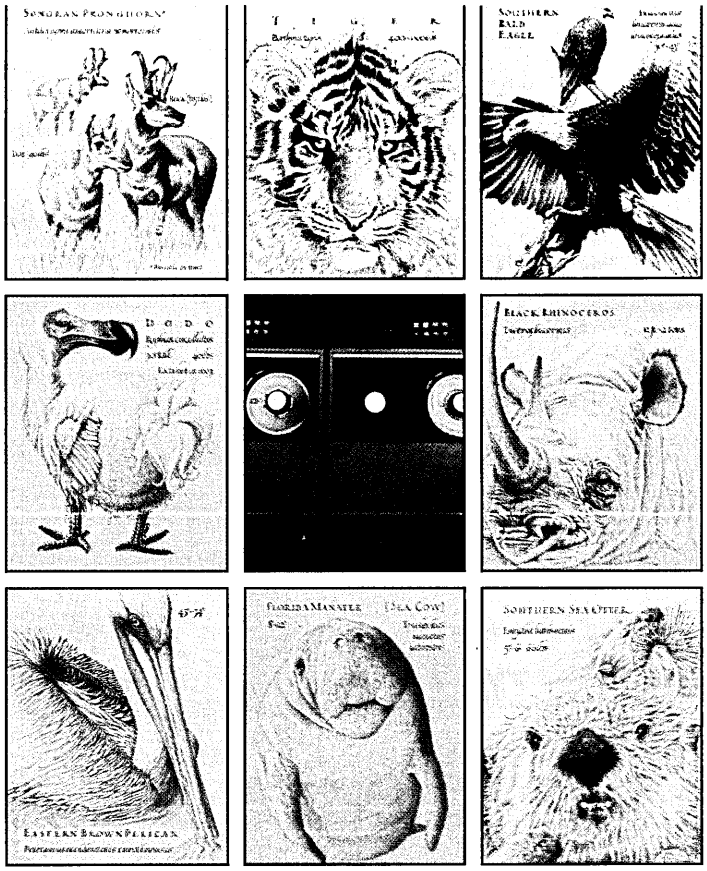

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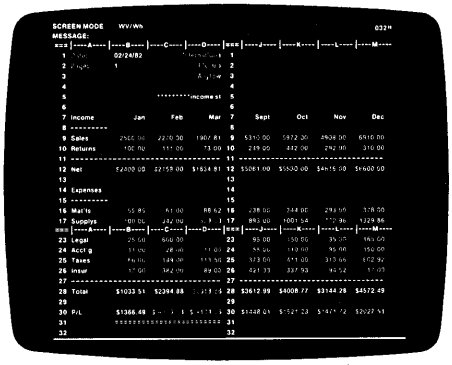

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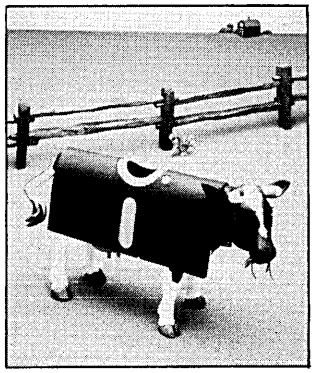

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**Computerworld, August 20, 1984*

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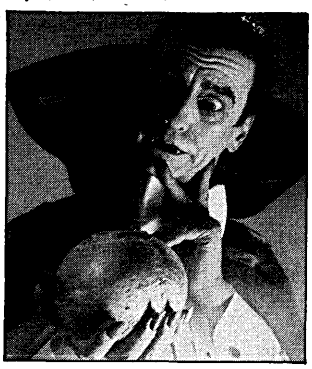

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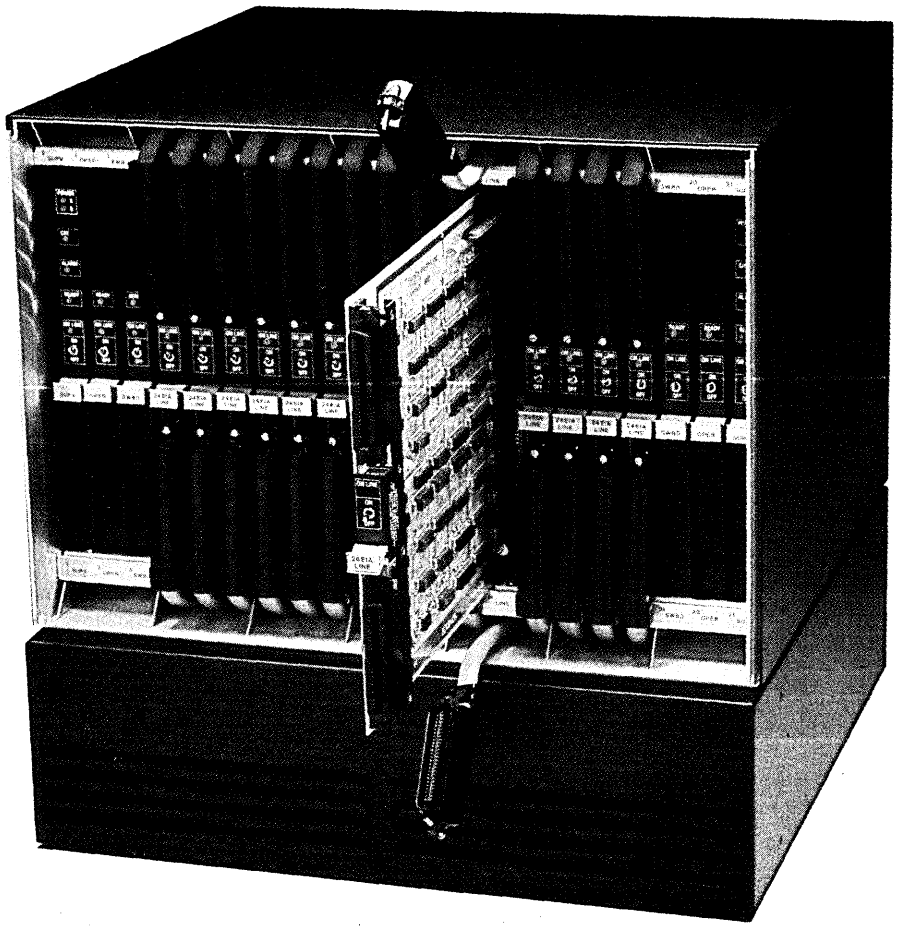

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Don Finello, Vice President of Data Processing at Subaru of America states, "At Subaru, MAPPER isn't just a report generator. Management, Accounting, Sales, Parts, Advertising—all departments use it."

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For more information or to arrange a demonstration of the MAPPER system at the Sperry Productivity Center nearest you, call toll free, **800-547-8362.** Or write, Sperry Corporation, Box 500, Blue Bell, PA 19424-0024.

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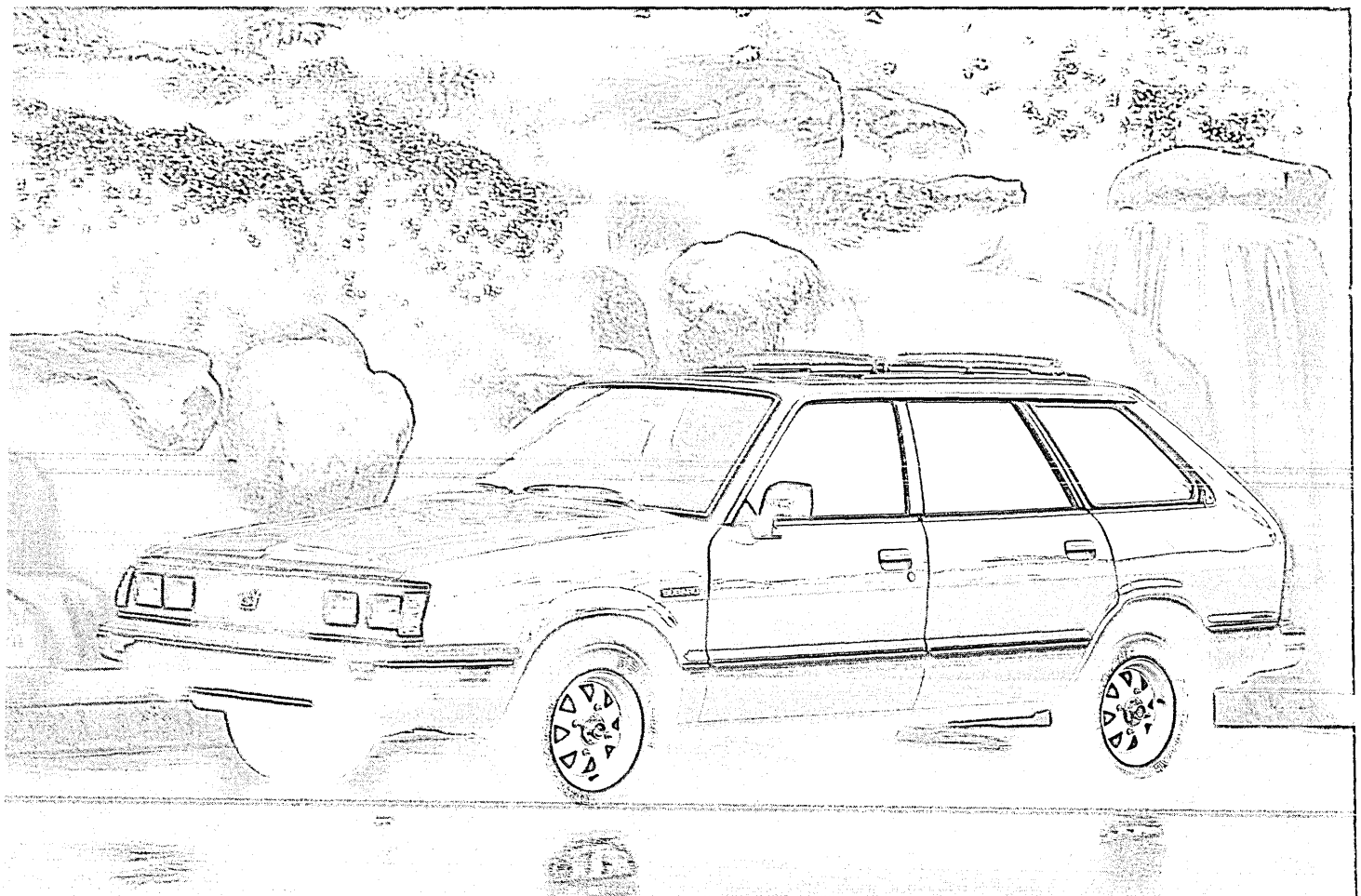

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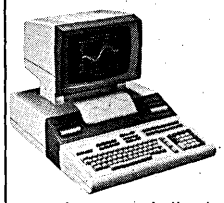

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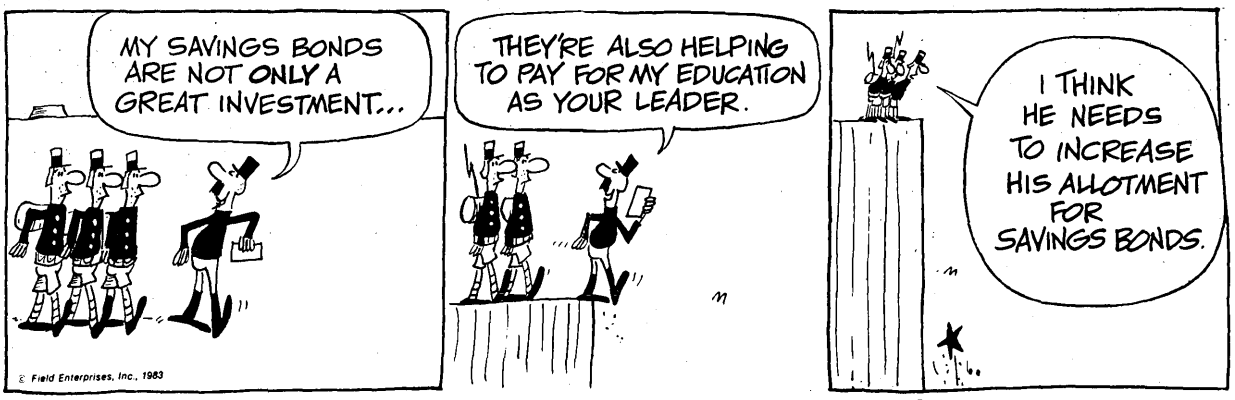

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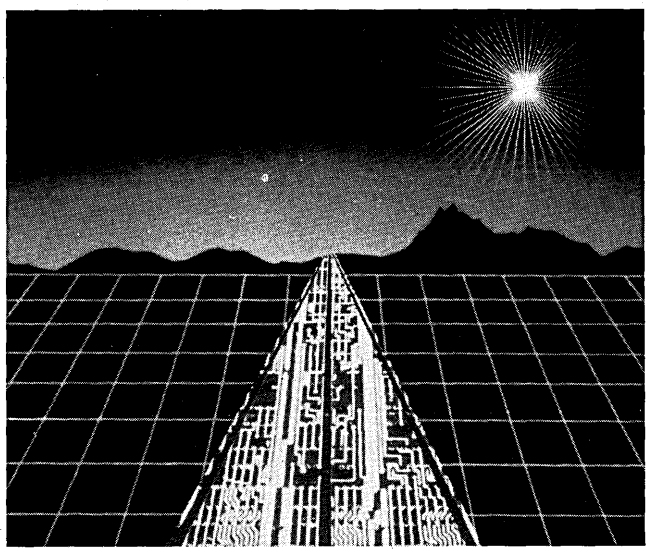

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6. DIRS will then ask for your inquiries. Respond by entering the inquiry numbers you wrote below and again, follow each number with a "#" sign. Answer questions with a "9" for YES (the number "9" has a "Y" on it), and a "6" for NO (the "6" has an "N" on it).

6A. Mailing Label ID number ☐☐☐☐☐☐☐#

6B.

1. ☐☐☐#	4. ☐☐☐#	7. ☐☐☐#	10. ☐☐☐#
2. ☐☐☐#	5. ☐☐☐#	8. ☐☐☐#	11. ☐☐☐#
3. ☐☐☐#	6. ☐☐☐#	9. ☐☐☐#	12. ☐☐☐#

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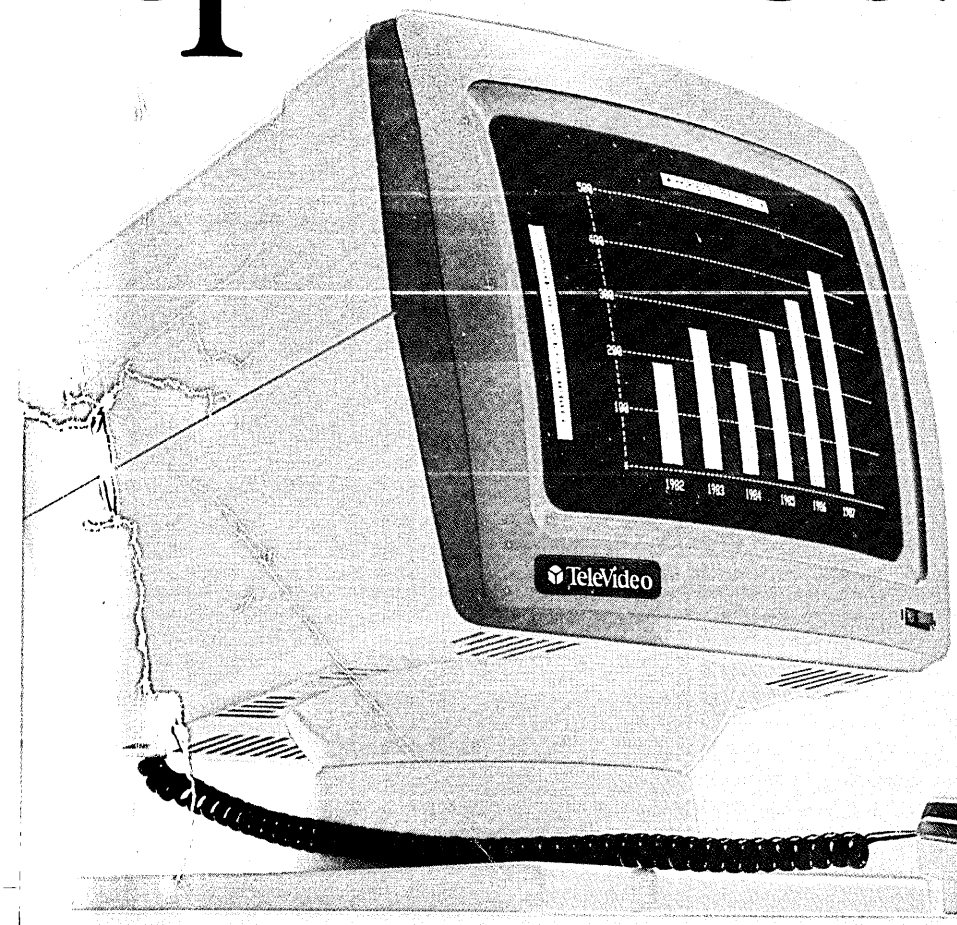

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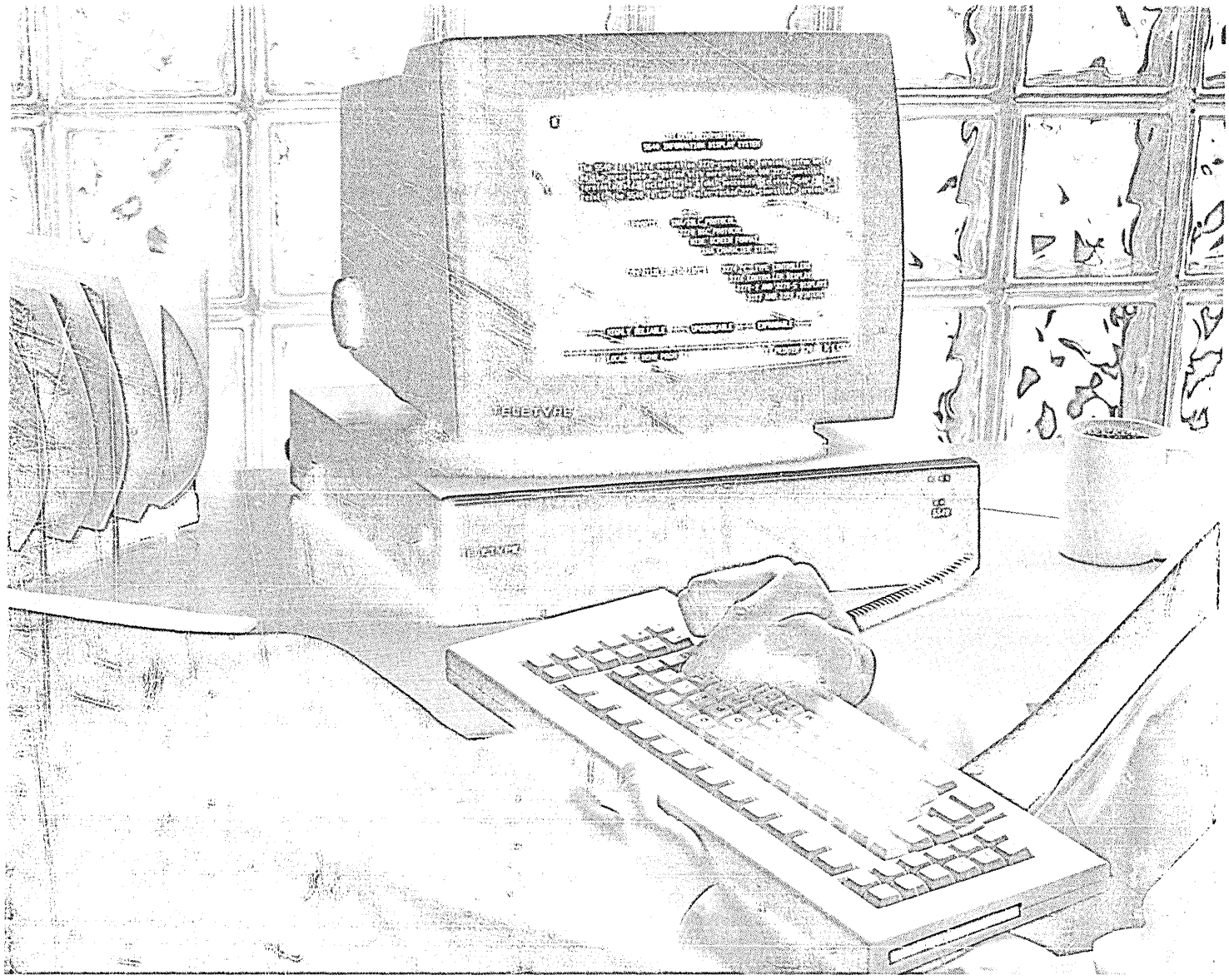

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