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The drive is effectively a ½" ta... smaller package.

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Protects the cartridge from damage if cartridge ...ams. This is accomplished by sensing a current ...urge and then disabling the motor, thus ...suring that the cartridge will not be damaged.

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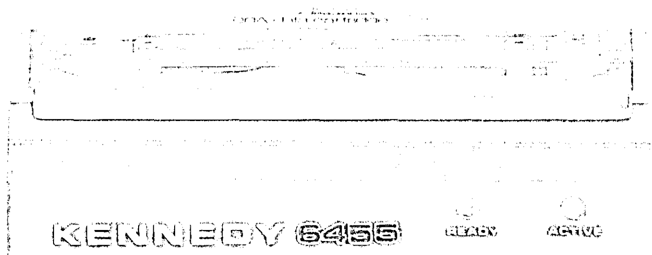

K... ...ut It'

Are You a DEC PDP-11 or VAX-11 User?

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Now DEC users can interface remote terminal clusters directly to their Unibus without making *any* hardware or software changes. MICOM's Series 11 Bus Driver™, an all-in-one asynchronous interface for DEC PDP-11 and VAX-11 computers, provides simultaneous support for both statistically multiplexed remote terminals and local terminals through the same multiplexor — each remote cluster simply plugs in as if it were an individual local device.

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Prices start at $6,300 for a system supporting a remote cluster of up to 16 terminals plus 15 more local devices. Call or send today for a brochure describing the Bus Driver and its applications.

Need a better way to get to your remote terminals?

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Candle Corporation – a software company supplying performance monitoring programs to MVS, CICS, and IMS installations.

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Candle is currently introducing a series of IMS products. OMEGAMON/IMS™, RTA/IMS™, and DEXAN/IMS™ will provide realtime windows into IMS problems, response time and degradation. EPILOG/IMS™ will perform in a background mode looking for and diagnosing response time problems.

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The Candle Computer Report is a newsletter that explores current topics and news in MVS, CICS, IMS and IBM hardware. It is provided free to IBM and IBM compatible installations.

CIRCLE 5 ON READER CARD

DATAMATION®

JULY 1983/$4.00 U.S.A.
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This issue, 162,130 copies

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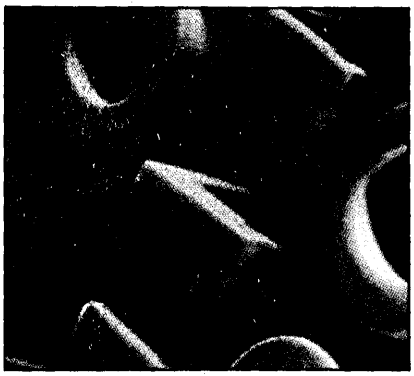

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OEM SUPPLEMENT 222-1

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Circulation Manager Joseph J. Zaccaria
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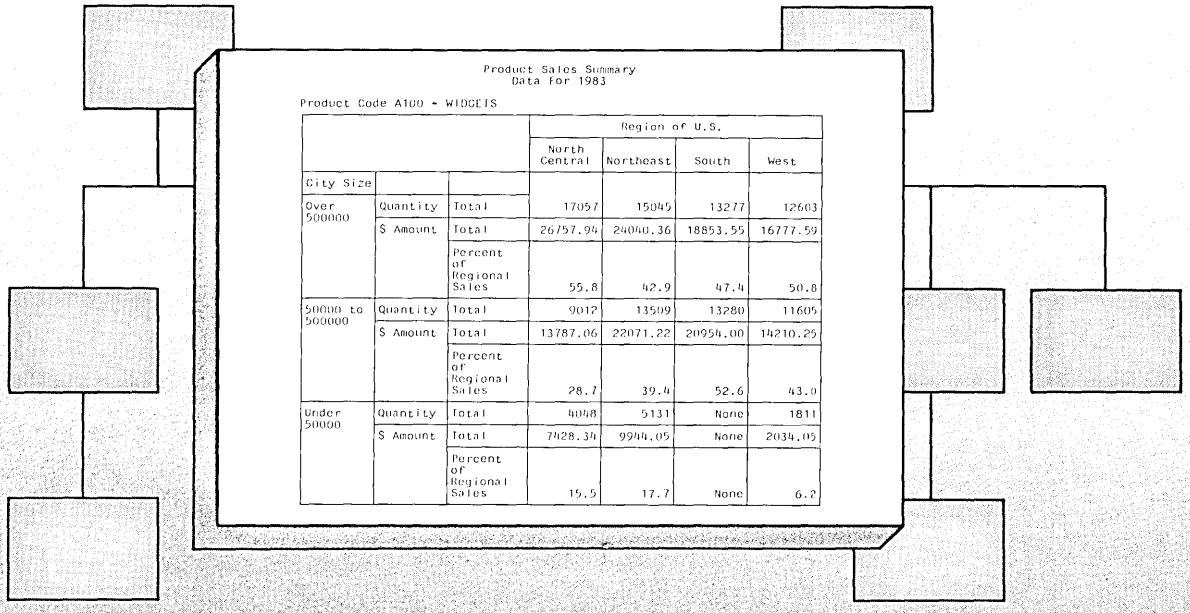
IMS-DL/I programmers
SAS users

SAS/IMS-DL/I saves you time



Product Sales Summary
Data for 1983

Product Code A100 - WIDGETS

			Region of U.S.			
			North Central	Northeast	South	West
City Size						
Over 500000	Quantity	Total	17057	15045	13277	12603
	$ Amount	Total	26757.94	24060.36	18853.55	16777.59
		Percent of Regional Sales	55.8	42.9	47.4	50.8
50000 to 500000	Quantity	Total	9012	13509	13280	11605
	$ Amount	Total	13787.06	22071.22	20954.00	14210.25
		Percent of Regional Sales	28.7	39.4	52.6	43.0
Under 50000	Quantity	Total	4048	5131	None	1811
	$ Amount	Total	7428.34	9944.05	None	2034.05
		Percent of Regional Sales	15.5	17.7	None	6.2

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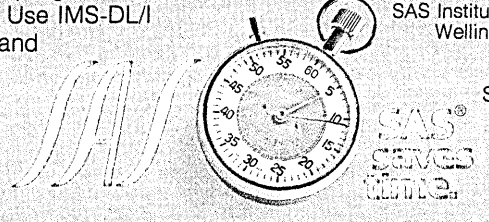
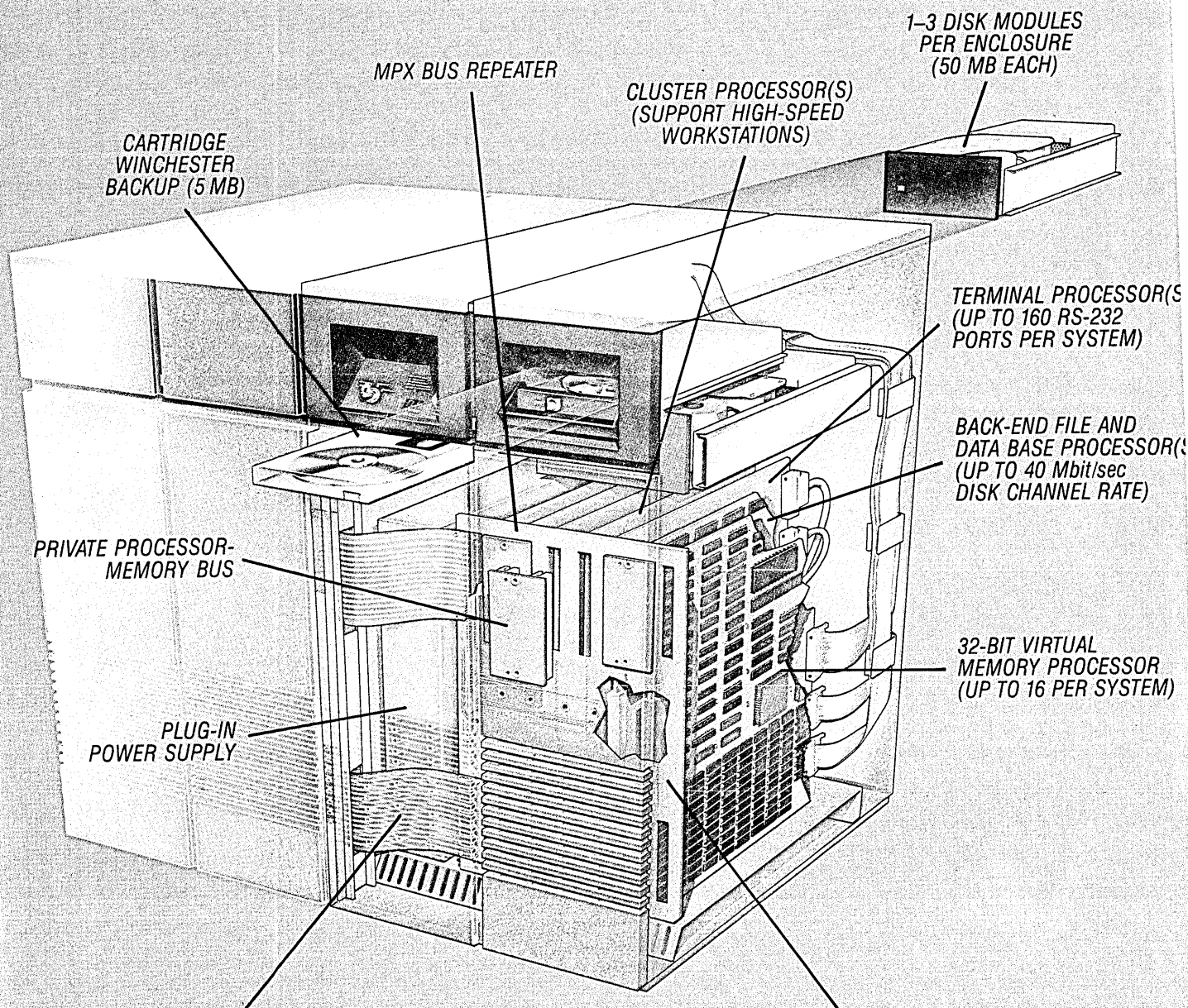


MEGAFRAME™

Now you can let DEC, DG, and H-P play catch-up with you.



☐ **Supports multiple operating systems (including UNIX) simultaneously sharing files and resources.**

☐ **Multiple specialized processors distribute the workload to achieve outstanding performance.**

☐ **Designed to support workstations and terminals to achieve a least-cost fit for any application.**

☐ **Low-cost processor modules provide incremental expansion from 8 to 128 users.**

Computer manufacturers and system builders face tough demands these days—demands that are just about impossible to meet with conventional hardware. So Convergent designed Megaframe: a highly unconventional new system. Its innovative archictectural features solve with one stroke the major problems of multiuser system design.

The Distributed Mainframe: Multiple processors, multiple operating systems.

Programs in a Megaframe system run on up to sixteen virtual-memory Application Processors—each with a 32-bit CPU, private RAM, and UNIX operating system kernel. But when a program needs to access a disk, communications line, or other system resource, the request is sent to one of the specialized high-performance service processors. So the application's I/O overhead is reduced to virtually zero.

But that's only the beginning. You can add separate processors to the Megaframe to simultaneously run completely different operating systems—like CTOS,™ which provides real-time multitasking and supports attached clusters of Convergent workstations.

The independent File Processors function as powerful back-end Data Base machines, providing relational DBMS, ISAM, and other disk-related services, with fully transparent file sharing by all operating systems.

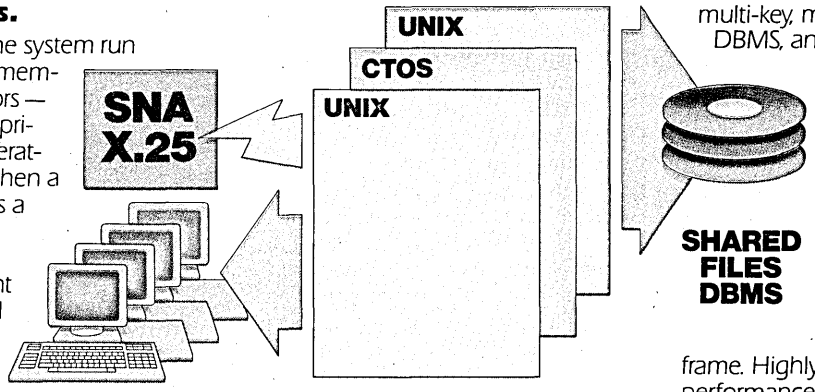
Megaframe's dedicated front-end Terminal Processors and Cluster Processors offload user communications from the Application Processors, ensuring fast, flexible response. They also manage access to facilities like SNA and X.25 networks, print queues, local-area networks, etc.

Configurable to exactly match application load profile

The various Megaframe processors can be installed in multiples, depending on the requirements of the specific application.

CPU-intensive jobs can utilize multiple Application Processors and expansion RAM. Systems with heavy disk usage can distribute this load among several File Processors. And the number of user ports can be expanded at any time by installing more Terminal Processors and/or Cluster Processors.

Modularity even extends to disk storage. Compact, 50-megabyte Winchester modules simply plug in—up to four per cabinet. High-capacity



SMD devices can be attached via a separate intelligent interface processor. File backup utilizes compact Winchester cartridges, ½" magnetic tape, or both.

Multiple cabinets daisy-chained for up to 8 MIPS and 128 users

A minimum Megaframe system supports 16 users efficiently for about $20,000—quantity one. As needs grow, Megaframe grows—to a 128-user system, with up to 8 MIPS execution, 24 MB of error-correcting RAM, and 21 billion bytes of disk.

Megaframe software: ready-made solutions

Megaframe offers system builders an extremely wide range of choices in application development tools.

If the chosen configuration includes Cluster Processors, then any software running on an existing Convergent cluster can be supported unchanged.

Inclusion of one or more Application Processors allows running UNIX System V. All standard UNIX tools including C are included, along with COBOL, FORTRAN 77, a BASIC interpreter and compatible compiler, plus Pascal.

Communications options include 3270 and 2780/3780 emulation (both Bisync and SNA), X.25, and Convergent's media-independent network software.

Data management facilities include multi-key, multi-user ISAM, relational DBMS, and a powerful ad hoc query language and report generator.

Megaframe: The solution with staying power

No system has ever combined the power, flexibility, and expandability of the Megaframe. Highly cost-effective at any performance level from "supermicro" up, with a per-user cost that will embarrass DEC, DG, and H-P, Megaframe is the ideal solution when needs are unpredictable or subject to rapid change.

Megaframe represents a true turning point in computer system evolution. The direction for the future is clear. Join us...don't be left behind.

For more information about the new Convergent Megaframe call (800) 538-7560 (in California (408) 980-0850), or write:
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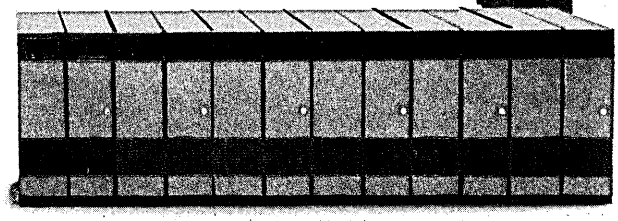
Santa Clara, CA 95050



Convergent Technologies

Where great ideas come together.

CIRCLE 8 ON READER CARD

Twenty Years Ago/Ten Years Ago

LOOKING BACK

TO B, OR NOT TO B

July 1963: At the end of March, Burroughs delivered its first B5000 system to United Technical Center, a division of United Aircraft, in Sunnyvale, Calif. Initial hardware tests used a prototype Master Control Program and an extended ALGOL '60 5000 compiler. Using a FORTRAN translator, the B5000 handled a rocket analysis problem, translating it into ALGOL.

A second 5000, installed at NASA Huntsville, included one processor, four consoles (three slightly remote), four I/O channels, four memory modules (with four more on order), a 700 lpm printer and 12 tapes, plus some special telemetry coupling gear that acted as four pseudo-tapes.

Both of these systems were in acceptance testing by mid-June. The system had been a little slow in getting off the ground, but Burroughs was now flying high with eight installations and two more scheduled deliveries in July. The other 5000s went to Northern Natural Gas, Dow Chemical, and the Los Angeles Board of Education; three were in-house.

As for software, Burroughs claimed its extended '60 ALGOL compiler was completed with the addition of I/O in early June. Some of the goodies added to the '60 ALGOL included stream procedures for handling character-oriented logic, the ability to handle partial word fields, and symbolic monitor and dump debugging aids. COBOL, minus the SORT construction, was being used to debug customer programs, and was supposed to have been ready sometime in July. A final-format MCP was installed in June, although the company planned to do more work on it. The installations at UTC and NASA both reported that the FORTRAN translator was running well.

MINIS COME HOME

July 1973: DATAMATION published two pieces on the impact of minicomputers; the first one, by W. David Gardner, then New England bureau manager, reported on some of the more novel applications that minis were being used for.

While most of the minis in homes were still being used by scientists and technicians in their work, it was felt that someday there would be more interest in minis as "novelty luxury items" by people without technical backgrounds. While no one actually bought any, Honeywell even offered a so-called "kitchen computer" through Neiman-Marcus that was programmed to provide menus and recipes from five famous cookbooks.

Even Edson de Castro, president of Data General, thought minis could be used as novelty items for "playing chess or other games."

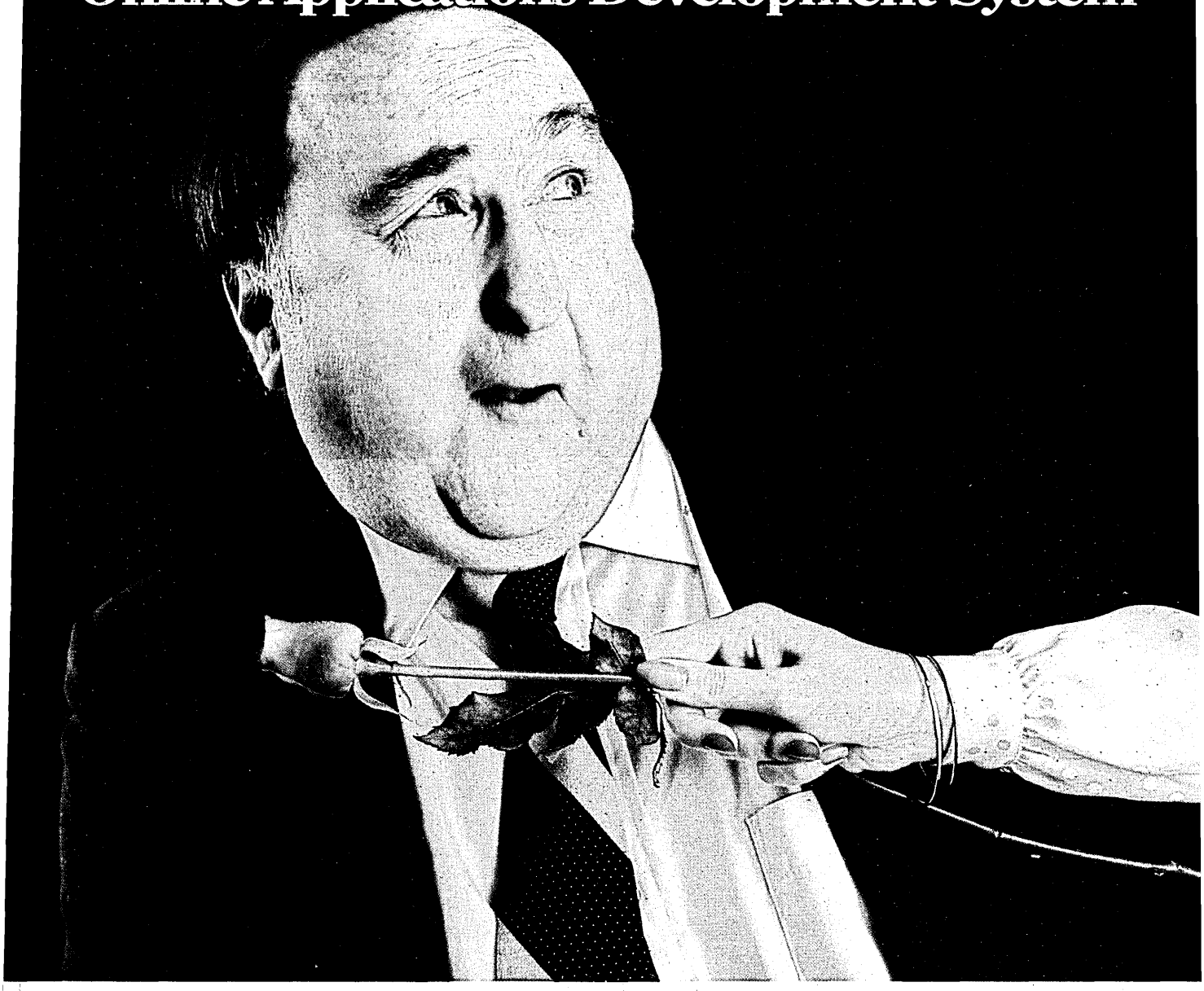
The article said education would play a big role in the sale of minis. The more children with hands-on computer experience, the more minis would pop up in homes.

There were a few students with some real hands-on experience at one Boston university, where a PDP-8 was set on fire during a student demonstration. After the fire was put out, the casing was taken off the machine, and even though soot and debris fell into the printed circuit boards, the machine still worked.

Andrew Knowles of Digital Equipment Corp. believed that voice recognition applications would be commonplace by the end of the decade and that many home applications would be controlled by minis. Grocery shopping, for example, could be done in the comfort of the home by telephone. The shopper's voice would be recognized by a computer and his account would be billed accordingly. In addition to the more logical household applications—like doing taxes and preparing food menus—minis could open and close garage doors, answer phones and take messages, and even serve as burglar alarm systems. Knowles also thought that they should be able to "sense" a fire and automatically alert the fire department.

—Lauren D'Attilo

NATURAL™
Online Applications Development System



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At last, help for companies wrestling with the problems created by personal computers.

"Overrun."
"Invaded."
"Swamped."

DP managers use a variety of terms to describe the arrival of so many different personal computers on the business scene. But the *feeling* is always the same.

After all, most managers have spent *years* developing well-controlled information systems. Now, almost overnight, they are losing control.

And while there's no arguing that PCs are valuable tools for individual productivity, everyone would prefer a more integrated approach for the company.

What's needed is a system that combines corporate data base capability with the personal computer capabilities employees now insist upon. A system with the capacity to extend the functionality of the corporate network to the individual local level. This is exactly what Honeywell has built.

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The cost-efficient microSystem 6/10 is a multi-personality workstation that provides an impressive range of functions – including networking.

Besides personal computing, the system handles data processing and word processing. It can function as a network end-point and a terminal emulator. What's more, power and flexibility make the microSystem 6/10 perfect for adaptation to industry-specific applications.

The microSystem 6/10 helps ensure organizational unity through excellent communications – it talks to IBM mainframes as readily as to our own.

It also offers expandable hardware and our time-proven GCOS operating system, which is compatible across the entire range of Honeywell minicomputer products, including even the most powerful 32-bit systems. This compatibility assures easy progress along your growth path by eliminating the need to re-create applications and retrain personnel.

Fight fire with fire.

Best of all, perhaps, the microSystem 6/10 will be an immediate hit with employees wed to their PCs. Because it accepts popular software packages based on CP/M-86® and MS-DOS,® chances are your people won't have to give up their favorite programs.

The microSystem 6/10.

Here's the way to win the battle against "PC Pandemonium."

And the war for control.

For more information, call **800-343-6665** (within the 617 area, call 392-5246) or write to the Honeywell Inquiry Center, 200 Smith Street (MS 440), Waltham, Massachusetts 02154.

Together, we can find the answers.

Honeywell

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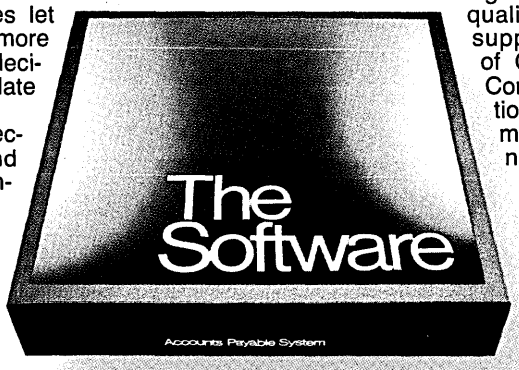

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SOFTWARE INTERNATIONAL

CIRCLE 22 ON READER CARD

LOOK AHEAD

AI PROFS GO COMMERCIAL

Marvin Minsky, MIT's leading light in the field of artificial intelligence, has formed a company to sell AI research services. Dubbed International Thinking Machines and based in Waltham, Mass., the company has been looking for as much as $10 million in venture capital. Among other high-flying investors is said to be William Paley, former chief of CBS Inc. Meanwhile, another AI superstar, Stanford professor Edward A. Feigenbaum, has joined Sperry's corporate board. Feigenbaum has been particularly vocal lately about the U.S. maintaining its lead in AI, pointing to Japan's ambitious fifth generation project as a serious threat to the U.S.'s very economic viability. The new Sperry director has cofounded two Silicon Valley AI ventures, Teknowledge Inc. and Intelligenetics Inc.

DRIVE AT YOUR OWN RISK

Defective 5¼-inch Winchester drives have been showing up more frequently than ever lately, hurting microcomputer vendors' ability to ship systems. Even IBM, whom disk makers would likely try to please more than other buyers, is finding a "significant" number of faulty drives in the shipments it receives for its new XT personal computer, according to a knowledgeable insider. IBM is understood to have cornered a large part of the 5¼-inch market, disrupting usual quality control standards. Sources at Lanier Business Products indicate that up to 20% of the drives it receives are DOA, a far higher proportion than for other electromechanical devices.

CDC'S NEW COLOSSUS

Not to be left in the dust by the forthcoming Cray-2 supercomputer, Control Data is readying a follow-on for its Cyber 205. The new machine, dubbed 2XX, will first be delivered in 1986. It is to use CMOS chips boasting some 40,000 gates each. Reliability problems deterred the use of galium arsenide in the machine, which is slated to offer three to five times the performance of the current 205.

ENGENDERED SPECIES

Prospective users are abuzz about a new workstation being readied for introduction late this year by Convergent Technologies, Santa Clara, Calif. Code named N-Gen, the unit will boast an Intel 80186 mpu, up to a megabyte of main memory, and up to 20 megs of 5¼-inch disk. An early user will be Automatic Data Processing, the Clifton, N.J., services firm, which plans to sell the system to brokerage firms. One N-Gen

LOOK AHEAD

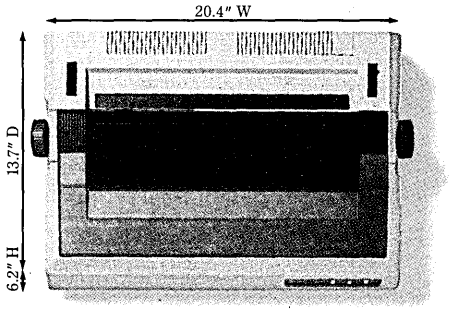
	could replace the clutter of terminals, typewriters, and calculators that now crowd brokers' desks. N-Gen is expected to run MS/DOS, CP/M and Convergent's own operating systems, with Unix to follow shortly.
FLOPPING AROUND	Look for Floating Point Systems Inc., the Oregon manufacturer of array processors, to unveil a new family of machines next month. The fastest of the four will offer performance of up to 62 megaflops (millions of floating point instructions per second), about six times the speed of the firm's previous models. Priced at about $2,000 a megaflop, the new systems use a distributed architecture enabling processing power to be added incrementally.
STANDBY MODE AT IBM	Despite Defense Department declarations to the contrary, IBM says it has made no formal commitments to join the so-called nth-generation computer project being proposed by government officials as an answer to Japan's fifth generation plan (see p. 61). IBM maintains that it is interested in participating in such a project, which it thinks would require cooperation between industry, academia, and the government to be successful, but it has submitted no proposals to DoD.
RUMORS AND RAW RANDOM DATA	Industry reports from Canada have it that IBM may soon replace its front-line office system, the 5520, with a clustered Personal Computer approach. Boston researchers at the Yankee Group expect IBM to build the controller from an upcoming 4300 machine -- the 4311?....Cincom Systems has apparently run into development problems with its Ultra product, a database manager for Digital Equipment VAX computers. The official intro has been delayed four months till October....Hewlett-Packard's offering of Unix for its 32-bit 9000 series desktop machine has led users to expect the operating system to appear on several other HP system lines....Meanwhile, a natural language interface, the fruit of a joint HP-Cal Tech research effort, is expected for the HP 9836 machine....Tektronix is understood to be tinkering with Unix, perhaps as an enhancement for its desktop computers....An internal IBM survey suggests the firm will gain more revenues from personal computers of all types -- small business, office, and home machines -- than bread and butter mainframes. Look for Artificial Intelligence Corp. next year to bring out a version of its Intellect query language for the IBM P.C.

The C. Itoh Starlet A-10 Daisy Wheel printer is made to order for the OEM micro market. Its footprint is so incredibly small, it goes just about anywhere – desktop, shelf, bookcase – yet it offers highest quality word processing printing at *less* than the cost of an electronic typewriter.

The A-10 is also extremely versatile. It can literally be configured thousands of different ways to accommodate your systems and performance needs. Its Shannon-text-rated 18 cps speed and unique 100-character drop-in print wheel (it's self-aligning) make it ideal for office applications.

PROVEN RELIABILITY

The A-10 is built around the same sound principles that have made our F-10 and Starwriter printers so successful. You get field proven, firmware-intensive technology for increased reliability. Plus a rugged, cast-aluminum baseplate, high quality metal parts, and low parts count for reduced maintenance: MTBF is 2300 hours, at 30% duty cycle (45 million character impressions). Easy access to all boards and subassemblies ensures low MTTR. And the A-10 is U.L. and FCC class-B approved as well as ESD tested.



ECONOMY OF OWNERSHIP

Low cost of ownership is one of the A-10's best features. Industry standard ribbons and a wide variety of wheels are available at popular prices. But best of all, many of the extra features that others call options come standard on the A-10. Like microprocessing for proportional printing, superscripts/subscripts, and bidirectional carriage and platen motion.

C. Itoh's Starlet A-10 Daisy. Small footprint. Big features. Contact C. Itoh Electronics, Inc. 5301 Beethoven Street, Los Angeles, California 90066. Telephone (213) 306-6700.

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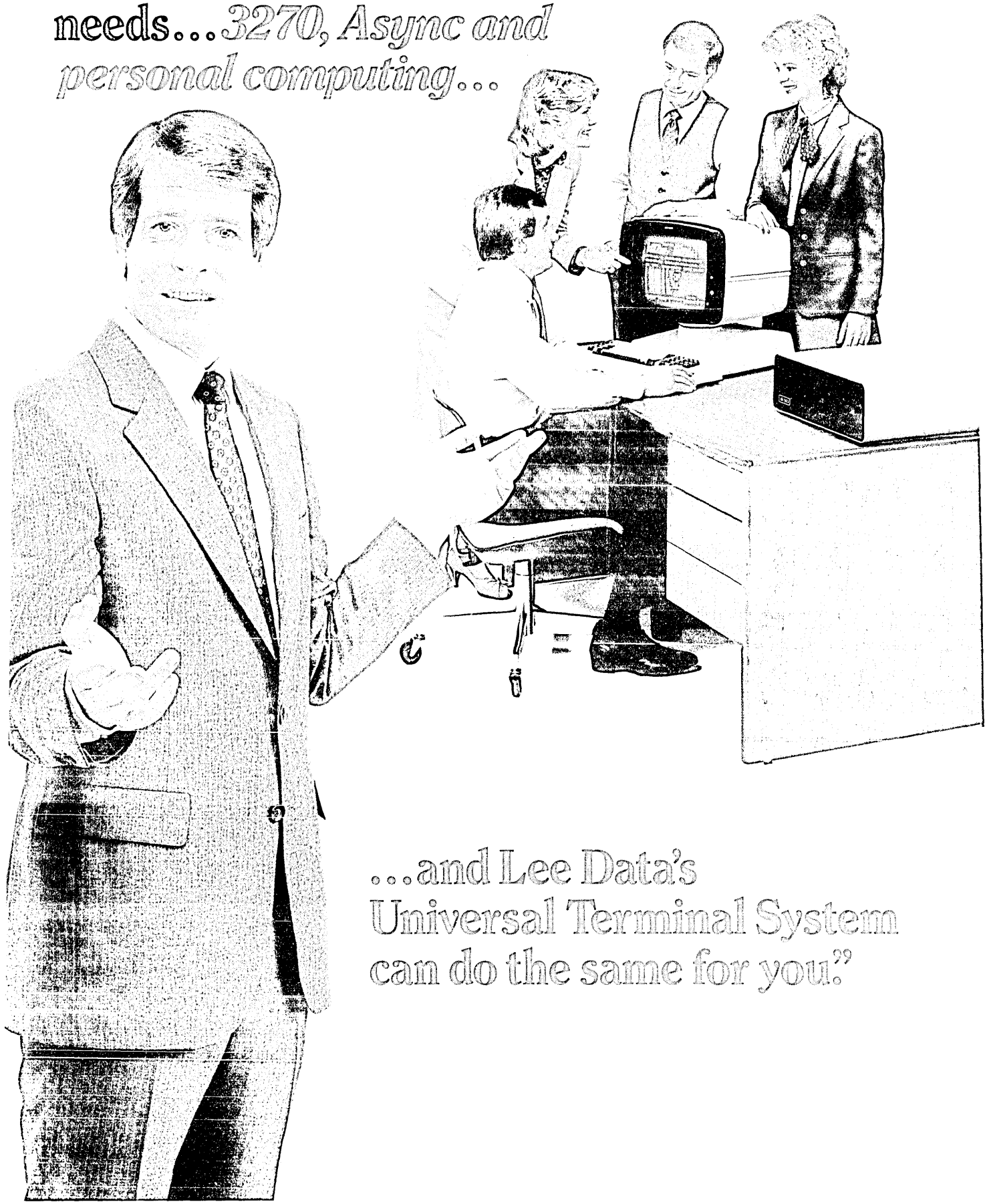
A World of Quality

CIRCLE 23 ON READER CARD

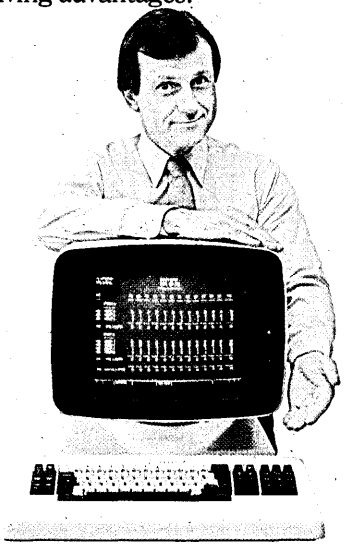
"Yes, one terminal system satisfies all of their information processing needs... *3270, Async and personal computing...*



...and Lee Data's Universal Terminal System can do the same for you."

Finally, there's a single, universal way to satisfy the individual information processing needs of all your people. From sales manager to accountant. From research to production. The Lee Data Universal Terminal System can do it all.

And our system is modular by design to provide you any or all of these cost-effective, problem-solving advantages:



3270-compatibility plus more

Combine complete 3270 system-compatibility with an innovative Lee Data design and you have a System that delivers greater convenience and flexibility.

As an example, you can choose from a full line of terminal capabilities, beginning with our cost-effective 3178-compatible display on up to our popular All-In-One Display which offers, in a single unit, four selectable screen sizes —including 132-column—a great advantage in program development, spread sheet applications and many others where flexibility is required.

3270-plus-Async: another cost-effective advantage

If your application needs currently find you switching between 3270 and VT100-style terminals to get the job done, Lee Data has a better way.

As part of our System, you can enjoy the further advantage of a 3270/Async capability that allows dynamic selection of 3270 and VT100 operating modes from a single Lee Data display. A simple command entered at the keyboard provides you access to applications running on an IBM CPU, non-IBM systems (such as DEC, H-P or Prime), as well as timesharing services. Another Lee Data solution to simplifying your company's terminal network.

And now integrated personal computing too

That's right! Now our System also includes a sophisticated personal computing package that can easily be integrated into an existing Lee Data 3270 system.

With our approach, you get continued interactive access to host-based files, plus all the advantages of professional business computing from the same Lee Data workstation.

Advanced features include a host file transfer capability, a single-board design, four standard system expansion slots and, of course, complete IBM-compatibility.

All these additional capabilities plus the same user-friendly Lee Data displays.

Plus these added benefits...

To any Lee Data System, add our unique Coax Eliminator products and realize additional savings of up to 85% in cabling costs alone.

Combine this with all the outstanding features already mentioned and you'll find a System offering everything you need for efficient, cost-effective operation.

Discover the advantages of our Universal Terminal System for yourself. For more information, call our system specialists toll free:

800/328-3998

Designers of innovative systems for the information worker

LEE DATA CORPORATION

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Minneapolis, MN 55344
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CIRCLE 24 ON READER CARD

CALENDAR

JULY

10th Annual Conference on Computer Graphics and Interactive Techniques (SIGGRAPH '83).
July 25-29, Detroit, Mich., contact: ACM/Siggraph, 111 E. Wacker Dr., Chicago, IL 60601, (312) 644-6610.

AUGUST

1983 International Computer Engineering Conference & Exhibit.
Aug. 7-11, Chicago, Ill., contact: The American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017, (212) 705-7740.

National Conference on Artificial Intelligence (AAAI-83).
Aug. 22-26, Washington, D.C., contact: Claudia Mazzetti, AAAI, 445 Burgess Dr., Menlo Park, CA 94025, (415) 328-3123.

IBM PC Faire.
Aug. 26-28, San Francisco, Calif., contact: Jim Warren, Computer Faire, 345 Swett Rd., Woodside, CA 94062-9990, (415) 851-7077.

Eurographics '83.
Aug. 31-Sept. 2, Zagreb, Yugoslavia, contact: ATLAS, Congress Dept., P.O.B. 17, YU-41001 Zagreb, Yugoslavia, telex: 22413 yu atlcon.

SEPTEMBER

Federal Computer Conference.
Sept. 13-15, Washington, D.C., contact: Federal Computer Conference, P.O. Box 368, Wayland, MA 01778, (617) 358-5301.

Word Processing & Office Environment Trade Show & Conference, (WPOE '83).
Sept. 13-15, San Jose, Calif., contact: Cartlidge & Associates Inc., 4030 Moorpark Ave., San Jose, CA 95117, (408) 554-6644.

Euromicro '83.
Sept. 14-16, Madrid, Spain, contact: Euromicro, TH Twente, P.O. Box 217, Dept. INF, room A312, 7500 AE Enschede, the Netherlands, telex: 44200 Thes.

IFIP Ninth World Computer Congress.
Sept. 18-23, Paris, France, contact: AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3600.

Sixth International Conference on Digital Satellite Communications.
Sept. 19-23, Phoenix, Ariz., contact: Conference Administrator, c/o COMSAT, 950 L'Enfant Plaza S.W., Washington, DC 20024, (202) 863-6248.

SICOB '83.
Sept. 21-30, Paris, France, contact: International Trade Exhibition, France, 8 West 40 St., New York, NY 10018, (212) 869-1720.

COMPCON Fall '83.
Sept. 26-30, Arlington, Va., contact: IEEE, P.O. Box 639, Silver Spring, MD 20901, (301) 589-8142.

Telecommunications Association Conference (TCA '83).
Sept. 27-29, San Diego, Calif., contact: TCA Conference Office, P.O. Box 208, West Covina, CA 91793, (213) 960-1838.

OCTOBER

Eighth Data Communications Symposium —1983.
Oct. 3-6, Cape Cod, Mass., contact: Datacomm, P.O. Box 639, Silver Spring, MD 20901, (301) 589-8142.

INFO '83.
Oct. 10-13, New York, N.Y., contact: INFO '83, 708 Third Ave., New York, NY 10017, (212) 661-8410.

Seventh International Fiber Optics and Communications Expo and Second International Expo on Local Area Networks (FOC/LAN '83).
Oct. 10-14, Atlantic City, N.J., contact: Information Gatekeepers Inc., 167 Corey Rd., Brookline, MA 02146, (617) 739-2022.

EduTech/East '83.
Oct. 13-15, Philadelphia, Pa., contact: Carol Houts, Judco Computer Expos, Inc., 2629 N. Scottsdale Rd., Scottsdale, AZ 85257, (800) 528-2355.

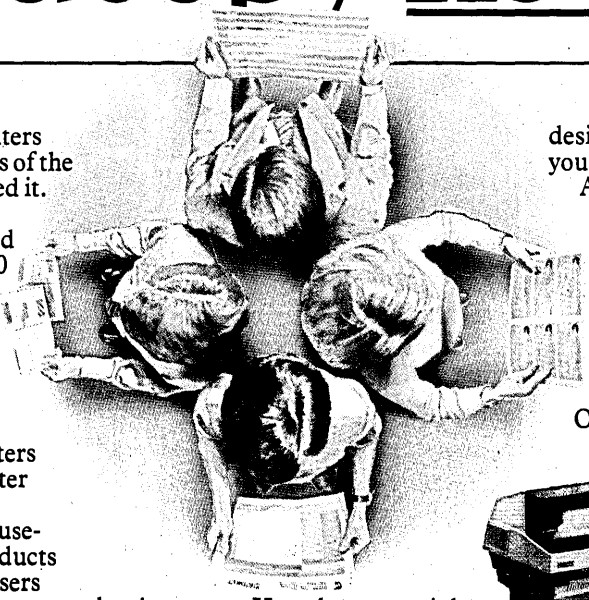
SYSTEMS '83.
Oct. 17-21, Munich, Germany, contact: Kallman Associates, 5 Maple Ct., Ridgewood, NJ 07450, (201) 652-7070.

The National Software Show.
Oct. 19-21, San Francisco, Calif., contact: Raging Bear Productions, Inc., 21 Tamal Vista Dr., Corte Madera, CA 94925, (415) 924-1194.

ACM '83.
Oct. 24-26, New York, N.Y., contact: the Association for Computing Machinery, 11 W. 42 St., New York, NY 10036, (212) 869-7440.

Ninth International Conference on Very Large Data Bases.
Oct. 31 - Nov. 2, Florence, Italy, contact: Mario Schkolnick, K55-281, IBM Research Labs, 5600 Cottle Rd., San Jose, CA 95193, (408) 256-1648.

The printer for the people who need hardcopy now.



Dataproducts B-Series line printers help you put the paper in the hands of the people who need it. When they need it.

The family of three, the B-300, B-600 and the B-1000, was designed to whisk out the printout, from 300 lines per minute to as much as 1100 LPM. And to operate at those speeds day after day.

How could we build 160,000 line printers and not make an impression?

We've produced more line printers than all other independent computer printer makers combined.

So why isn't Dataproducts a household word? Because most Dataproducts line printers are delivered to end users with somebody else's name on them.

Virtually every major OEM in the business has selected our B-Series printers for the systems they sell. Each has made that selection after months, sometimes a year, of intensive evaluation.

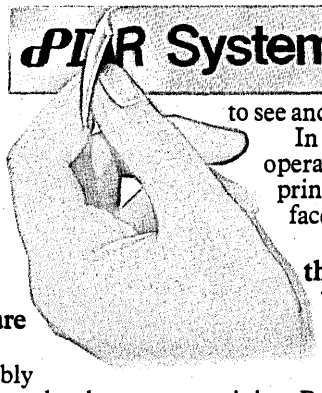
More than anything else, they look for a machine that can perform reliably over a long period of time. Their reputations are at stake.

Which is why the safest choice for your company may be a printer you've never heard of.

The best printers are the easiest to use.

Dataproducts probably knows more about the people who use computer printers than anybody. We know how they slam cabinets. How they jam paper. How they smear ink on their pants.

We conceived the B-Series for the operator. Extensive diagnostics help the operator locate and correct troubles fast. Long-life ribbon cartridges are quick and clean to load. The machines open wide so all controls are easy to see and easy to reach.



In less than a minute, the operator can even change the print band—to a different typeface, a different language.

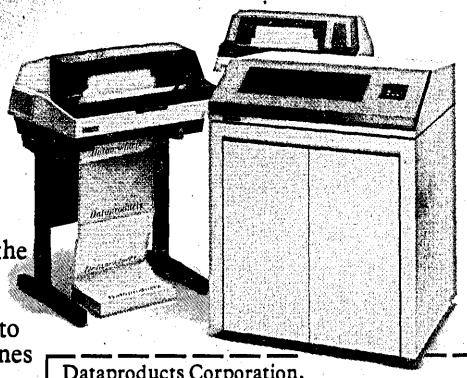
The best printers are the least expensive to own.

90% parts commonality within the family minimizes spares inventories and training. Power consumption is low.

Operators fix most problems. When they can't, the B-Series is designed to help service people get you back on-line quickly.

And because we make so many of these printers, we don't have to charge a lot of money for yours. You get low initial cost. And low cost of ownership.

If you'd like to know more about our B-Series printers, or the name of our distributor in your area, call (213) 887-3924. Or send the coupon below.



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The Printer Company

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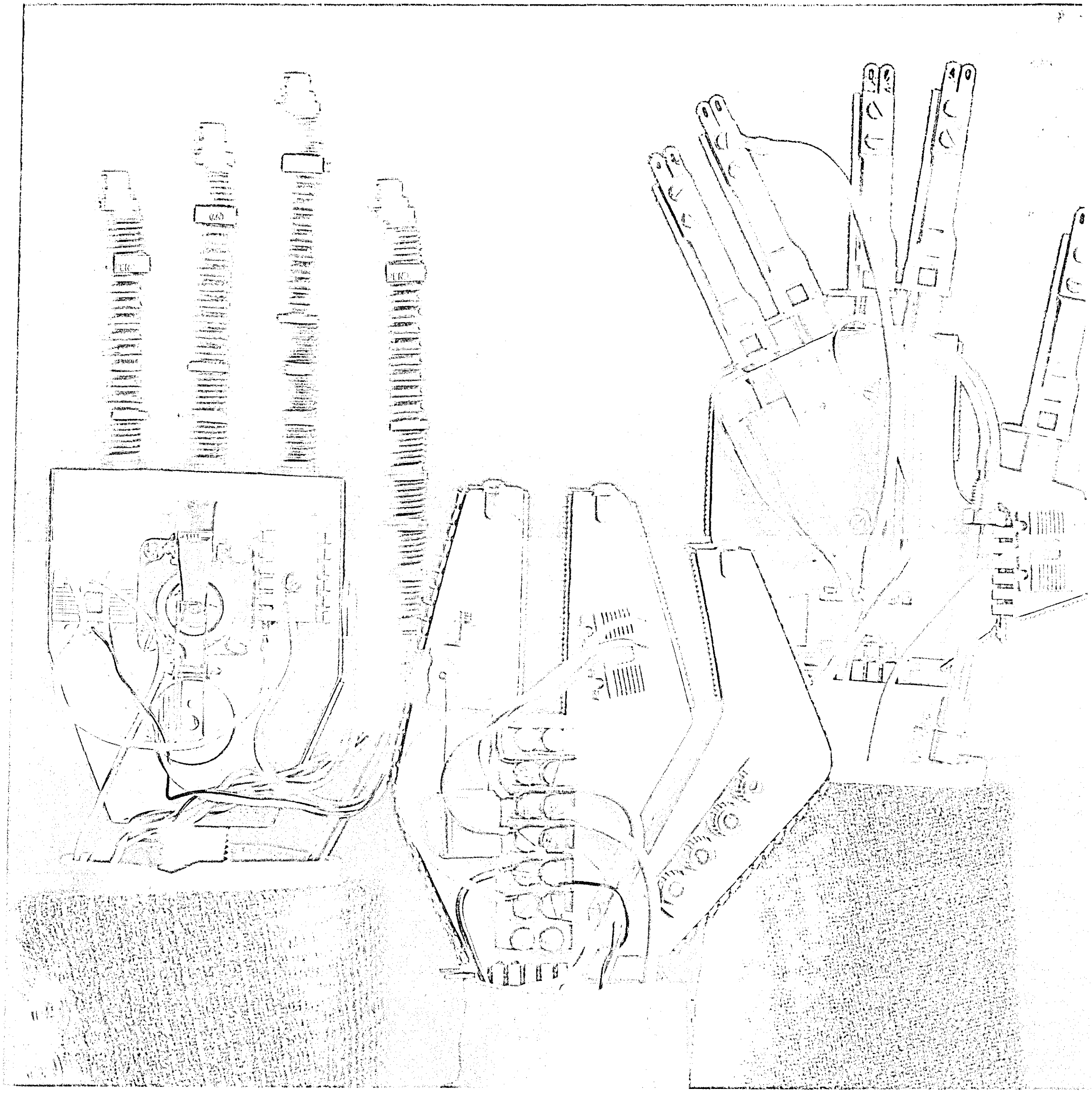
CIRCLE 25 ON READER CARD

Everyone in favor of office automation, raise your hand.



Before you buy a printer look at the fine print.

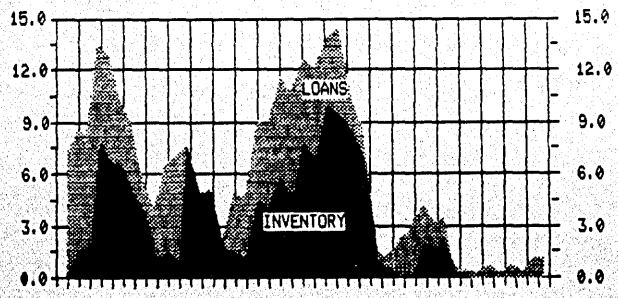
There's a big difference in printers, and the proof is right before your eyes.

This is an actual printout from Digital's Letterprinter 100. As you can see, it's good enough to send out to customers.

But that's not all the Letterprinter 100 can do. Suppose, for instance, you're in a hurry.

JUST PUSH A BUTTON AND YOU CAN PRINT OUT A WHOLE PAGE OF DRAFT COPY IN LESS THAN TEN SECONDS.

There are other fine points. You can see how the Letterprinter 100 can print multiple typefaces. It can also print in **BOLD**, **double-width** and condensed. And do all these styles automatically, without stopping. And with its wide range of graphics capabilities, you can even draw your own conclusions.



You simply can't find a more versatile printer than the Letterprinter 100. And it's just one of a family of printers we offer for Digital's personal computers and video terminals. Including a daisy-wheel printer, the LQP02, and a low-cost Personal Printer, the LA50, that still make you look good on paper.

So now that you've read the fine print, see our fine printers. Call 1-800-DIGITAL,extension 700, for the distributor near you. Or write Digital Equipment Corporation, Terminals Product Group, 2 Mt. Royal Avenue,UP01-5, Marlboro, Ma. 01752.

digital

LETTERS

CREDIT WHERE CREDIT'S DUE

The interesting article "Fifth Avenue Genesis" by W. David Gardner (March, In Focus, p. 34) did an excellent job of explaining the importance of design in IBM's success. It rightfully gave due credit to the superlative work of Eliot Noyes. But it neglected to mention another extremely important component in the IBM design strategy: the very sizable amount of work that was done by Charles and Ray Eames. This included many excellent films, as well as exhibits at such events as the World's Fair, that the Eames studio designed for IBM. This effort was a major factor in emphasizing the role of design at IBM. Many companies still have not caught up with IBM design.

ALFRED BORK
Educational Technology Center
University of California
Irvine, California

LAUDABLE LAUTENBERG

Thank you for the fine article on Frank Lautenberg (April, In Focus, p. 32). Being a fellow Patersonian, I would ask that in future articles you correctly spell Paterson with one "t."

BERNARD M. SLOTNICK
Rancho Palos Verdes, California

Your profile on Sen. Frank Lautenberg in the April issue described the senator as the first person in the history of the U.S. Congress to come out of the data processing business. There is at least one other: Sen. Mack Mattingly of Georgia was sales representative for IBM in Brunswick, Ga., before his election in 1980.

ROBERT ELLIS SMITH
Publisher, *Privacy Journal*
Washington, D.C.

APRIL COMES BUT ONCE A YEAR

I read the April 1 issue of the *Digital Tattler* with great interest, and I especially appreciated hearing of the system crash in New Delhi (p. 151). That news confirmed my feeling that computers can be dangerous.

After perusing your publication, however, I regret to inform you that I could not find the promised information on free subscriptions to DATAMATION, occasional copies of which are forwarded to me by our purchasing director. This will be only a small inconvenience, however, if I can continue to receive copies of the *Digital Tattler*. Your treatment therein of LANs, PBXs, and micro applications will, I trust, be much simpler than the complicated treatment presented elsewhere.

STEPHEN R. HAMPLE
Director, Institutional Research
Montana State University
Bozeman, Montana

PBXTRA

Your article on the digital PBX (March, "Is There a PBX in Your Future?") confused stored program control switch attributes with digital switch capabilities.

There are currently available two major categories of switching vehicles, both of which are stored program controlled in their logic functions. The first, and more commonly deployed, of these is a *space division* vehicle in which connections are made via a metallic path through the switch for the duration of a call. *Time division* (digital) switches, on the other hand, establish connections by allocating the very small slices of time required to transport bits from switch inputs to outputs. Both types of stored program controlled (SPC) devices can offer the flexible routing, billing, and other features to which your article referred.

The inherent advantages of a time division switch are that it is essentially nonblocking; quiet, allowing higher data rates with less impulse noise; and able to interface directly with digital transmission facilities such as T1, fiber, etc. Digital switches also tend to be quite modular in their design, facilitating more graceful growth and greater flexibility.

G.P. MARBLE JR.
Califon, New Jersey

REVERBERATIONS ON RIO

The feature article "Roundup in Rio" by Marc Burbridge (March, p. 189) has given me a new perspective toward the importance of automation in Latin America, and at the same time a better understanding of the dilemmas automation tends to present to these labor-intensive societies. More needs to be said throughout the industry publications to help all of us in the U.S. gain insight into this important market area.

Just one note: Brazil's national language is Portuguese, not Spanish, as is assumed by most North Americans. In Brazilian Portuguese, the name of the beach near the hotel where the panel held its discussion is "Copacabana," not "Copa Cabana."

MILTON A. MAUGHAN
Morton Thiokol Inc.
Brigham City, Utah

SAYONARA, INDEED!

Your story on automation in Japan was informative and interesting (April, International Edition, "Saying Sayonara to the 19th Century"). It is important that readers of your magzine understand what is happening in Japan, and stories like this are helpful.

The dominant impression given by this story, however, is not wholly accurate. The title and the author both imply that a prime reason for Japan's less than enthusiastic response to office automation has been tradition. The simple fact is that until a handful of years ago such devices as Japanese word processors did not exist at affordable prices. Even today they are expensive and not as useful as their English language counterparts.

In order to appreciate the true scale of the problem, I feel that the author should have gone more deeply into the language issue and explained just why inputting is a major problem. Your readers deserve the following background information if they are to have a true image of office automation in Japan.

Written Japanese is a mixture of alphabets and ideograms (kanji). Three alphabets are currently in use: ours (ABC. . .) and two indigenous ones. They consist of a grand total of about 200 letters and punctuation marks. For practical purposes, the number of kanji is limitless. In fact, though, the Ministry of Education requires students to master about 1,600 characters during their compulsory education. The well-educated adult should know from 5,000 to 10,000 kanji.

The above facts mean that a competent Japanese word processor must have the capacity to manipulate about 7,000 characters quickly and accurately.

Kanji are written one stroke at a time, and there may be any number of strokes from one to about 24. A minimum of 16x16 dots are required to represent

kanji on a crt display. The production of high-quality business-grade documents requires 24x24 dots. These restraints are reflected in hardware requirements.

First of all, about 500K of storage are required just for the graphic patterns for a 7,000 kanji set. This is not the only storage requirement. A standard 80-column crt can display only about 40 columns of kanji, very high-resolution displays can go up to about 65 columns.

Daisywheel or other fixed character set printers cannot be used. Options are limited to dot (16 or 24 wire) or laser printers. The latter is not cheap.

But the hardware is nothing compared with the software. It took years of dedicated research to achieve the present clumsy-to-use system.

When setting up a kanji dictionary there are three possible ways to organize the word—by pronunciation, by number of strokes, and by structural details. For word processing, we usually opt for pronunciation since stroke counts and structural details are usually not memorized.

The pronunciation of kanji is no trivial matter. Each kanji typically has two or three different pronunciations; occasionally there are as many as 10. Which pronunciation should you use when searching through the dictionary? Although there are conventions regarding this, they are difficult to remember. A good software system needs to cross-reference all possible pronunciations (about 25,000 to 30,000 for a 7,000 character set).

But it gets worse. A given pronunciation may correspond to several kanji. For example, the sound "kan" may be represented by at least 45 totally different kanji, each with a different meaning. These must also be cross-referenced.

Finally, and worst of all, most Japanese words are comprised of several kanji. If each character of a three-kanji word has three possible pronunciations, this means that the word has 27 possible pronunciations, but only one is correct.

To illustrate, consider the word "denkikeisanki" which may be broken down into five kanji like this: "den-ki-kei-san-ki." Alone, each kanji has the following meanings:

den: electric, electronic, electricity
ki: animation
kei: measure
san: reckon
ki: machine

Put them all together and the result is computer. When inputting this word, the average Japanese will first input "denki" which usually is translated as electricity. He will not input "den" and then "ki." Now, as it happens, there are over 200 possible combinations of kanji which could be pronounced "denki," but only one is correct. Good software must be able to isolate the one correct combination.

Currently two means of inputting kanji are in common use. One is very slow, and the other is just slow. The very slow method makes use of a huge tablet on which all the kanji (say 7,000) are arranged according to just one of their pronunciations. The operator selects his character with a stylus, and it is thereby entered. The average time for an inexperienced user to find his character is about 20 minutes. This is just for one character, mind you. An expert can input about five characters per minute. Experts are scarce, and are ex-typists, as this is the same method used for mechanical typewriters. The slow method uses a more or less normal keyboard. The desired pronunciation is input using one of the Japanese alphabets, for example, "kan." The software then offers 45 options, from which the operator chooses one. Provision is made so that the most frequently selected option is presented first, and so on down the ladder.

If the input is recognized as a combination word (stored in a dictionary), then the most frequently selected combination is offered (as with "denki").

Although Fujitsu has spent many years developing and improving its Japanese language word processors (OASYS), they are still far from ideal. A faster learner in an intensive course can master them in about two months and can produce copy at triple the handwritten rate. The average office assistant can produce copy at about one fifth the handwritten rate.

Basic word processing systems in the U.S. sell for around $1,000; our cheapest model is about $3,500, and our top-of-the-line model is $20,000. These machines cannot double as programmable computers.

Given these problems it is a wonder that there are any word processors at all in Japan. Given the time and energy expended to get where we are, I think that in some areas the Japanese will go to great lengths not to be bound by tradition.

I apologize for taking your time with such a long letter, but the situation is complex, and I have just skimmed the surface essentials.

ERIC OLSEN
Fujitsu Ltd.
Tokyo, Japan

CARTOON BY FRANK COTHAM

EDITORIALIZING ON EDITORIALS

Thanks for sending me the reprint of the editorial "Backing into the Future" (February 1982), along with the article by John L. Kirkley and Milton Wessel regarding the TNIC proposal (September). Together they will be grist for an editorial in *SCOPE* on the same (albeit more specialized) need in the academic community.

Let us hope that a commission on information policy is formed and that among its members are at least a few humanists and social scientists. Such people are needed for a variety of reasons:

- They have the longest tradition of preserving, searching, and revising information;
- They are trained to consider problems from viewpoints other than the material; and
- Their domain will be affected, like all others, by any national and international policies.

Please keep me informed of any way that I may participate in this effort.

JOSEPH RABEN
Professor of English
Queens College
Flushing, New York

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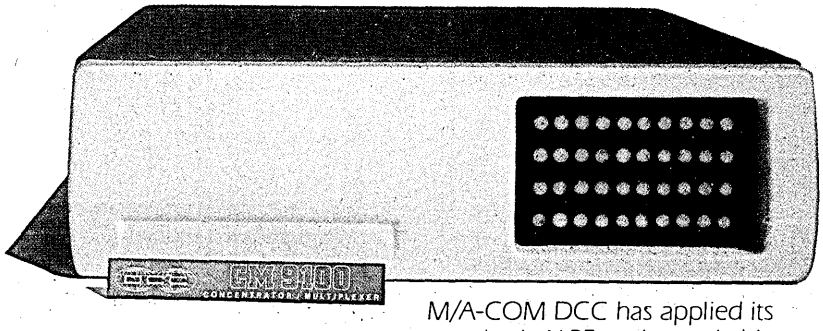

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CIRCLE 28 ON READER CARD

LETTERS

Bravo for your editorial in the March issue! Yours is not only the best of the dp magazines but also the most literate. It is always a pleasure to read and I also enjoy the cartoons.

Since my avocation and first love is literature, yet I make my living in office automation (which I also enjoy), I can second your statement that "the reunification of the sciences and the humanities is essential." I only hope that the computer industry will take up your challenge.

BRADLEY R. STRAHAN
Editor/Publisher
VISIONS
Arlington, Virginia

For shame on your statement in the April editorial in which you say ". . .whose efforts contributed much to the creation of the first primordial computers back in the early 1950s." I trust that you simply forgot your thinking cap that day when you ignored the grandfather of the electronic computer, the ENIAC!

Certainly this machine was developed and implemented in the decade before the 1950s. In fact, its history, in brief, was that the contract to develop same was awarded June 4, 1943, after the Army was notified May 18, 1943, by the University of Pennsylvania that the Moore School of Engineering could start the initial work (for $61,700). The University of Pennsylvania certified on June 9, 1943, that it would indeed proceed with the work on developing an electronic numerical integrator and computer.

The ENIAC was placed in operation at the Moore School, component by component, beginning with the cycling unit and an accumulator in June 1944.

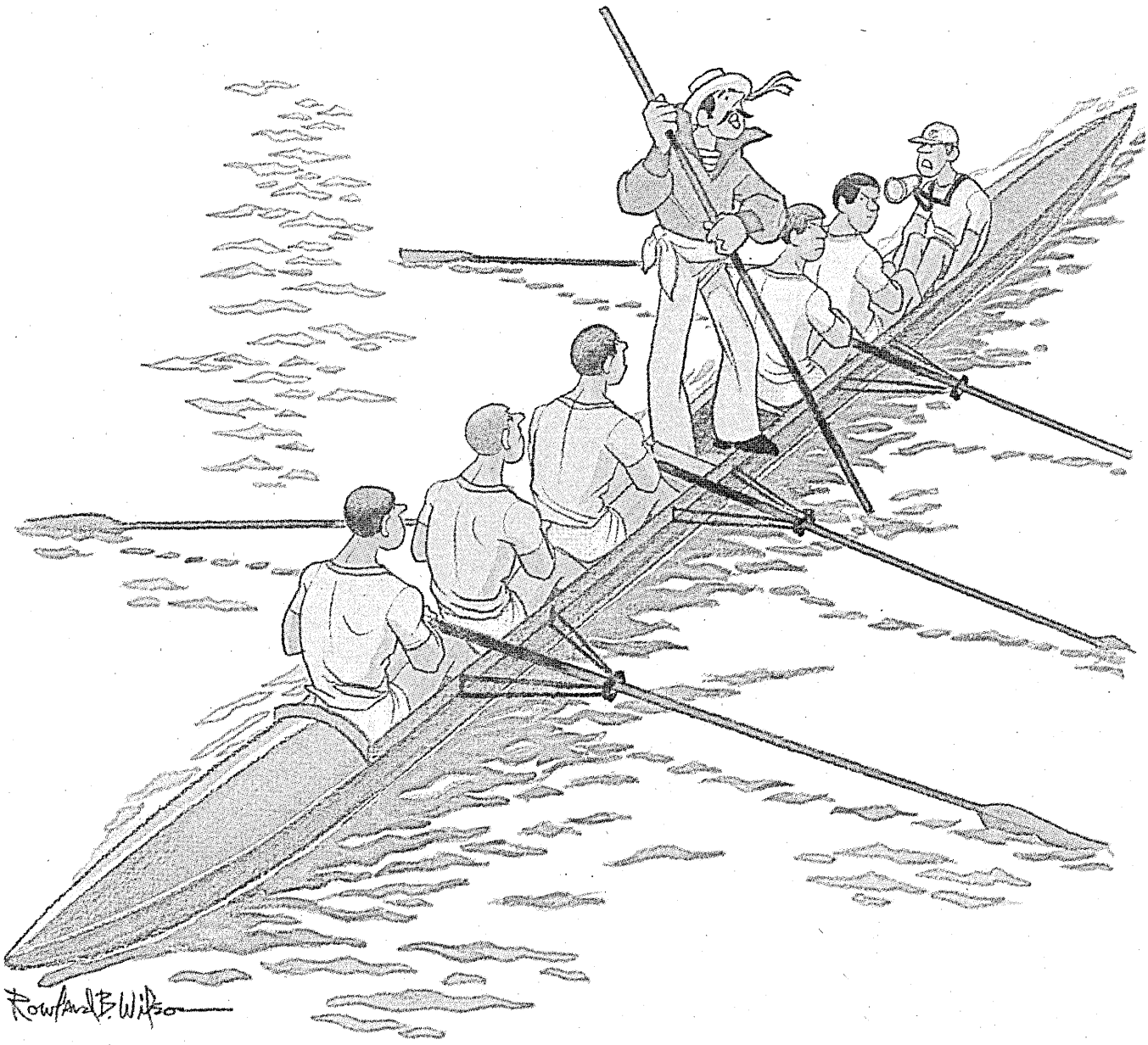
This was followed in rapid succession by the initiating root unit in October 1945. Final assembly took place during the fall of 1945. The ENAIC was formally dedicated at the Moore School on Feb. 15, 1946, and accepted by the Army in July of that year. The ENAIC was dismantled and shipped to the Army Ballistic Research Laboratory in January 1947 and became operational again in August 1947. It remained in operation until 11:45 p.m. on Oct. 2, 1955.

This letter was written on a modern-day computer that is located on the exact spot on which the ENAIC resided those many years ago.

MICHAEL B. DANISH
Ballistic Research Laboratory
Aberdeen Proving Ground, Maryland

BY THE NUMBERS

In the March "Applications Software Survey," Citizens Automated Systems' Canton System/1990 product was mistakenly labeled as the Canton System/80, according to the Canton, Ohio firm. —Ed.



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CIRCLE 30 ON READER CARD

John L. Kirkley, Editor

EDITORIAL

THE DYNAMIC DUO: IBM AND DIGITAL

Buried on p. 20 of the June 1 *New York Times* business section was a little story headlined "IBM-Digital Pact at MIT." It told how DEC and IBM have anted up $50 million in equipment and personnel for a five-year deal with MIT to "develop software that would for the first time enable users of the equipment to move information and programs easily from IBM systems to one made by Digital and vice versa."

Although the two companies characterize the arrangement more as a gift than a research contract, the commercial possibilities are obvious. From DATAMATION's point of view, when faced with an intriguing maneuver such as this by the country's two largest computer manufacturers, we invariably ask: what are the implications for the users and for the industry?

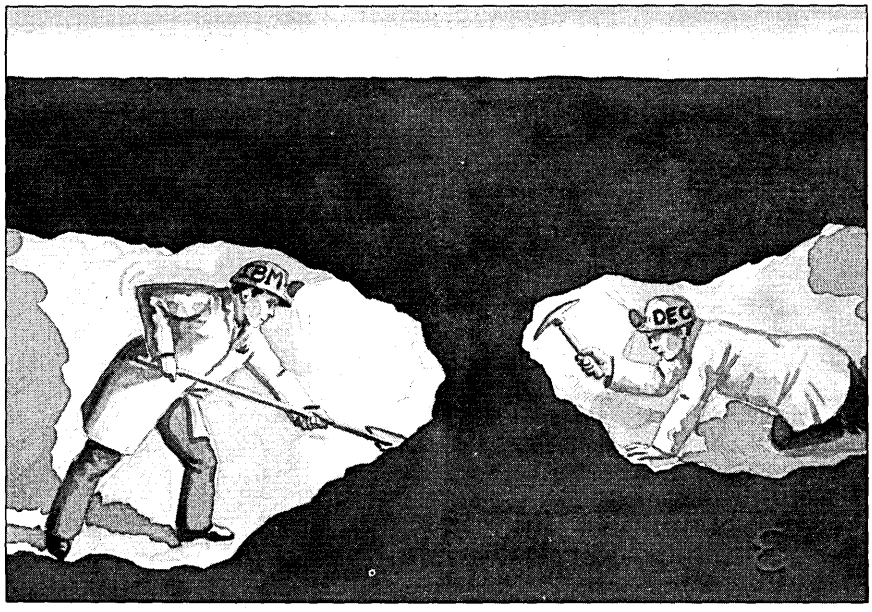


ILLUSTRATION BY DORIS ETTLINGER

One response, leavened with a dash of paranoia, might be, "Ye gods, these two giants are teaming up to take over the world. Once they're able to hook up all the PDP-11s, VAXs, and 370s in the world, not to mention their personal computers, they will so control the information processing environment that other companies, especially the BUNCH, will find themselves on the outside looking in. The others will have the not so pleasant option of converting to the new environment, retreating to a well-protected market niche, hoping this new, double-headed monster doesn't come sniffing around their little patch of turf, or, in the face of overwhelming odds, packing it in."

That's one perspective. A more optimistic viewpoint would argue that it appears IBM is finally doing what everyone else has had to do—addressing a multivendor environment. Burroughs, NCR, HP, and the rest have been sensitized to the open architecture approach for some time and have become quite adept at building interfaces between their gear and Big Blue's. (And what they haven't concocted, some entrepreneur in his garage in Burbank, Calif., is just about to announce to the world.) NCR, for example, is making its move into IBM compatibility through a rigorous implementation of SNA up through the higher protocol layers (see "The Corporate Communications Conundrum," p. 112).

If we are reading the signs and portents correctly, the MIT-IBM-DEC pact and the moves toward compatibility and software portability by many of the other major vendors promise good things for the user and for the industry as well. A mechanism developed to allow software portability between such disparate gear as Digital and IBM equipment will probably be a highly transparent general purpose transport environment that other vendors with the desire and a reasonable R&D budget should be able to duplicate. It portends a time in the not too distant future when there is a complete partitioning of hardware and software, a time when software is totally independent of hardware and can be moved with ease from one system to another. It suggests a day when hardware will be a commodity bought "by the bag," as one industry observer put it—a stock item sold on the basis of the number of MIPS per box or some other significant measure.

We are moving, it is hoped, toward an information processing environment that is not dominated by one vendor or the other, but rather is fluid and open, allowing users to solve their information needs by selecting from a wide variety of options, options available from a broad array of firms both large and small, competing in an open and robustly diverse marketplace.

IN FOCUS

THE NEW INFO CENTERS

Walk-in offices for advice on which micro to buy are springing up in companies across the country.

by Laton McCartney

Right off the bat there are several things you should know about information centers. First, the concept is gaining popularity. In fact, whether you know it or not, one could be starting up in your organization this very moment. "Information centers are becoming extremely popular," says Frederic G. Withington of Arthur D. Little, in Cambridge, Mass. "They're growing about as fast as anything that brings about a change in human behavior can grow." A recent survey by the Diebold Group Inc., N.Y., of 32 major companies found that two thirds expect to support two or more information centers by 1985.

Second, the computer industry is going to have to live with them. "Information centers are a real concept," notes Joseph Ferreira, vice president of Diebold. "They're not going to go away."

Third, the information center concept could have a significant impact on your career. How you deal with this issue may determine whether you emerge as a goat or a hero.

Simply put, an information center is a means of providing computing to end users in their own terms. "It is a shortcut for users to get data and reports directly," says Joseph E. Izzo, president of the JIA Management Group Inc., a Santa Monica, Calif.-based management consulting firm.

Here's how the concept works at a major New York-based stock brokerage firm. "Different users need different tools and our information processing lab provides a central place for the user to come and get the tools that make sense," explains the recently hired info center manager. "It is a computerized version of a library. The user comes not knowing how to get what he wants. He asks us to solve his information problem, and we dispense the tools from our kit of microcomputers, intelligent or smart terminals, and external or internal database access codes. This is our solution to the hodgepodge of hardware and software that has grown up in many companies."

The center differs from distributed or dispersed data processing in that it is usually built around a special walk-in facility where the users come for data and word processing help from a technical staff that's there to support them.

Withington of Arthur D. Little adds that the fundamental difference between information center approaches is determined by the need to access the corporate database or operating system. "You have two classes of information centers," he asserts. "Those where getting into the corporate database on an on-line basis is a requirement and those where it isn't. In the latter case you can include micros as part of the center, but otherwise micros are not feasible on other than a standalone basis because the tools are simply not there to connect them effectively to the mainframe, at least not that I've seen."

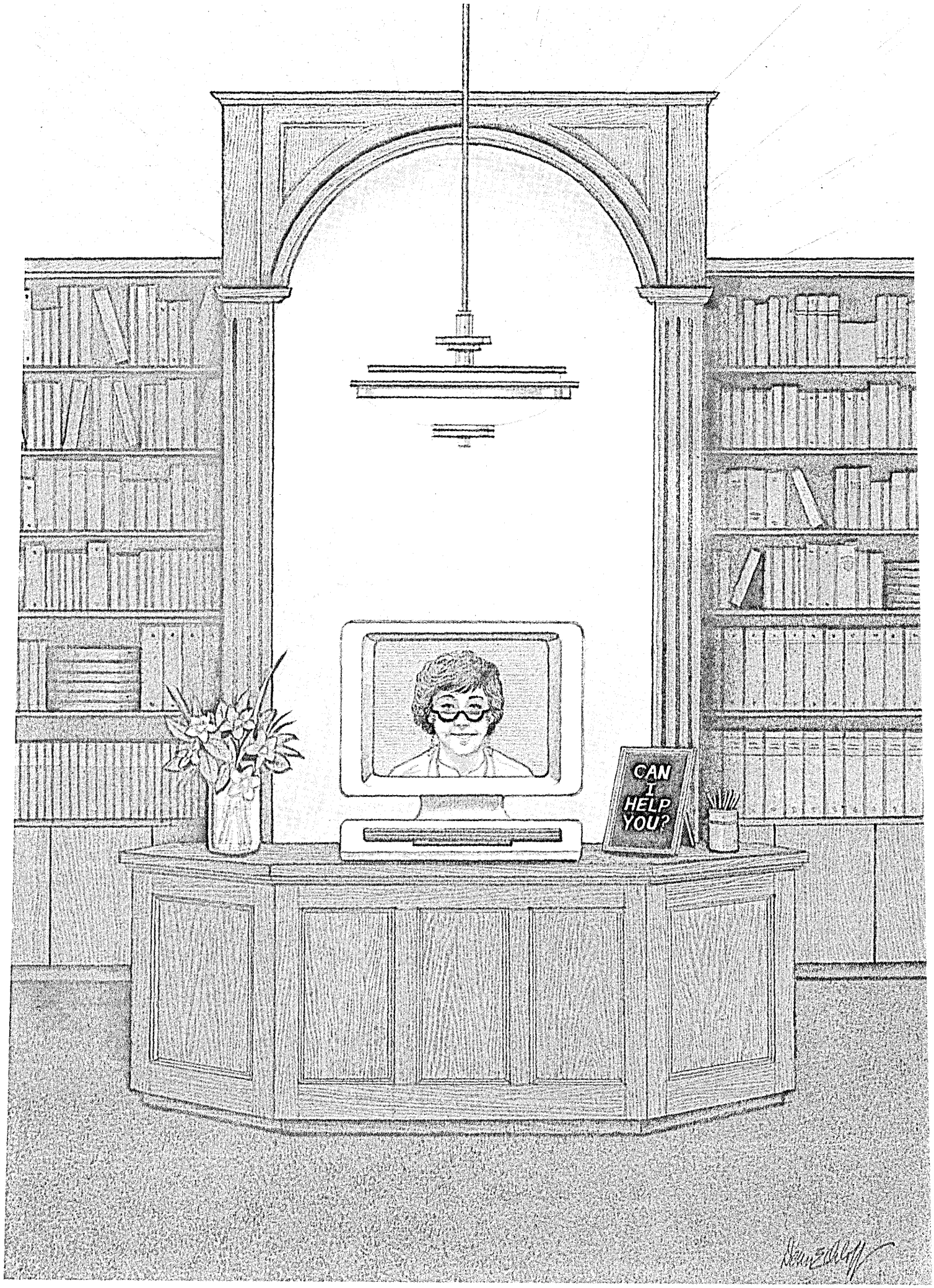
The concept itself is nothing new. IBM Canada initiated the information center approach in 1976 as a strategy to bolster internal user productivity and reduce applications backlogs. For a number of U.S. users as well the concept is old hat—for years colleges and universities have made their dp resources available to their students through this approach. Security Pacific Bank in Los Angeles has had an information center since 1970. Today many major corporations, including Atlantic Richfield Oil (Arco), Union Carbide, Lockheed, Northrop, Chase Manhattan Bank, and North American Philips, boast information centers.

Moreover, with the advent of microcomputers, end-user oriented software packages, and fourth generation, user-friendly computer languages, the demand for access to computing resources has taken a quantum leap. "The pressure coming from end users has grown enormously as all these user-friendly products came out and the knowledge level of the user increased," asserts Izzo of JIA. Adds the new microcomputer expert at a famous Wall Street investment firm: "Because many people here do not understand how to use micros, we're now studying whether we should have an electronic library where non-dp types can call or come for help."

Today the impetus for many centers comes from the users themselves, particularly in instances where users think the dp shop isn't giving them the service they feel they deserve or need. A center at one Wall Street brokerage firm, for example, was organized after users formed a kind of de facto vigilante committee and threatened to go outside and buy a slew of micros if their internal dp department didn't meet their demands. With the full blessings of senior management, users at a big Georgia corporation completely circumvented data processing and unilaterally set up an information center. Today that center is run as a separate entity, totally outside the dp organization.

The impetus for many centers comes from the users themselves.

ILLUSTRATION BY DENIS ORLOFF


CAN I HELP YOU?

Management consultants such as Izzo say the frustration that sparks these user "end runs" around dp and user-controlled centers is frequently the by-product of the dp department's built-in inertia. "In many instances the dp department hasn't changed in 20 years in the way it's structured and the way it supports users," he argues. "The dp people, some of them anyway, are afraid of concepts like the information center. Three years ago they had total control of the company in relation to data processing. Now that control is slipping away and the information center is symptomatic of this."

Well, maybe, but the vendors themselves are increasingly pushing the center concept these days—often as a means for dp to *retain* control and impose standardization on the use of computing capabilities throughout their organizations. IBM, which has promoted the information concept harder than anyone in the field, is a case in point.

"IBM is marketing the information center as a structure to impose around the end user," notes Stamford, Conn.-based dp consultant Angeline Pantages. "It gives the users some say in what equipment they buy, and it keeps them from running helter-skelter in putting on new applications and using outside services."

Writing in IBM's slick publication, *Information Processing*, a magazine the company puts out for IBM Information Systems Group customers, Robert H. Torgler, manager, Business Professional Center, IBM Corp., Bethesda, Md., spells out the company party line on centers. "The Information Center is neither a process nor a product, but a strategy a dp manager can use to support and manage a company's burgeoning information needs," Torgler writes. "Business professionals [the users of info centers] need more than mere computer access. They need guidance, education, and ongoing support. It is the dp manager's responsibility to decide how to deliver these services—applications on the company's mainframe, distributed systems, personal computers, and/or other approaches. He must also ensure that access to sensitive information is controlled, computer resources are managed effectively, and the integrity of the databases is maintained."

The trade-offs in this marketing approach are self-evident. IBM pushes the information center with the tacit stipulation that the dp manager keep control. The grateful dp manager, in turn, recommends purchase of IBM-directed products such as the Personal Computer, ADRS II (a departmental reporting software product), GraphPack, the graphics package, and the 3270 terminal. Maybe the dp manager even goes out and buys another 4300 to take care of the additional processing load the center engenders or to provide users with a dedicated machine. Everybody, including the user who now has his own computer romper room, goes away happy.

Dp managers also learned early on that the information center could benefit them and in many instances have themselves been the prime factor in initiating the center concept.

"Our firm now encourages the use of the appropriate computer tools," relates Lee R. Greenhouse, assistant vice president, personal computing, E.F. Hutton & Co., "as long as it is coordinated by the manager of information services. Our in-house minicomputer is a handholding device, encouraging people to use external and internal databases as well as computational power. Most users have access to several external databases now, but over time that will change as the mini also functions as a controller—with its massive storage capability, it will enable us to share data without repeated access to outside sources."

Security Pacific handles as many as 250 users at one time out of several thousand internal customers.

At Security Pacific, the data processing organization was given the green light in 1970 to establish a center as an alternative to increasing outside use of timesharing services by the bank's management in a number of different departments. "The bank believed it was more cost effective to do the processing internally through a center and use Security's own resources rather than go outside," says Norman H. Leibson, first vice president, information services. Even so, in developing the center, the bank insisted its dp shop adhere to two ground rules: the center would be operated as part of the dp group, but the individual who headed it up would have to be drawn from the user community within the bank. Leibson, who had been in the financial department and was a heavy dp user, got the job.

In addition, the choice of going outside or using the center was left open to the various departments within Security. "We went into the concept marketing it as an alternative to timesharing," Leibson recalls, "but if the user didn't buy the idea or

THE DOS AND DON'TS OF INFO CENTERS

There's no body of set rules for implementing information centers. Each organization has its own specific requirements, and each center varies accordingly. But you can benefit from the experience of others who've already set up centers by following, or at least reading, some of their suggestions. Among them:

- Form a special, dedicated support group to work with users in the center. Obviously, the size and makeup of this staff will vary with the size and resources of your organization, but it should be at least partially comprised of users even though it reports to, and is part of, MIS or data processing. Typically, the staff at a large organization will include systems people as well as product specialists, a project leader, and a secretary and/or administrator.
- Be prepared to provide extensive technical support, especially at first. "You're not just going to be able to hand these people an IBM manual and say, 'Here's TSO,' " says Norm Leibson of Security Pacific. "A lot of handholding is involved."

"The software hasn't reached the point yet where the user can be expected to walk in the door, sit down at a terminal, and use the center effectively," adds Bruce W. Hasenyager of Kidder, Peabody, the brokerage firm. "Consequently, technical support is critical."

- Try to restrict the center's use to decision support, problem solving, and planning functions. If possible, restrict users from attempting overly ambitious projects, projects that didn't go through the normal dp checkpoints and projects carried out as part of the normal dp function.
- Most centers take on the responsibility of training users themselves, using a variety of techniques that include individual tutoring, workshop and classroom sessions, and computer-based training. So far this has generally worked out well, notes Carole Renfer, national account consultant for Deltak, Canada Inc. because, she says, "Pilot programs were limited to a small number of people and involved few software products.

"However, as more and more employees use the system center, the training process will prove far more complex and will probably require direct assistance from the central dp department." Renfer sees the situation developing along these lines: "In the future . . . both groups [dp and IC] will probably be involved, possibly with product and background training being provided by the dp training department and product updates and exchange sessions handled by the IC."

- This from an IBMer who has been involved with some big centers in California: "Make sure all the center's major start-up problems are ironed out before the user ever walks through the door. If the user senses the center still has problems, it will add to his apprehension and may cause him to bolt and run."
- A variation on the same theme from Kokoszka of Kelly: "Plan out the development thoroughly and move slowly enough so that you're able to absorb the users into the center and meet their needs. Otherwise, you'll recreate the same problems the center was set up to alleviate."

didn't feel we could deliver the same quality of service as was available outside, he simply didn't sign up."

Today, this pioneer information center, which in the early years would service perhaps 10 to 15 users concurrently out of 100 who had signed up, now handles as many as 250 at one time out of several thousand internal customers.

As the numbers indicate, the center has proven a success from the users' viewpoint. At the same time, Security's dp group has taken major steps in keeping its backlog under control because of the center, Leibson claims. "It serves as an escape valve that gets users around the bottlenecks," he notes.

It has also expanded the dp organization's territory in the form of larger budgets and additional equipment. (An Amdahl V8 168 that's about to be upgraded to an Amdahl 5860 is dedicated exclusively to center processing.)

Finally, it has enabled dp to standardize software usage throughout the bank and adjust to the onslaught of micros in an orderly fashion. Routinely, the center tests new micros and software that come on to the market and currently, as an example, is serving as a beta test site for Apple's Lisa and putting Lotus's 1-2-3 through its paces for possible inclusion in the center or in other bank departments. Outside purchases must have the center's approval and are contingent on the product's meeting center-

Merrill Lynch offers debugging assistance to non-dp types who have written software for their personal computers.

imposed criteria. (The product has to have the capability of being tied into the center, for example.)

By comparison to the Security operation, the center at Kelly Services in Detroit is scarcely off the ground, yet it is dedicated toward many of the same aims. The center, initiated early this year after Kelly conducted a thorough feasibility study of the project, is structured as part of the organization's MIS function and employs micro-Apples currently and possibly will include Lisas or IBM P.C.s as the center grows.

Kelly is taking a cautious, one-step-at-a-time approach in developing the center. Shortly, the center's micros will be tied into the organization's two IBM 4341s and users will be able to query and utilize the mainframes directly.

Users themselves are also being brought in on an incremental basis. "The impetus behind the center is, of course, to get the tools into the users' hands," says Joseph Kokoszka, Kelly's director of MIS planning and business analysis. "But we discovered that some users such as finance and human resources have a more pressing need for these tools. Both areas, as an example, have significant *ad hoc* processing requirements for things like benefit analyses or budgetary reports.

"Consequently, we started out very slowly and just brought on four or five users from these departments initially. When we're sure we can meet their needs, we'll start marketing the center to other departments, something we haven't even started to do yet."

Kelly also intends to expand the system, which is presently situated in the MIS area, into the user's area of the company's Detroit headquarters. But before an employee can sit down in front of the computer in the user center or go out and buy a micro, he or she must first pass muster by using the micros at the MIS-based center under the supervision of Kokoszka and his staff.

"Before a user can justify a move out, or a micro acquisition of his own," says Kokoszka, "we go over the history of what he's done in the center by looking at the logs with him. Then we sit down and discuss the kinds of things he's thinking of doing in the future, and on that basis make recommendations regarding the hardware and software we think is best suited for his requirements.

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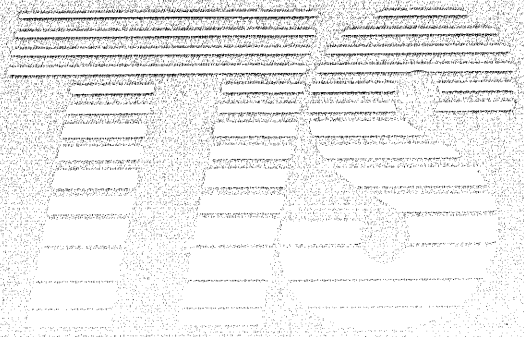

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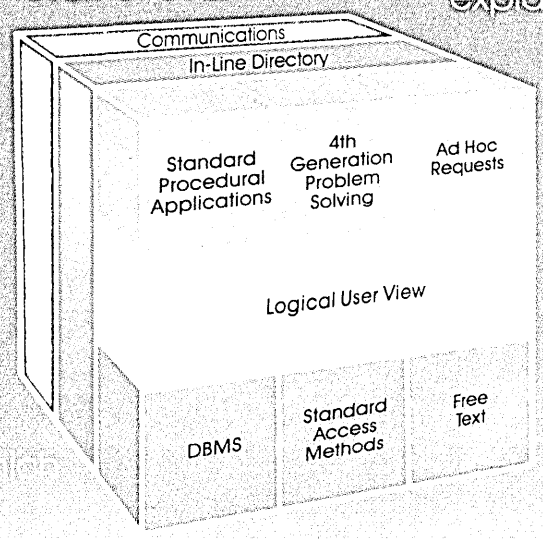

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Already Kelly has discovered that a number of user-initiated jobs can be performed more quickly through the center than through traditional dp channels. As a result, the dp shop's backlog has fallen off, but Kokoszka feels the real long-term benefit lies in greater user awareness of what MIS is and how it can be used effectively. "My own feeling is the users' involvement with MIS projects is going to be far greater in the future because of the center," Kokoszka explains. "They're going to want to contribute to MIS projects in a positive way rather than view MIS as an entity that's totally removed from them."

Positive interactions between the users and the center's dp personnel are common in the brokerage industry. Merrill Lynch offers debugging assistance to non-dp types who have written software for their personal computers. Drexel Burnham Lambert, another Wall Street firm, has developed standardized software packages for its info center clients. E.F. Hutton has an internal newsletter with advice for microcomputer or terminal users, including critiques of new software and database services, and columns by other users on their latest projects.

Another factor to consider is the capability to upgrade on an incremental basis, a key consideration in Kidder, Peabody & Co.'s selection of a Tandem computer for its information center. "When we went in to set up an information center, we hadn't the foggiest idea of how much we'd grow," explains Bruce Hasenyager, vice president at the Wall Street brokerage firm. "The Tandem gives us the ability to grow in small increments to almost any capacity we need. Moreover, the software environment was comfortable for large databases and the machine's high reliability was also important." Today the center supports 60 users on ASCII-compatible terminals who can tap into the Tandem as well as outside databases through a data switch.

Information centers differ significantly in the way they're structured. Some, like Kelly's or the one developed by the Essex Group, a major wire and cable manufacturer in Fort Wayne, Ind., which couples P.C. and IBM 3279 color display terminals with its mainframe, rely on a micro-mainframe mix.

Others, such as Northrop's center in Hawthorne, Calif., rely exclusively on the mainframe—in Northrop's case an IBM 4341 operating under VM Mod Group I—and function effectively as internal timesharing centers. Notably, Northrop, which had gotten significant flack from users who claimed its dp department was unresponsive to their needs, and so set up the center to bring these users back into the dp fold, plans to set up additional centers throughout the company, linking them together via satellite. At this point, IBM P.C.s or other micros don't figure at all in this multicenter network, however.

A number of organizations have based their centers on outside timesharing services.

Finally, a number of organizations have based their centers on outside timesharing services. This was the case with Bechtel Power in San Francisco, Calif. Part of the Bechtel Group, the world's largest engineering and construction firm, Bechtel Power decided to tie into the IBM Information Network rather than put the center on its own main 3033, which didn't have the immediate capacity the center needed.

"We decided that rather than wait for available capacity and then hurry the support phase, we would go to an outside service," explains Steve Paris, Bechtel Power's manager of Information Center support. "That way we could train our support staff in bringing up the first user applications." This outside timesharing approach is being pushed as well by National CSS with NOMAD and Sperry with its Mapper Executive Information Service Center. Sperry bypasses dp altogether and provides the user with a ready-made center. "As soon as we receive the customer's order, we

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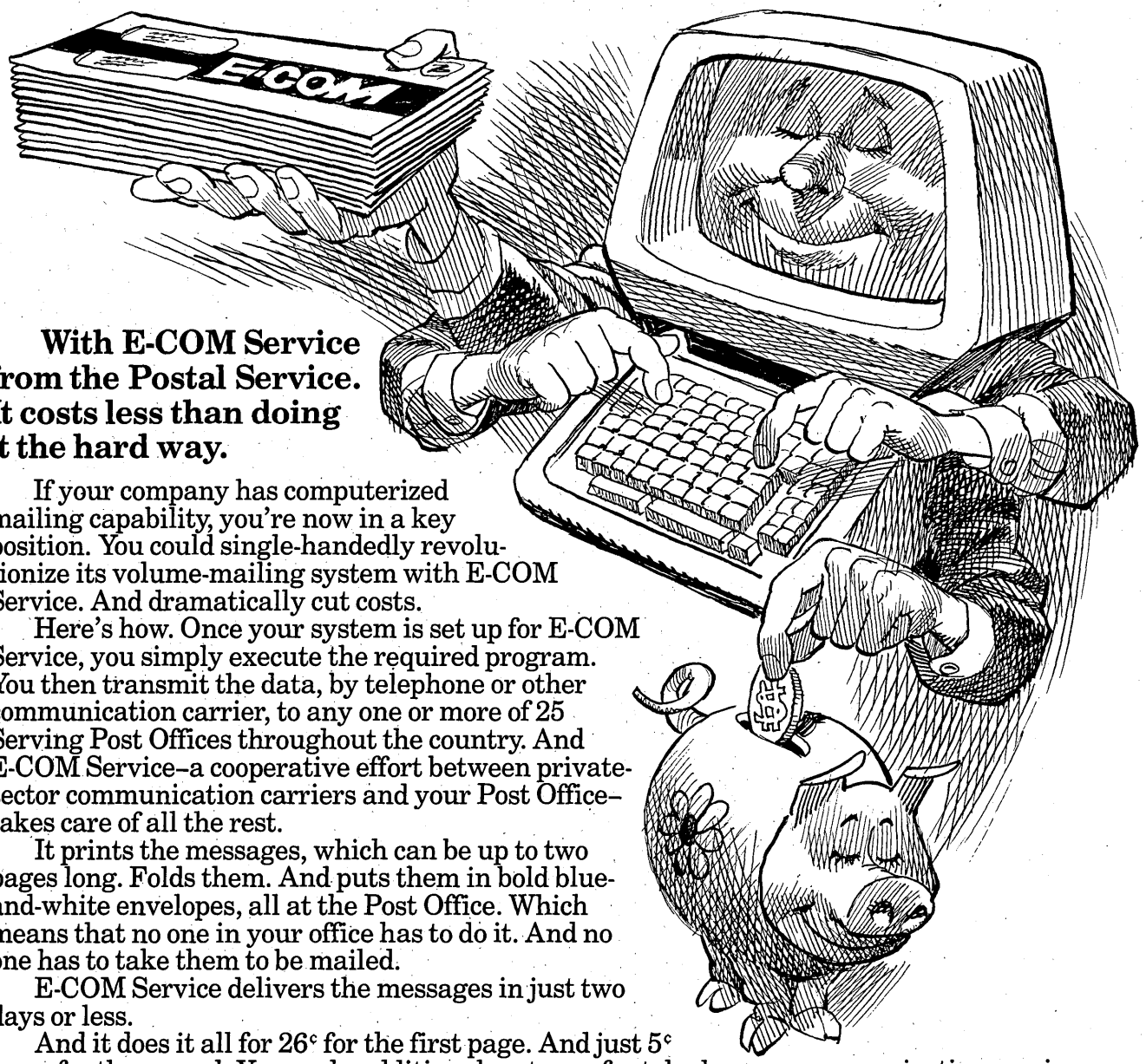

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provide him with a terminal—a dumb UTS 20 at first, an intelligent UTS 40 later, if the customer is inclined to upgrade—a small printer, a modem, and the call-in-code to our system," William E. Russell, Mapper's director, explains. "But what we are really selling is the solutions Mapper provides. Our users are doing decision support and strategic planning and long-term planning functions. That's what Mapper is for."

Some users rebel against the terminal and timesharing approach, though. "They take the situation into their own hands, forming vigilante groups to buy personal computers, because most of the centralized solutions do not have a spreadsheet capability," concedes the senior vice president for information services at a large New York–based company that tried the approach.

In fact, it is not at all unusual for an information center client to ignore advice. One brokerage firm information center manager says that "brokers are an independent bunch, and when they call and ask 'what kind of computer should I buy,' we

The centralized timesharing approach will evolve into a hub and spoke configuration.

sometimes say they do not have a genuine need for one. In a majority of these cases, when I offer the terminal and remote timesharing solution, they say thanks and go out and buy a personal computer." What they were really seeking, he adds, is the hands-on experience of working with a personal computer.

Over time the centralized timesharing approach will evolve, notes Withington of ADL, into what could be called a hub and spoke configuration—the center functions as a service, training, and acquisition support entity, but the micros themselves are dispersed throughout the organization. In the meantime, he sees the center concept as "an excellent compromise" between unrestrained user access to corporate computing and information resources and the other extreme—total control by a highly centralized, monolithic dp department.

"With information centers, experts are interspersed between the user and the mainframe," Withington notes. "That provides some degree of control, something most organizations want, and protects the defenseless mainframe from user fraud or stupidity, which can ruin data, or impossible user requests. At the same time the user gets what he wants."

The best of both worlds, in effect. The information center is clearly a concept whose time has come. ✱

Laton McCartney, a former managing editor of DATAMATION, is currently a free-lance writer in New York and a regular contributor to the magazine.

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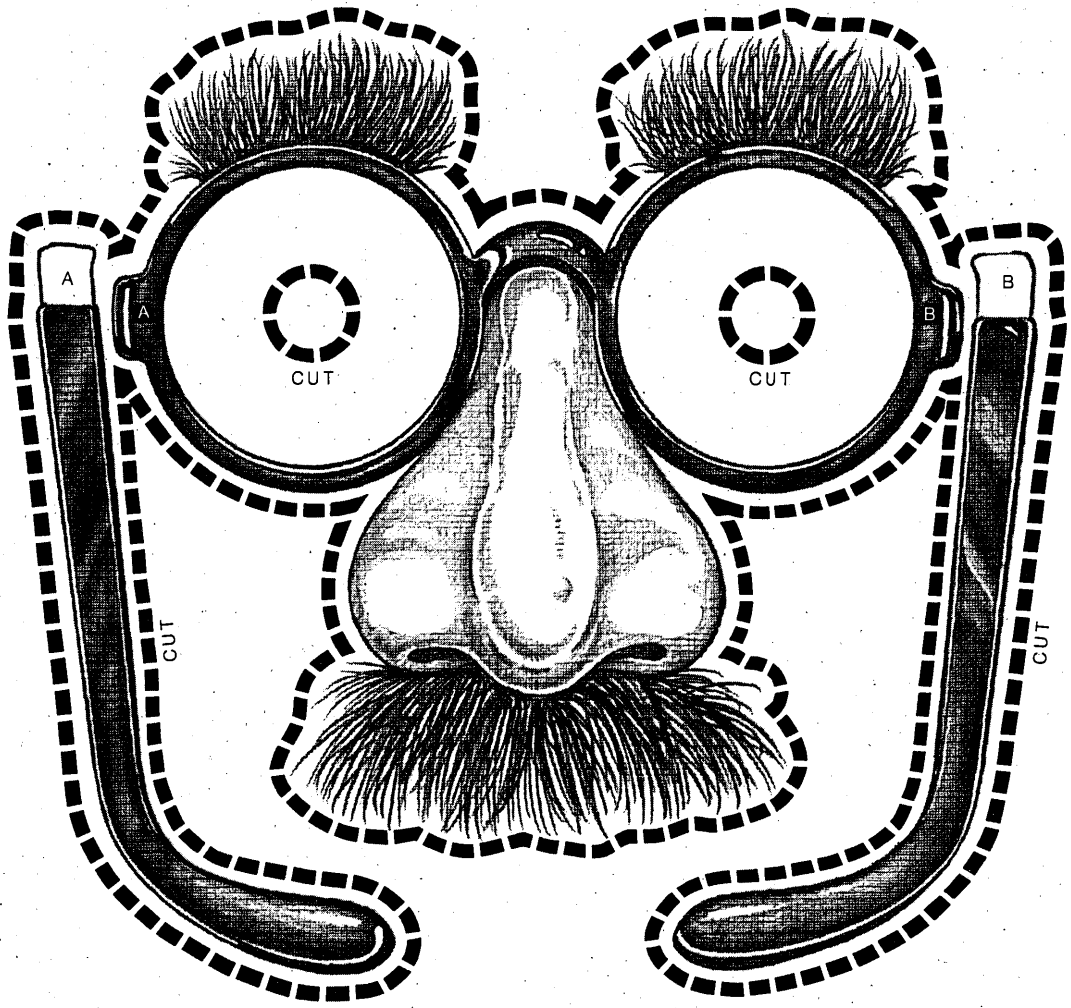

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1. *Datapro:* "User Ratings of Proprietary Software-COMPLETE" November 1982. 2. *Computerworld:* December 20, 1982.

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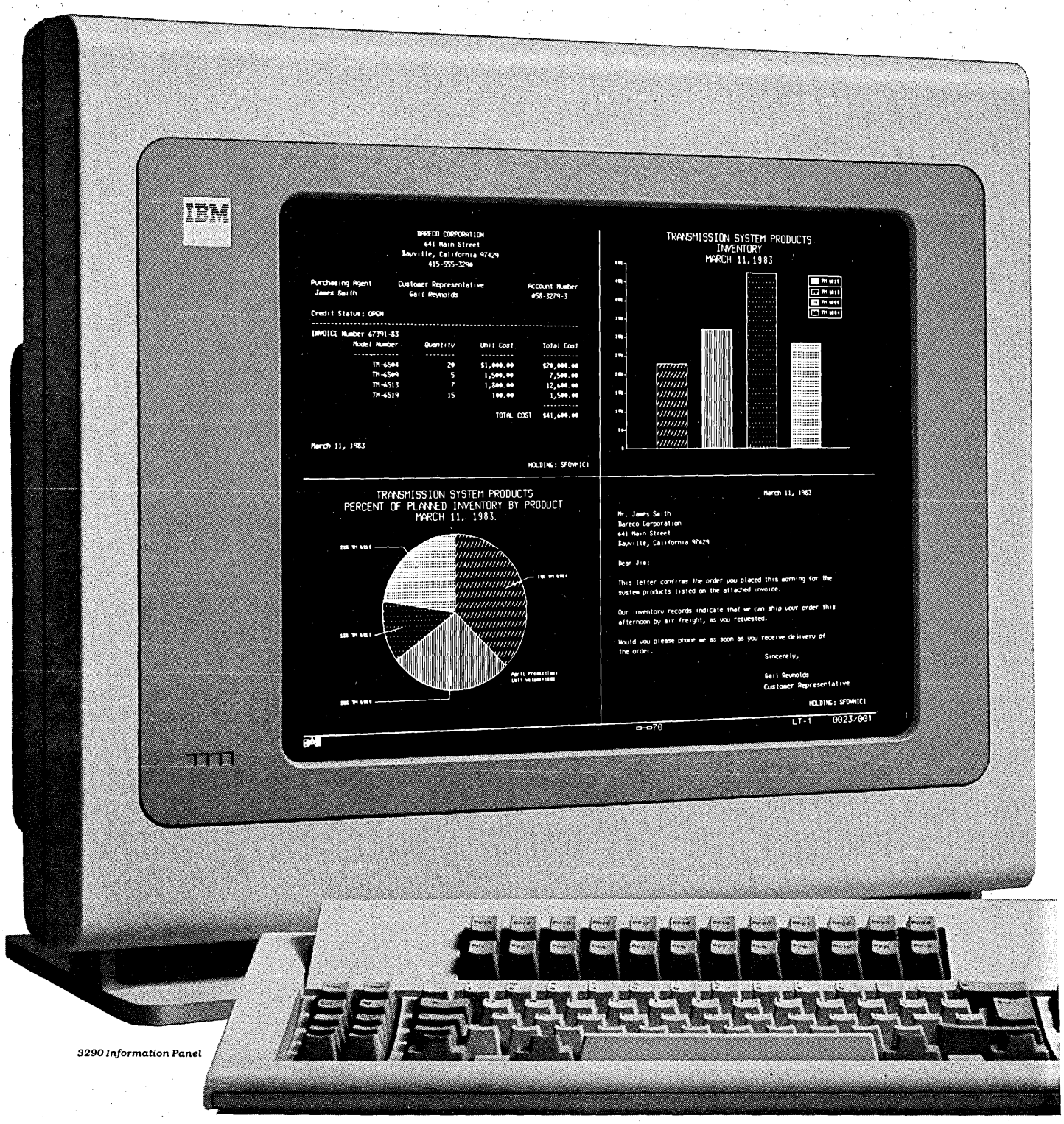

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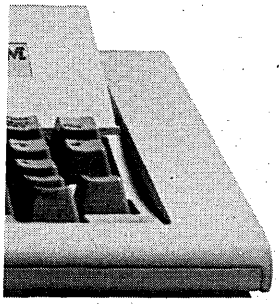
It means, for example, you can see a customer's file, your inventory levels, production status and the text of a letter acknowledging an order — all at the same time.

Next is a new version of IBM's highly successful Personal Computer: the IBM Personal Computer XT. It can be linked with large host computers, and it comes with its own fixed disk drive that can store more than 10 million characters — which is the equivalent of 5,000 pages of text or 100,000 names and addresses.

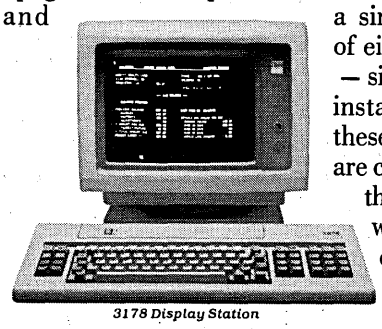


Then there's the IBM 3270 Personal Computer Attachment which does exactly what its name implies. It converts any 3278 display tied to a central computer into a personal computer, simply by pressing two keys.

There's also the new IBM 3178 Display Station, an attractive, low-profile terminal that provides the most popular functions of the widely used 3278 Model 2 display at a significantly lower price. The 12-inch screen can display up to 1,920 characters and swivel or tilt for easy use.

Four new models of the IBM 3274 Control Unit offer dramatic price/performance improvements in directing communications between a host computer and display terminals and printers. Features include a faster, more powerful microprocessor and 50 percent more control storage than previous models — all at the same or lower cost.

Last, but not least, is the new IBM 3299 Terminal Multiplexer. It connects as many as eight terminals or printers to the 3274 Control Unit with a single cable — instead of eight individual cables — significantly reducing installation costs. When these last three products are combined in a system, the average price per work station is significantly reduced.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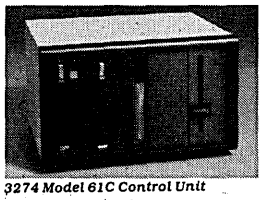
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NEWS IN PERSPECTIVE

STRATEGIES

NCR CHANGES COURSE

The first of a two-part look at the revamped mainframer that is entering new markets while holding on to old ones.

It was 1979 and there sat NCR Corp., like the Queen Mary moored at dock: big, proud, and, in NCR's case, even profitable—but going nowhere. "We knew how to run a business and we knew how to make it profitable. What we needed was dramatic growth," remembers Charles Exley Jr., NCR's president.

So Exley and then-chairman William Anderson sat down with other top executives to chart a new course for the company. They rewrote product and marketing strategies, changed operating structures, reorganized crew, and brought aboard new hands. It's taken five years, but now the brass feel they have a viable plan in place for navigating the tricky waters of the 1980s and beyond.

What was wrong with the old NCR? Like other members of the traditional BUNCH, NCR had positioned itself as an alternative supplier to IBM. "Invented here" was king. Third-party software houses were enemies, recall several NCR executives. That strategy worked fine until customers started jumping ship.

Lack of software was a major shortcoming. NCR couldn't keep pace with the ever-expanding programming demands of its users, while IBM users seemed showered with software choices from IBM and a host of independent sources.

NCR has addressed that shortcoming with a third-party software program that it claims has between 500 and 600 participants. To encourage outside support, attractive royalties, joint marketing arrangements, and outright purchasing programs are in place.

In its new bag of tricks is a tool that appears to be unique among the BUNCH. Called the program conversion tool, it is a source language translator that takes a standard IBM 370 COBOL program and converts it to source code for NCR mainframes.

"It is a very effective product, although not 100% effective," said William Buster, executive vice president, development and production division. The company is actively marketing it among third-party suppliers, he says.

Other problems facing NCR were not so immediately addressable. Acquisition fever, for example, which swept over the country about three years ago and has continued to burn, has played havoc with NCR's customer base. That base is largely small to medium-sized companies. Too often, NCR found itself on the weak side of the bargaining table when a big company—usually outfitted with IBM gear—rolled in for the takeover. Guess who's equipment went out the door.

And, of course, the recession has hit those same small and medium-sized NCR users, leaving them little budget to buy more hardware—unless of course they are taken over by a bigger company.

The message was clear: NCR was in trouble and its balance sheet showed it. For the past decade, the firm's revenue growth had averaged less than 8% a year (growing only 3% annually between 1981 and 1982), reports Steve McClellan, vice president and computer industry analyst at Salomon Brothers Inc. It was clear something drastic had to be done; this led to a fundamental change in the company's strategy.

It appears NCR's soul-searching process went something like this: to grow the company, a more nimble, aggressive organization was needed to go after new markets. Since NCR's traditional business was with small to medium-sized companies, its most potent untapped market was large corporations. In order to address them, however, NCR needed new product strategies. It had to reposition itself in the marketplace.

Reposition itself NCR did, about 180 degrees from its old post as an alternative supplier to IBM. NCR describes itself today as a "coexisting" supplier to IBM.

The company foresaw that future growth would have to come from large corporations, not from smaller, IBM-prone users.

"The central thrust here is that you have a fundamental repositioning of NCR from a company that primarily concentrated on selling to smaller organizations to one that is primarily attempting to sell to larger organizations," explained David Laws, NCR vice president for product management and quality assurance.

NCR insists a plug-compatible strategy is not in the plan. "We are not in the plug-compatible business. I figure IBM can do its work better than we can," states NCR executive vice president Buster. What is in the plan, in large letters and marked as a key first step to making a successful bid for his company business, is SNA/SDLC communications compatibility.

The recent rash of new NCR products shows NCR's company-wide commitment to SNA/SDLC. For example, the 5000 bank branch automation system, the Tower oem

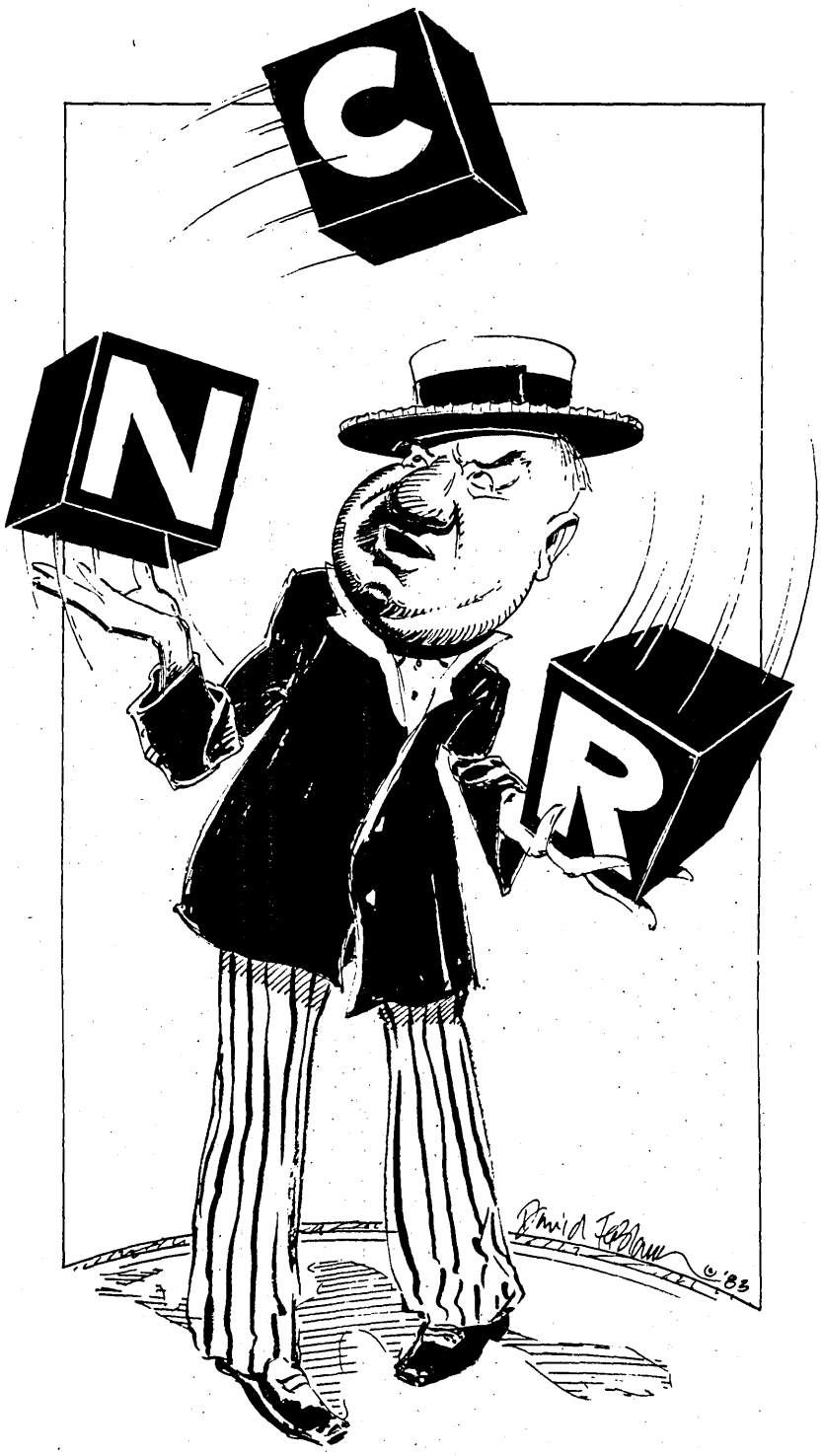


ILLUSTRATION BY DAVID FEBLAND

microcomputer, the 9300 mainframe, and the recently announced 8600 models all support SNA/SDLC, and, in most cases, several other commonly used protocols.

Although NCR's personal computer, the Decision Mate 5, which supports MS/DOS and CP/M, was designed as a single-user system, it too, has a path to SNA capability and, therefore, to host systems when used in a clustered arrangement. In the clustered configuration, Decision Mates, Apple IIs, and IBM P.C.s can be networked together over NCR's Decision Net (which is actually Corvus's Omninet).

Decision Net links the personal computers to a file sharer box called Modus. "Modus looks like a Tower but is just a shared storage device that hold six disks," explains Don Coleman, vice president of NCR's commercial (CI/MEG) systems division. SNA capabilities reside inside the Modus box.

Why has the change taken five years to bear fruit? Making the transition from an IBM alternative supplier to a coexisting supplier proved far more difficult than NCR expected, from technology and company attitude standpoints. NCR's SNA approach appears to be more in-depth than some of its competitors'.

"In selected cases," explains Hugh Lynch, vice president, general purpose systems divisions, "we have taken the SNA capability all the way up to the application level. In certain cases we provide software for both the IBM processor and the NCR terminal control processor so we can establish an SNA PU type 2 interface and in addition interface to the network control management programs running on the IBM host under VTAM."

Changing technology is one thing; changing people's attitudes is another. "When you have a big company like NCR [1982 revenues were $3.5 billion], trying to turn it around is like trying to turn the Queen Mary around—the thing keeps going in a straight line for a long time," quipped Laws.

NCR insists it has no 370-compatible mainframe plans, but SNA is a key part of its systems strategy.

The company looked around for some help. It found it in the form of Minneapolis-based Comten Inc., a maker of IBM-compatible communications processors. Comten was acquired for $145 million in 1979. According to executives, NCR got its money's worth from the acquisition, primarily critical SNA expertise and an attention grabber. The belief at the top, say company sources, was that spending big bucks on IBM-compatible expertise would get the attention of everyone in NCR, not to mention the industry, and prove management was serious about its new strategy.

Even though NCR is hungry for new business and has targeted large organizations as its most fertile hunting ground, it seems to have little interest in taking on IBM directly in the central data processing center. Instead, NCR hopes to make inroads at the departmental level. Therein lies the basis of another set of new product strategies.

Think about the problems facing large corporations today. From the MIS perspective, there is a multitude of incompatible vendors scattered throughout the organization. Juxtaposed against that situation is the ideal goal, a wired world of information flowing freely among widely scattered sites and operations. It's a world where the PC can talk to the host and information gathered on the shop floor can be used by purchasing and the corporate financial officer. To bridge the gap between here and there, many MIS managers have adopted industry standards as guidelines for corporate standards.

None of this has been lost on NCR

Charles E. Exley, Jr.

management. Its approach to large corporations appears to be focused at the department level with a strategy to offer distributed processing equipment, a wide assortment of industry standard features, low entry cost, and smooth migration paths.

Has NCR put its product where its strategies are? Notes Bill Easterbrook, partner and vice president of research for Wall Street's Kidder Peabody & Co.: "NCR's array of products at the low end is not far short of IBM. They are the only two companies that have come up with a satisfactory number of products at the low end."

Changing technology is one thing; changing people's attitudes is another.

Even the 9300, the first computer system product to make use of NCR's VLSI 32-bit chip set, hit the streets with an entry-level price of $24,235. "As the price curve on our products comes down, we start to get into the signature authorization levels, such that a department manager has the authority to buy a department processor like the 9300," comments Buster. When upgraded to support 10 to 14 users, NCR claims, its 9300, with a desktop footprint of only 7½ in. × 17½ in. × 25¾ in., offers the performance of a DEC VAX-11/730. The NCR configuration costs about $72,000, about 45% less than DEC's cost, states NCR.

As for NCR's distributed processing strategy, an in-house publication on the Tower raises the veil on how NCR expects to integrate its products. For the Tower, it appears to be a three-step plan. First, the Tower was introduced as a distributed processor supporting up to 16 terminals (or eight, in a highly interactive environment). Later, several Towers will be networked together, perhaps serving several departments. A Tower in another department could support four to eight Decision Mates over Decision Net and the Modus file sharer. These two could be networked together with a third Tower via Ethernet. The third Tower could support several word processors and also handle a communication link to a host mainframe.

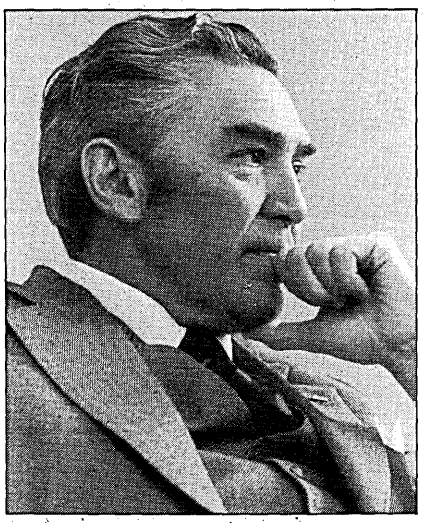
With the capabilities of the VLSI chip in the 9300, it seems likely the machine will also find itself in a similar networked environment.

The importance of NCR's in-house-developed VLSI 32-bit chip set, which is primarily responsible for the 9300's attractive price/performance ratio, should not be glossed over. As Buster points out, NCR is still at the beginning of the cost curve for its VLSI chips, while bipolar technology is nearing the bottom of its curve. Whenever NCR pits its new generation, VLSI-based product against an old bipolar generation product it will have a hefty marketing advantage, NCR claims.

A powerful feature of the chip set, which NCR sells in the merchant market as well as in a complete system box, is its programmability at the microcode level. It can be "shaped" to meet many needs, a marketable strength from the compatibility standpoint.

"Suppose you have previous software that does not necessarily let you exploit the technology of your new product," explains Lynch. "By dropping an entire function into microcode, we can have microcode that supports the previous software." From a user's perspective, that capability goes a long way when it comes time to migrate from one system to another, he says.

Lynch adds: "We are using the firmware intervention capability to get high performance in certain areas like database processing. We put the database function directly into microcode. Doing this with communications doesn't generally pay off because communciations is so slow relative to the speed of the computer."



William S. Anderson

Keep an eye on the 32-bit chip set, for NCR executives indicate it is destined to turn up in many product lines to come. "Using the 32-bit chip set we can configure a machine to be an I, a U, or a V," says Lynch, referring to the three types of NCR criterion mainframes. That capability reveals much about how NCR could easily evolve its systems into a tightly integrated family of compatible products. But wouldn't it follow, at least for specific applications, that the chips could handle DFC, or Data General or IBM software?

"Yes," confirms Lynch, it is possible. "Our approach in that area, though, is that we are offering the chip set to anyone else in the industry that wishes to put a particular software set on it. We, at the moment, are not planning to enter the plug-compatible business. Instead we are doing a lot of communications integration with other processors."

Perhaps the corporate slogan should be "have product, will fit."

Industry analysts speculate that eventually NCR will exercise the plug-compatible option. "At some point I expect NCR to announce the capability to run IBM software using the 32-bit chip set," speculates Tom Crotty, vice president of research at The Gartner Group, Greenwich, Conn.

Judging by the dizzying array of de facto and formal standards the company supports on its products, particularly in the fast-moving small systems arena, NCR's corporate slogan could easily be "have product, will fit." The company has gained high marks from Wall Street and other industry analysts for addressing the very real need at large corporations for getting different types of systems to work well together.

Kidder Peabody's Easterbrook singles out NCR as the first "non-IBM" company to recognize the proliferation of low-end, entry-level products and the compatibility problem that worries so many MIS managers. The Gartner Group's Crotty observes: "All in all, I think NCR is making all the right moves, opening new distribution channels, leveraging itself in volume, and adopting compatibility strategies. It has really done a lot of things to separate itself from the BUNCH."

What remains to be seen, of course, is if the firm's sales force can sell the wide range of new products recently introduced. NCR has entered several already crowded markets—personal computers, oem systems, merchant semiconductors. As chairman Anderson sees it, his "new" NCR has just entered its marketing phase.

"Many of our programs are still relatively new. The proof of the pudding will be in the eating."

—Jan Johnson

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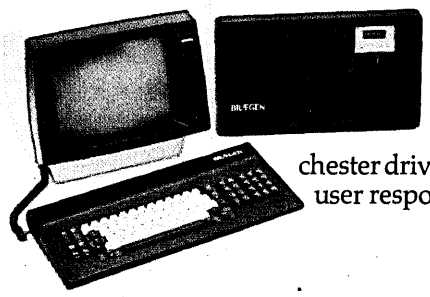

More Control And Economy. Undoubtedly, it is the control you gain and the dollars you save that really distinguish the 8410. Because the PC capability is integrated into the controller, each user is tied into the overall corporate communications network—giving the DP Manager control over critical computer resources.

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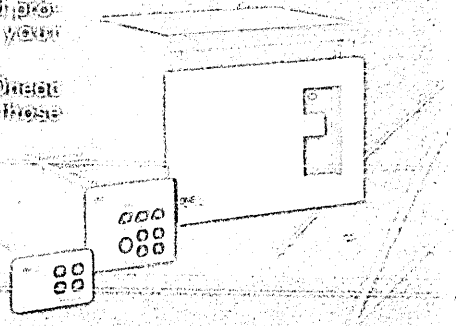

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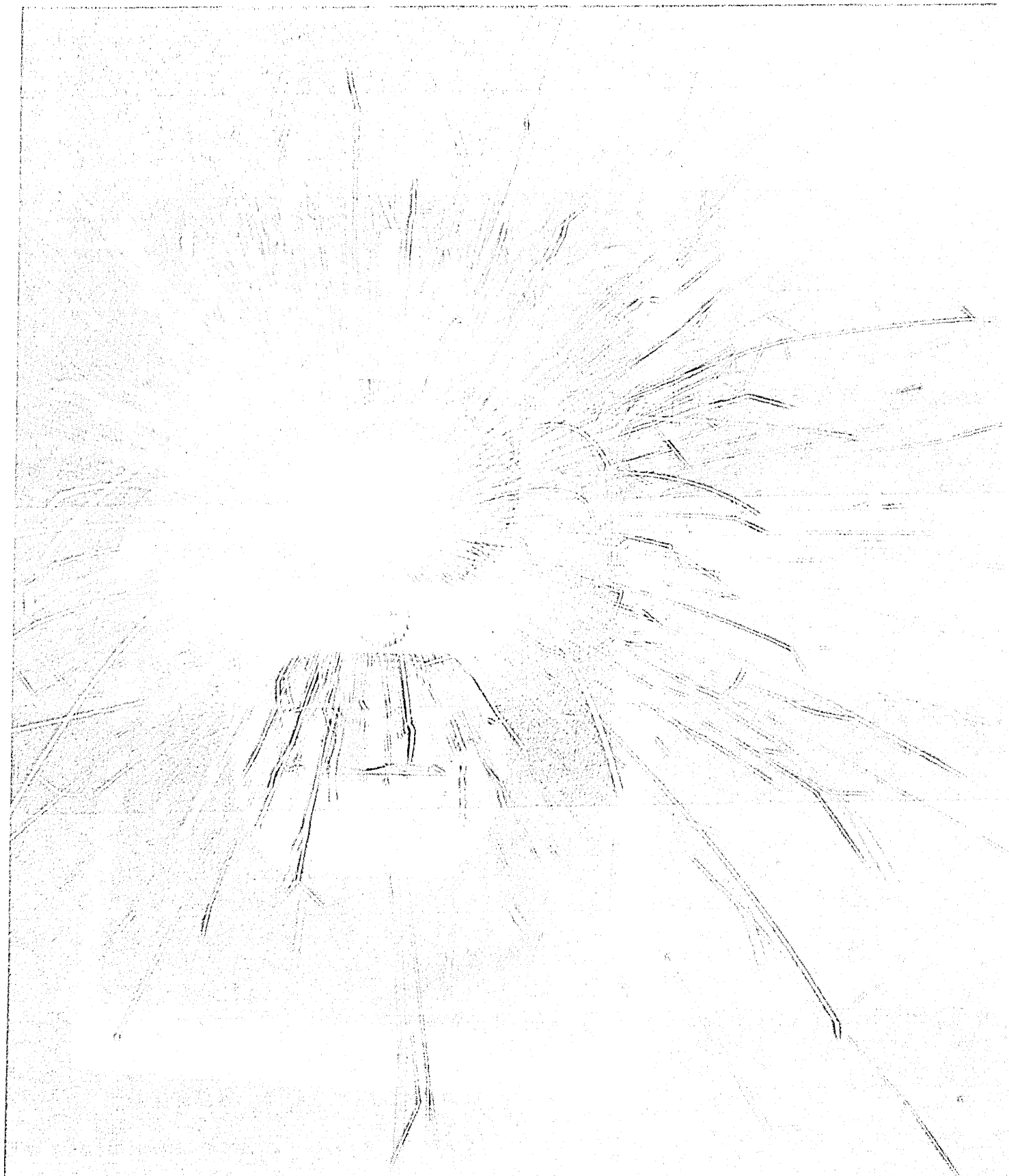

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LEGISLATION

DO CRTS KILL?

It's a question that is being raised once more as unions, manufacturers, and legislatures debate the safety of office systems.

Just when you thought it was safe to go back to your video display terminal. . .it may not be.

What we've got here is an electronic *Jaws*, according to an increasingly vocal portion of those who are married to their high-resolution screens eight hours a day, five days a week. Those who manufacture the little boxes say they always have been, still are, and always will be safe and sound and that those who insist otherwise are just creating a smokescreen. While each side is firmly convinced it knows whereof it speaks, and the other does not, neither wants a confrontation. Just the facts, ma'am.

"We're getting a lot of calls about health problems," says Janice Blood, public relations director of 9 to 5, AKA the National Association of Working Women. The group announced on May 17 a nationwide "Campaign on Vdt Risks" to alert employees to what it considers the dangers of working with the terminals.

"If the manufacturers are right, why are women working with vdts having miscarriages and malformed children in numbers beyond what could normally be expected? We're not challenging anybody in the sense of an ultimatum. We want to be more productive in our work just like the employers want us to. But with 5 million to 7 million people sitting in front of these machines, it seems like a bad risk to wait for the scientists to make up their minds."

"The scientists have already made up their minds," counters Vico Henriques, president of the Computer and Business Equipment Manufacturers Association (CBEMA), point group for the manufacturers. The issue has proved hot enough for CBEMA to form a special vdu task force and produce a pamphlet called "The Facts About Visual Display Units," which affirmatively answers the question "Are vdus safe?"

"We don't want this to be a confrontation," Henriques says. "We're not at odds with groups like 9 to 5. The problem is that the vdu has become a lightning rod for several sectors of people who are unhappy with their jobs. Vdus aren't a health problem. They're a management problem. The scientific facts say there are no problems."

The facts, according to the National Institute for Occupational Safety and Health (NIOSH), haven't changed in two years. The agency released in May 1981 the findings of a study undertaken at the request of a consortium of unions in the San Francisco area on the health effects of vdts. The message was that you're worse off sitting in front of a television screen.

"Radiation levels are far below current standards and, in most cases, were not detectable," NIOSH concluded. "The visual display terminal does not present a radiation hazard to employees working at or near a terminal. Routine surveys of video display terminals are not warranted."

NIOSH did uncover a large number of health complaints. But those were related to visual, muscular, and emotional problems, not to any unseen waves that might be emanating from the display section of the vdt. And when the Food and Drug Administration's (FDA) Bureau of Radiological Health & Human Services followed the NIOSH study with one stating "there are no significant emissions from visual display equipment. . .it must be concluded that no significant radiation exposure hazards exist in the normal use of visual display equipment, whether monochrome or color," the issue seemed as dead as the dodo.

But it refused to die. Now, thanks mainly to 9 to 5, the Newspaper Guild, and a number of state legislators, it is alive and well.

"We cannot afford to wait," 9 to 5 executive director Karen Nussbaum said during the May 17 kickoff announcement. "While scientists argue over possible causes and links, millions of men and women are sitting in front of these terminals, and it's irresponsible not to take simple precautions such as temporary job transfer and metal shielding."

"Radiation levels are far below current standards and, in most cases, were not detectable," concluded NIOSH.

Those two are among several recommendations 9 to 5 makes in "The Human Factor: The Consumer Guide to Word Processors." The group also suggests: employers design equipment to be adjustable to the worker, not vice versa; regular employer-paid eye exams be provided for all vdt operators; frequent rest breaks be given; and women who plan to become pregnant be given the choice to transfer to non-vdt work at no loss in pay. The recommendations are tailored to specific ones made by NIOSH in its 1981 report.

As corroborating evidence, 9 to 5 cites some examples of abnormal pregnancies among women working with vdts: seven miscarriages and three birth defects in 15 pregnancies in one year at a defense contracting office near Atlanta; seven miscarriages and premature infant death in 12 pregnancies in one year at the Sears computer center in Dallas; six out of seven pregnancies ending abnormally since the installation in 1978 of vdts at a Vancouver hospital; and four of seven babies born with birth defects over a two-year period to women vdt operators at the *Toronto Star*.

In the Dallas and Atlanta cases, exhaustive epidemiological studies revealed no connection to vdts. But 9 to 5 has criticized the studies for not including radiation measurements. The Toronto Department of Public Health concluded that "vdts do not emit measurable levels of ionizing radiation, and only emit such low levels of non-ionizing radiation that both should be considered inconsequential to the health of the vdt operator. The birth defects in the babies of four *Toronto Star* employees were *not* caused by radiation emissions from vdts."

Bills regulating the use of vdts have been introduced in Connecticut, Illinois, Massachusetts, Maine, New York, and Oregon.

Thus speaks the scientific community. But there are those out there who, though listening, may not be hearing. Bills regulating the use of vdts and providing safeguards for workers have been introduced in Connecticut, Illinois, Massachusetts, Maine, New York, and Oregon. The most radical of these, courtesy of State Sen. Joseph Mantalto of New York, would require that every public and private employer using word processors or computer terminals furnish pregnant employees operating them with a radiation protective jacket or blanket upon request. Illinois and Maine have decided to refer the subject for further study. Massachusetts is expected to follow suit.

But the manufacturers have not seen the last of attempts to regulate them. Reports are afoot that California is considering a regulatory bill. And where California leads, others will surely follow.

"It's clear that manufacturers don't want to be regulated, and I don't blame them," 9 to 5's Blood says. "But the only way to ensure that is not to create the need for it. They've got to start marketing with product safety in mind. They all ought to want to be the safest as well as state of the art. It's in their best interest as well as ours."

"If you're sitting in front of a machine and thinking 'I wonder if that thing's poisoning me,' that's clearly not a healthy situation," Henriques admits. "The facts say it's no problem. But fears can be equally as real as facts.

"None of these bills are concerned about employees' health. They're concerned with job content and work place surroundings. They fold up on health because

Whisper Writer communicates via phone lines; an RS-232C version is also available.

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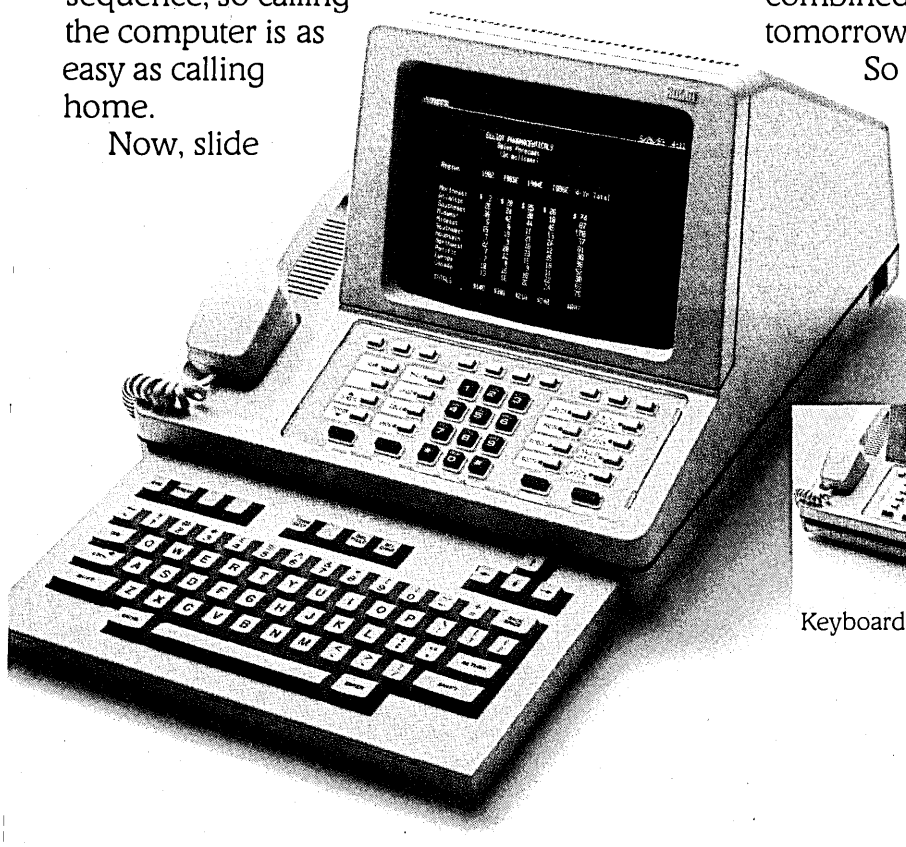

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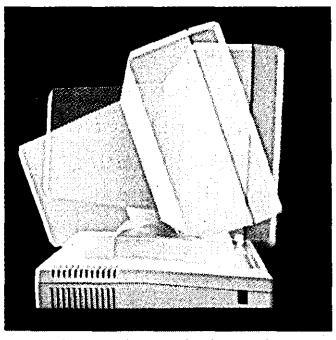

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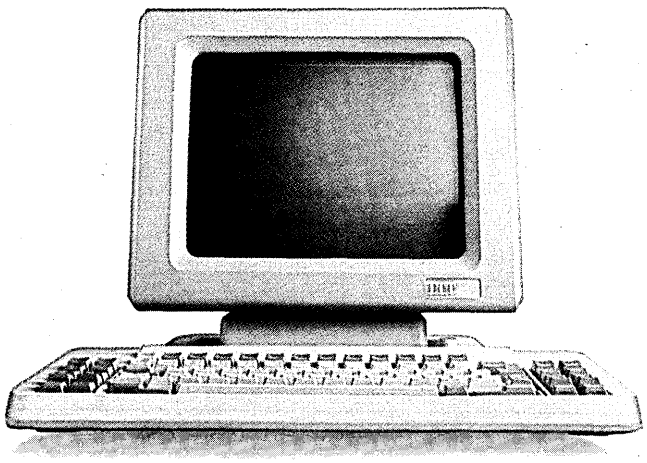


ITT Courier 1700.

CIRCLE 54 ON READER CARD

there's too much evidence against them. But union organizers want to plow the virgin field of office workers. The best way to organize is to scare the hell out of somebody and then say you're their salvation."

While employers may not consider vdts God's ultimate gift, they're certainly in His top five. There figure to be plenty more vdts where these have come from. If 7 million to 10 million folks are using vdts at this very moment, there won't be fewer by 1985. So in terms of waves, you ain't seen nothing yet.

"We certainly, absolutely need more scientific research," Blood says. "The reason for believing the radiation is not harmful is based on a theoretical model, not scientific tests. No one can say for a fact there are no biological effects on the human body from vdts. They can't say there's no problem.

"It's a vicious circle. The line is always 'we don't need to study it because there's no problem.' That's wrong. The only common denominator in those problem pregnancies was a vdt. The research speaks for itself. If the unions are organizing around this issue, there's a basis for it." (Blood points out that 9 to 5, although affiliated with the Service Employees International Union (SEIU), does not consider itself a union.)

"We don't need any more scientific study," Henriques says. "We may need behavorial studies. For too long we've been style-conscious in the office rather than function-conscious. It's not the vdu that's creating the dissatisfaction. It's the dead-end jobs driven by the vdu that are causing the problem. Where people control their machines, there's no problem."

Now that it has risen from the dead, the vdt dispute only promises to become more heated, despite both sides pleading for restraint. A vdt hot line (800-521-VDTS) has been established by 9 to 5, for employees and, it is hoped, employers to share information. All 9 to 5 says it's doing is increasing awareness of health issues among employees and employers. It also wants to make sure the scientists don't put away their instruments just yet.

CBEMA, which is in the tricky position of telling its members that they haven't been too careful about how they've set up their offices, has testified in all six states where bills have been introduced. Its input has reduced the anxiety level to the point where discussion, at least for now, can proceed more or less rationally.

"All we're trying to do is educate customers to be more sensitive about job content," contends Henriques, who two years ago was telling a subcommittee of the House Committee on Science and Technology that the industry has been sensitive to the problem of radiation leakage for many years. "We're also becoming much more aggressive about educating the public. There are justifiable questions for which answers should be sought.

"We live in a paranoic society. We suspect the worst of what we don't understand. I think that's what's happening here. The hard scientific and medical evidence is that there's no hazard," he concludes.

The moral of the story? Don't trash your vdt, but keep your typewriter handy just in case.

—Willie Schatz

FUTURE COMPUTING

IEEE VS. DARPA

The two organizations are competing for R&D money to build big computers to combat the Japanese fifth generation project.

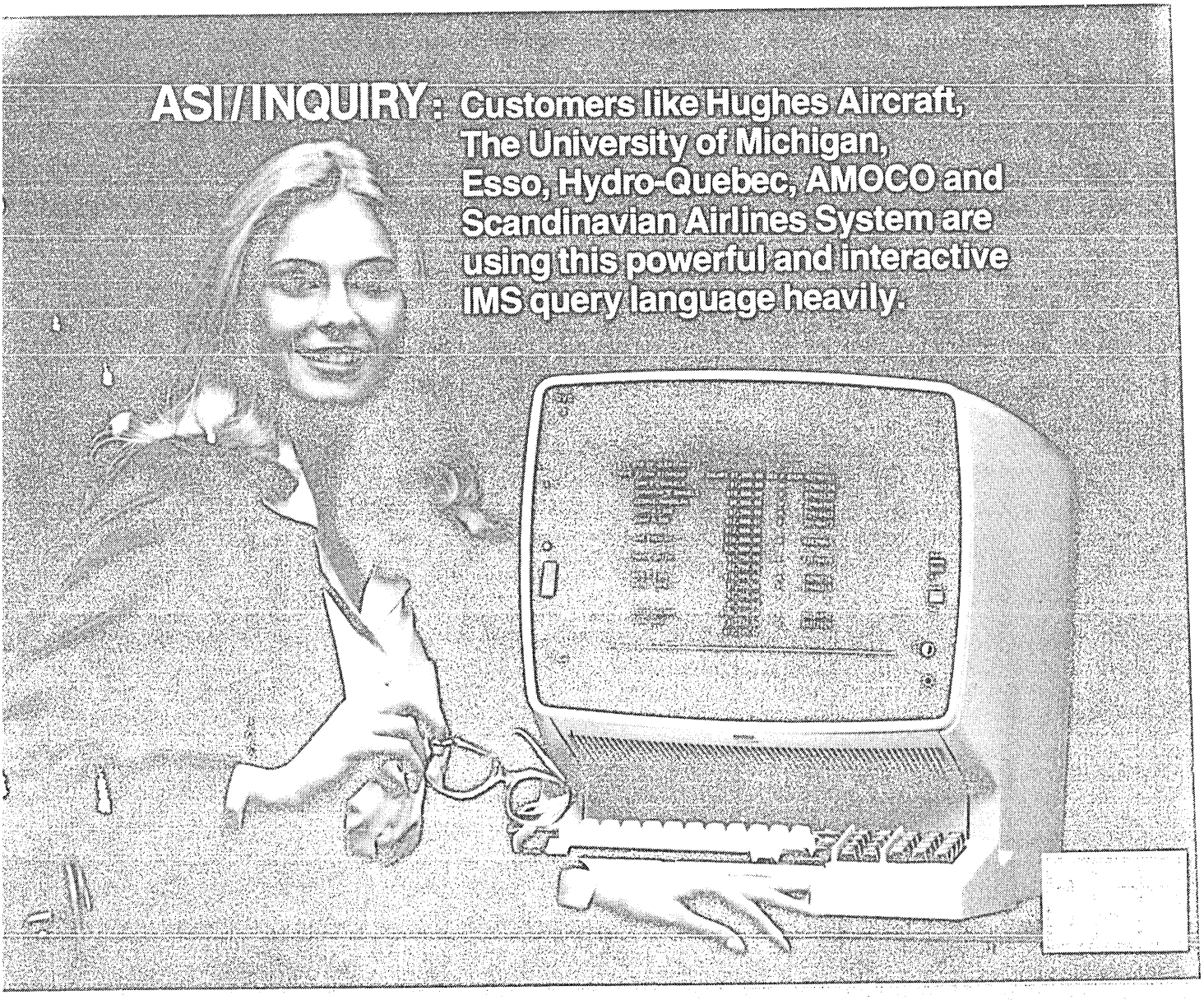
What's in a name? That which we call a supercomputer by any other cpu would be the fifth generation, no?

No, no, a thousand times no, insists the Institute of Electrical and Electronics Engineers (IEEE). What we have here, says IEEE, is a serious generation gap.

" 'Fifth Generation' and 'supercomputer' are being used interchangeably, and they're not the same thing at all," contends Ted Bonn, director of the computer research lab at Sperry and a member of the board of directors of the IEEE. " 'Fifth generation is really artificial intelligence [AI], a knowledge-based machine. 'Supercomputer' means a number-cruncher beyond any one we have now. We want to call attention to this difference. Nobody's paying attention to it. We think people should."

To that end, the IEEE has established an Ad Hoc Committee on Super Scientific Computers. Bonn's brainchild, it is chaired by Dr. Sidney Fernbach, a theoretical physicist and computer consultant to, among others, Control Data Corp. (CDC). It's no secret that CDC's Cyber 205 is one of the two supercomputers currently available, the other being, of course, the Cray-1.

The committee is composed of 16 leading lights of government, industry, and academia. Their mission comes in four parts: 1) to inform IEEE membership of Japanese and U.S. plans to develop advanced computers; 2) to establish liaison with the National Science Foundation, the Commerce, Energy, and Defense Departments, as well as other federal agencies having an interest in Japanese attempts to gain a lead



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in supercomputers; 3) to assess U.S. research and development efforts to determine if government support is necessary; and 4) to issue recommendations to the membership and government agencies.

"I got this idea when the Japanese announced their fifth generation program," Bonn says. "I think it's necessary for two reasons. The Japanese have a fifth generation program involving their government, industries, and universities. It's an AI program. My feeling is that AI is risky. It's not certain that anything will come out of it.

"The superscientific computer is just a matter of moving current technology. We already have this technology. The U.S. [government] program is emphasizing AI too much. AI is a gamble. Let's provide for the sure thing. Besides, the Japanese program is merely a framework on which to develop a superscientific computer anyway."

The superscientific market right now is not what you'd call pervasive. The latest census revealed a total of 25, of which the government has purchased half. Making one of these monsters, as Bonn wryly acknowledges, "is not the most optimum, cost-effective use of high technology for private industry."

But with a "made in Japan" label everywhere you look, who can worry about optimum? We're talking world leadership in high tech here. After being a Hertz for so long, the U.S. is not kindly disposed toward becoming an Avis.

Which brings us to the government, where all things begin and end. Deep within the vast reaches of the Pentagon, home of the Department of Defense, lies the Defense Advanced Research Projects Agency (DARPA). It is this group that has been assigned the momentous task of protecting our shores from the Japanese menace. It is also this group, according to Fernbach, that has erroneously merged the supercomputer with the fifth generation.

"DARPA has just jumped on the bandwagon. They're confusing the government by using 'supercomputer,'" Fernbach charges. "What concerns me is that the government gives $50 million to them, then we come along and say we need $50 million, then the government says 'we just gave you $50 million.'

"Supercomputers can do logic problems equally well [as a fifth generation machine]. Supercomputers can do more than the fifth generation. I'm not at odds with DARPA, but they're lying through their teeth to get the goddamn money."

DARPA hasn't been shy about asking for cash. It's requested $50 million for fiscal year '84, $95 million for FY '85, and a whopping $186 million for FY '86. Its projected grand total is $500 million for five years. Whether it receives a penny rests with the infinite wisdom of Congress.

To further muddy the waters, three major research organizations recently announced that they will combine their considerable talents to develop a supercomputer (their word) capable of performing calculations 1,000 times faster than current Cray and CDC models.

The Lawrence Livermore and Los Alamos National Laboratories, which usually disagree on the allocation of every government penny, will be joined by the Stanford Research Institute (SRI) International. Their offspring will be called the Supercomputer Project Research Experiment for Access and Development (SPREAD). SPREAD also plans to place prototype experimental supercomputers it hopes will be 100 times faster than those now available onto a network that research scientists can access.

"My feeling is that AI is risky. It's not certain that anything will come of it," says IEEE's Ted Bonn.

If money talks, the project should walk by mid-1984. Naturally, part of its goal is to beat the Japanese at their own game. "The Japanese supercomputer [their word again] program is well organized and well funded," an SRI spokesman was quoted as saying. "It poses a threat to U.S. technical superiority."

That clearly comes as no great shock to the folks at DARPA. Since early this year, they have been burning the midnight oil on their "Strategic Computing and Survivability" program. (The title seems to imply that if we lose we will not be around to find out what it's like to come in second, but we've got at least a decade to worry about it).

Until the beginning of June DARPA had little more than that project title to work with. There were the obligatory quotes from Defense undersecretary for research and engineering Richard DeLauer ("I don't want to say it's a fifth or sixth generation machine, only that it will outperform anything the Japanese develop"). But it was all talk and no action.

Congress, an expert in that philosophy, was not about to be taken in. When DOD representatives appeared before the House Armed Services Committee to present that budget request for FY '84, which begins Oct. 1, the committee members were not impressed.

"DOD representatives could not provide a comprehensive plan for the conduct of the fifth generation computer effort or delineate major milestones," the committee reported. "No funds can be obligated or expended until the Secretary of Defense submits a comprehensive plan for the conduct of this program."

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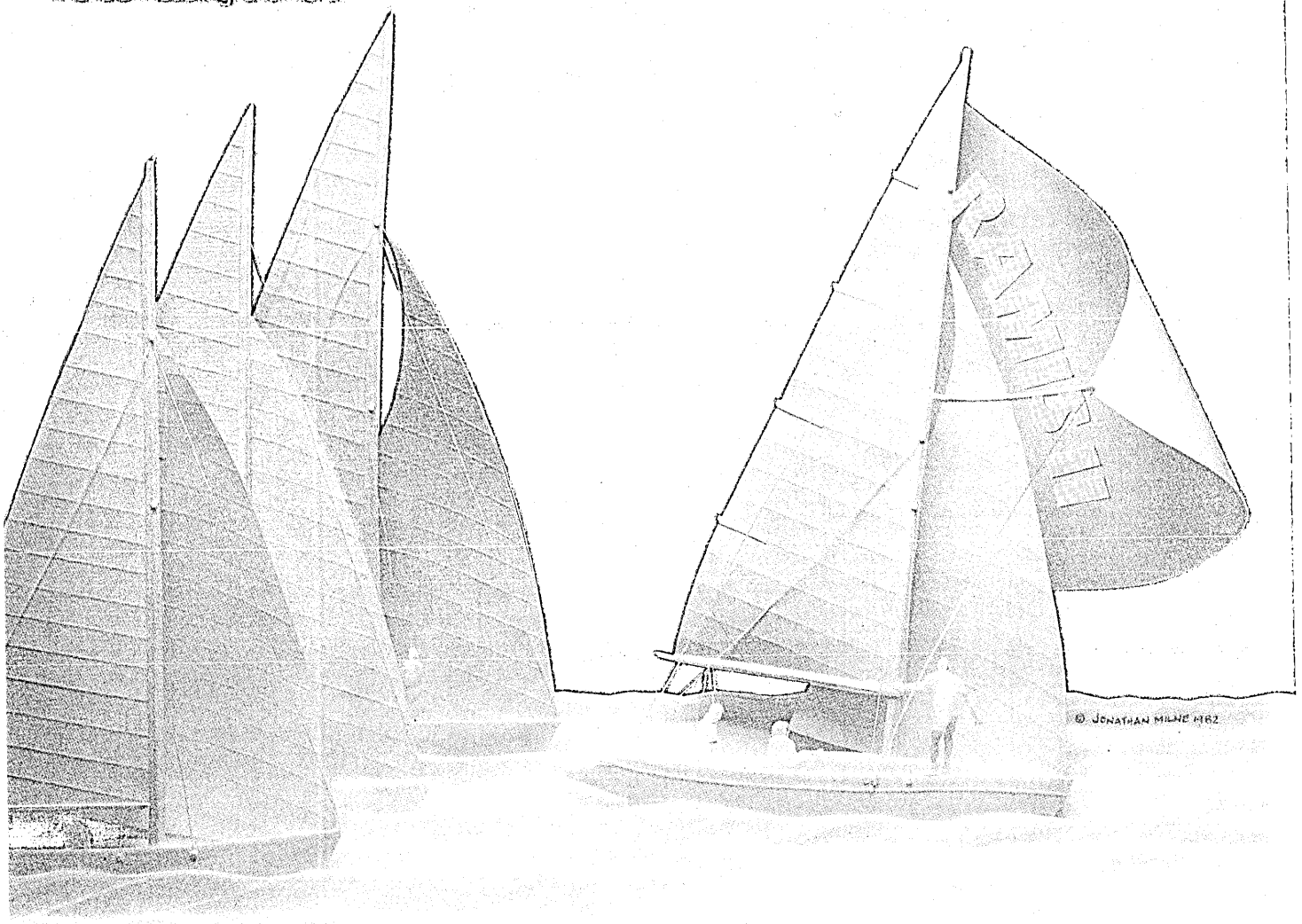

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NEWS IN PERSPECTIVE

SYSTEM EXPERT

Although she's keeping quiet about her new post, that of heading the Defense Department's ambitious "nth generation" computer project, Lynn Conway has a reputation that precedes her. She is generally regarded as one of the world's leading authorities on the design of VLSI circuitry.

Working out of her offices at Xerox Corp.'s Palo Alto Research Center (PARC), Conway has been instrumental in helping U.S. universities establish expertise in VLSI design methods and teach it to engineers. Until she and Carver Mead, a Cal Tech professor reknowned for pioneering many integrated circuitry concepts, combined their efforts, useful knowledge of VLSI design was hard if not impossible to come by. For obvious competitive reasons, VLSI techniques were kept secret, sequestered deep in the labs of industry.

But working primarily through the Defense Department's Arpanet, a nationwide computer network connecting leading research organizations, Conway and Mead in two years put together what has come to be the primary textbook for all VLSI courses in the world, *Introduction to VLSI Systems*. Arpanet helped the two authors distribute drafts of their text, receive feedback in the form of text, graphics, and charts, and generally communicate with a broad, electronically gathered collection of experts.

Moreover, Conway helped students, faculty, and other researchers to get their experimental and practice VLSI designs implemented in silicon, again via Arpanet, which connected university labs with circuit manufacturers on the West Coast. The turnaround time for most student projects was about one month, a vast improvement over previous educational endeavors.

Thus, Conway appears to be a good choice for heading the nebulous nth generation project, which, at this writing, has yet to receive any funding. Her development of the VLSI text is viewed by many as just the right kind of coordination effort between different researchers that will be necessary to pull off the sort of grand plans the Defense Department envisions.

Conway began her computing career at IBM Research, where she worked in the early '60s through 1969 on high-speed computing architectures. That year she joined Memorex to lead the design of a small business computer system that apparently never reached the market.

In 1973 Conway joined Xerox's PARC. Her research has been in the areas of image processing, LSI systems, and, most recently, so-called knowledge systems. The latter, Xerox says, refers to developing "knowledge engineering methodology" and developing software environments for "knowledge-based expert systems." Expert systems are expected to be key elements in the proposed Japanese fifth generation machine and in the U.S.'s nth generation systems. In fact, researchers hope to apply expert system techniques, originally developed by the artificial intelligence community, directly to the design of highly complex VLSI circuits.

Conway was named a Xerox Research Fellow in 1980 and has taught VLSI design at the Massachusetts Institute of Technology.

—I.W.V.

self several secretaries. Although he ostensibly has until Oct. 1 to tell it to the Congress, his actual deadline is late July or early August. That, according to a well-placed congressional source, is when the DoD appropriation should be ready for final action. If there's no report, there's no money.

DARPA may be getting the hint. Its spokesman still can't—or won't—tell reporters what its plans are, if it indeed has any. Word did come down in early June that as of Aug. 1, Lynn Conway, manager of the Knowledge Systems Area at Xerox's Palo Alto Research Center, will become DARPA's computer research manager. DARPA wouldn't say what Conway's duties would be, and neither would Conway, whose office said she's declining all requests for interviews. You can bet your chips Conway will have something to do with very large scale integration (VSLI) technology, in which she is an acknowledged expert (see box). Her Xerox group has recently been investigating methods of applying AI techniques to VSLI design.

DARPA hasn't been shy about asking for cash. It's requested a whopping $186 million for FY '86.

While Conway's arrival will surely help DARPA convince the House Armed Services Committee that the agency isn't just speaking computerese, her presence won't do much to distinguish between a superscientific computer and the fifth generation machine.

"Getting Conway will only make things worse," Fernbach says. "She's a name." True. But the IEEE isn't exactly chopped liver. While the ad hoc committee's official mission may be to determine "whether U.S. government initiatives are required for maintaining the U.S. lead in the development of superscientific computers," that outcome is a foregone conclusion. The group really wants to make the point that AI may not be all that smart.

"There's no way private industry can do this job alone," Bonn admits.

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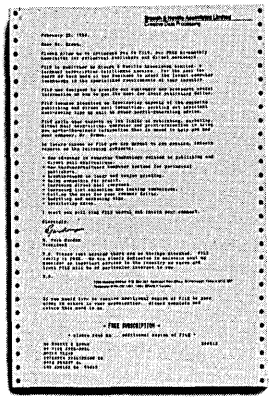

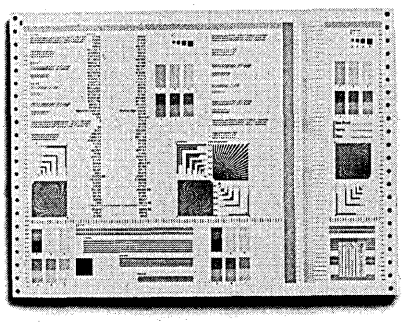

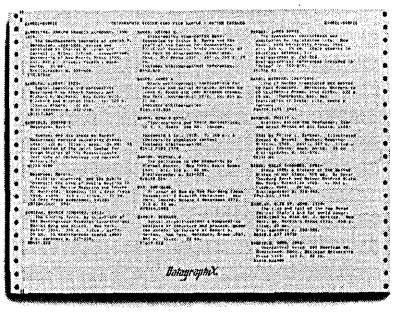

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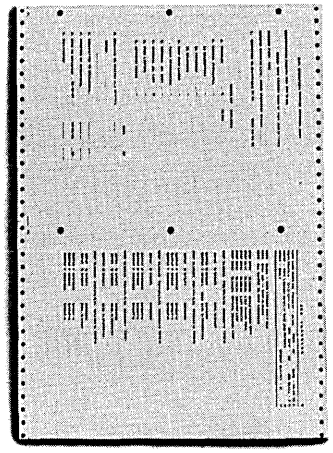
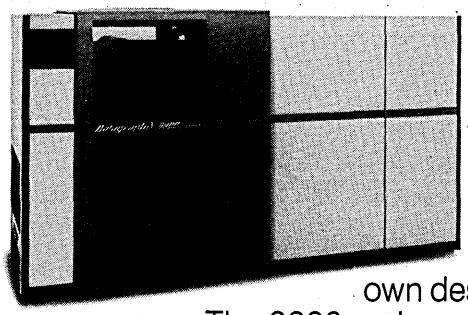
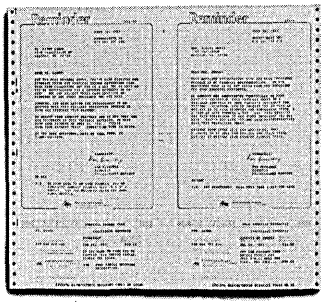
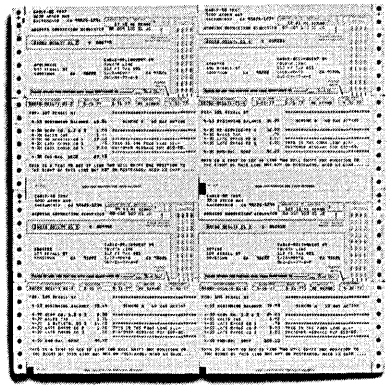
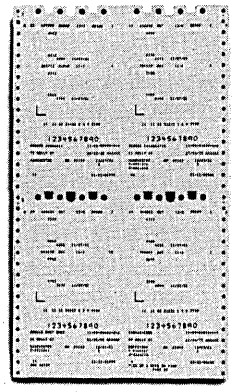






The 9800 series comes in a variety of on-line, off-line, or on-line/off-line configurations compatible with a broad selection of CPUs. Off-line models offer user-oriented menu-driven software, hard copy log, 6250 BPI tape drives with ping-ponging capability and more. On-line models offer full IBM 3800 compatibility, in addition to the advantages of DatagraphiX's advanced engineering.





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CIRCLE 60 ON READER CARD

"Right now the government isn't giving it any research and development funds. Some government contracts provide some incentive, but there's no direct funding. With such a limited market, private industry isn't about to risk it on its own."

"How does the U.S. stay in the lead in superscientific computers?" Fernbach asks. "Here's the kind of support that's needed: the government should order a dozen [machines] for 1986 and a dozen for 1990. Right now it's not providing a damn thing. It's not even promising to buy any that are manufactured. All it's saying is 'you make them and we'll take a look.'

"That's insane. The manufacturers are willing to make them, but they have to know someone's going to buy them. We don't want to sell our souls to the government. If the government guarantees the market, we'll enter. The IEEE hasn't fully made up its mind yet, but I'm sure we'll say, 'look, government, you've got to do something.' "

While waiting for the talk to turn to action, things are happening across the Pacific. According to Fernbach, Japan's trio of Fujitsu, Nippon Electric Corp. (NEC), and Hitachi each has developed a superscientific computer that's faster than the Cray-1. Fujitsu's and Hitachi's creations will reportedly be ready for work at the end of the year, and NEC's in mid-1984.

Back home, the various industry powers are jockeying for the post position in the competitive bidding for the fifth generation contract. Most of the research is being conducted in the groves of academia, but will soon be moved off-campus. A DARPA source promised that Conway's appointment would not give Xerox any advantage over its rivals. He also pledged that IBM, which is already involved in the plot, "will get more than its share." (In a recent speech at Stanford, DeLauer compared IBM's involvement to "giving Catholic services in a synagogue.")

Xerox's Lynn Conway has been named to head DARPA's computer research efforts, a move many have applauded.

In the midst of this war of the words, DARPA and the IEEE at least agree that the U.S. is now number one and, for the greatest good for the greatest number, ought to remain that way. That doesn't mean they won't continue fussin' and fightin' over superscientific computers versus the unborn fifth generation.

"Our efforts are clearly getting overshadowed by DARPA," Fernbach complains. "Our efforts are more realizable. They've asked for $500 million for five years. If we get $50 million period for the superscientific computer, we'll be lucky."

They hope the Japanese won't be.

—Willie Schatz

U.K. EYES 5TH GEN.

Industry and government are joining hands in an attempt to develop a homegrown artificial intelligence capability.

The British government has given the go-ahead to a U.K. copy of the Japanese fifth generation development scheme. Up to £200 million ($310 million) has been allocated from public funds to the U.K.'s Advanced Information Technology (AIT) program over the next five years. An additional £150 million ($230 million) is expected to come from private investment.

The AIT scheme is a major research initiative in Britain. "This is the first time in our history that we shall be embarking on a research project of this magnitude which involves such close collaboration between industry, academic researchers, and government," commented U.K. Industry Minister Patrick Jenkin. Academic institutions will get £50 million ($80 million) of the public funds and the remaining £150 million ($230 million) will be invested in projects where industry is prepared to match the state investment. In such partnerships the U.K. government will contribute up to 50% of the costs.

The four main research areas for AIT are in VLSI, software engineering, man/machine interfaces, and so-called expert systems—areas that mirror the Japanese scheme. The aim, according to Jenkin, is for participants in AIT "to collaborate in the laboratory, but to compete in the marketplace." Companies taking part will be required to release know-how gained in the research to their project partners, and to license any results to others in the program. Jenkin added that "where there is a need to secure exploitation," licenses could be given to organizations outside the AIT scheme. In this way the government hopes that smaller British companies without the financial resources to be full partners will still benefit from the research.

The AIT program will also be open to subsidiaries of non-British-owned firms like IBM U.K. and Wang, but—and it is a big "but"—these companies must guarantee that the results of AIT research will be exploited by them in the U.K. and that "secrets do not leak abroad."

The inspiration for the scheme was a U.K. trade mission to Japan in 1981 by

NEWS IN PERSPECTIVE

Reay Atkinson, a senior official in the U.K. Department of Industry. Frightened by the scale of the Japanese fifth generation proposals, the government set up a study into future areas of technology under John Alvey, director of technology at British Telecom. The resulting recommendations, contained in the Alvey Report published in September last year, were based on discussions with representatives of the British computer industry and were well received by research workers, industry, and government alike.

The AIT plan largely incorporates the Alvey Committee's proposals, except in one crucial area. Alvey wanted to provide up to 90% funding for projects "where very widespread dissemination of the results is required." The U.K. government, however, under pressure from noninterventionist hard-liners and the Treasury, has set a limit of 50%.

The four main research areas will be VLSI, software engineering, man/machine interfaces, and expert systems.

Bob Muller, director of the fifth generation computer project being mounted by systems house SPP SPL, feels that 90% funding would have been particularly helpful to smaller firms and fears that the main benefits of the scheme will now be confined to the larger companies. He voices the U.K. industry's general reaction to the AIT plan: "At last we are on the move. The government support may be insufficient, but at least we are steaming ahead in the right direction."

ICL technical director Mike Watson is also disappointed at the 50% state funding limit. "In the current economic environment," he says, "industry has limited resources for investing in this type of long-term research." He adds, however, that ICL welcomes the AIT approach and would be working in the scheme. The company has already set up an Intelligent Knowledge Based Systems center.

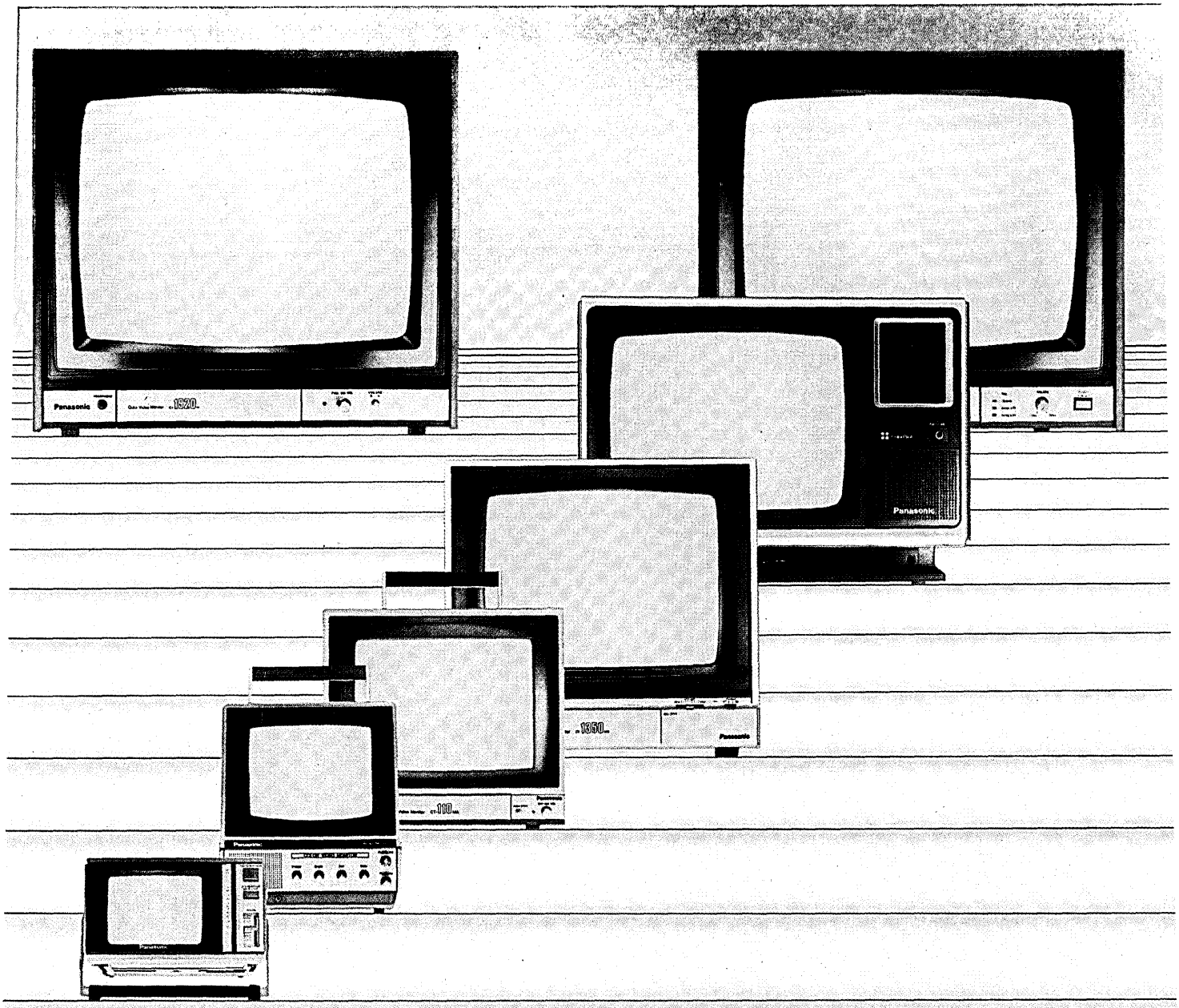
One of the other reservations about AIT is that it is too concerned with the hothouse atmosphere of long-term laboratory research and is unnaturally divorced from commercial realities. Peter Wilhelm of Ericsson Information Systems, who was in the U.K. when the scheme was announced, argues that "It is like nourishing plants in a greenhouse, only to find that they will not survive when they are moved to the real world outside."

Professor Brian Shackel, head of the Department of Human Sciences at Loughborough University, feels that AIT needs to be complemented by other projects that have a shorter-term focus. "The big battle for users will be determined in the next two or three years by the ability of manufacturers to supply systems that incorporate *current* know-how in ergonomics and human factor engineering to create user-friendly products. Since the Alvey Report was published, we have seen two U.S. companies take the lead in low-cost office products that have captured the users' imagination by incorporating current human factor research—Apple's Lisa and VisiOn from VisiCorp. I would like to see the government mount an awareness campaign to ensure that British suppliers respond quickly to the growing user demand for these sorts of easy-to-use systems."

The British government has limited its funding of the project to 50%, a figure seen as too low by several observers.

Patrick Jenkins hopes the 50/50 state/industry funding structure will help AIT keep its feet on commercial ground, aided by the appointment of industry representatives on the directorate that will run the AIT program.

There is, however, a wider concern over the U.K. plan. Can Britain alone achieve anything worthwhile in new research even with government backing and



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CIRCLE 65 ON READER CARD

enthusiastic industry involvement? The approach of AIT is in many ways similar to the European Commission's Esprit project, which involves European countries but is restricted to European companies. No sooner had the U.K. government laid its cards on the table with AIT than Viscount Etienne Davignon, the EEC commissioner for industry, urged the 10 members of the EEC to approve a collaborative five-year plan costing $1.3 billion and aimed at strengthening the whole of Europe's electronics and communications industry. The project will be put to European heads of state at a meeting in October and could mean that AIT in the U.K. will become simply a part of a wider European fifth generation research initiative.

—Malcolm Peltu

MAINFRAMES

MIPS, MIPS, MIPS

The new relational database trio from IBM will help sell more hardware, say industry observers.

IBM's new Database 2 relational database manager is the first of a series of cycle-hungry software packages the company will unveil to spur migration to the extended architecture (XA) of its large-scale mainframes.

The new software products will offer users extended features and will increasingly address end-user as opposed to strictly programmer needs, but most important to IBM, will consume vast numbers of machine cycles and other system resources. IBM, industry analysts point out, is still heavily dependent on mainframe revenues; any software that can help sell hardware is a welcome addition to the IBM catalog.

While the company has not yet publicly released performance figures for the new database package, unofficial estimates are that the software may require as much as 10 times the number of machine cycles as IBM's traditional IMS system to provide equal performance.

"Early projections" show Database 2 using "significantly more systems resources, both machine cycles and memory" than IMS, is all that Sam Kahn, advanced database products manager at IBM's Santa Teresa Labs, would say at the product's early June introduction in New York. "The amount of difference between IMS and Database 2 is acceptable," he stated, noting that specific performance numbers would be difficult to state without "many pages" of qualifying information.

In any case, industry observers say, it is clear that Database 2, and its attendant query management facility (QMF) and data extract packages, will help the company move users to the 31-bit addressing world of XA. That world, or programming environment, is of course only available on the firm's latest series of large-scale mainframes, the 308X line.

"IBM wants to sell computing," notes Curt A. Monash, securities analyst at Paine Webber Mitchell Hutchins Inc., New York. "It's not surprising that the software uses so much resources."

Monash and other industry analysts suggest that relational database systems tend to be more resource-hungry than traditional database systems. "That's the price you have to pay for the additional flexibility and functionality you get from relational systems," says one observer.

IBM says it has designed the new DBMS for use by "non-data processing professionals, including managers, production specialists, engineers, scientists, and others who need the data for strategic planning and decision making in their day-to-day operations. Programmers," IBM says, "can develop and modify application programs in a fraction of the time currently required."

Chet Thompson, director of cross-systems marketing and planning for IBM's National Accounts Division (NAD), noted at a press briefing that Database 2 is "tightly coupled" to MVS/XA, taking advantage of the operating system's vast address space and reliability, availability, and serviceability (RAS) features. This suggests that although the new database system can run in 370 mode on 308X, users will have to move to the XA environment to fully exploit Database 2's full features.

IBM's Kahn added that Database 2 and QMF take advantage of the "functional recovery" aspects of MVS: "The MVS world [of systems] expects programs like this to work all the time, so we have tested it extensively for compound failures." He explained the latter term as referring to the occurrence of several isolated system glitches at once. "Our goal has been to build a base of system software that will last a long time," added Kahn.

"IBM wants to sell computing. It's not surprising that the software uses so much resources."

Towards that end, the company is thoroughly testing the new products before shipping them, IBM officials emphasize. The Database 2 package will not be available until the third quarter of next year, a long lead time even by IBM's standards. However, some analysts suggest that IBM is striving to avoid the black eye it got when IMS was originally shipped and found to be lacking in several key functional aspects.

"It's late," says Robert Fertig, president of Greenwich, Conn.'s Enterprise Information Systems Inc., referring to the new database products. "It's late and it's extremely expensive. Even XA, which is a much more complex program, didn't have such a long lead time between introduction and first customer shipment."

Fertig's initial analysis of the package led him to conclude that the software will run as much as 30% faster under XA than in the standard 370/MVS environment. He bases his projection on what IBM has said about the dynamic channel reconnect features that boost I/O on 308X machines running under XA.

Industry analysts were particularly surprised at the lack of integration between MVS and Database 2.

As for the long lead time, Fertig suggests that IBM is delaying first customer shipment of Database 2 in order to ready a new piece of hardware, designated external storage element (ESE), which is an intelligent cache buffer that, he thinks, will attach either to 3880 controllers or into a mainframe channel. "This box will spread access across a string of disks and improve overall response times. It will probably help boost performance of IMS as well," the Connecticut IBM watcher states.

Particularly surprising to Fertig and other observers was the lack of integration between IMS and the new relational package. IBM has offered the data extract package, which will enable sophisticated users to pull out selected files from an IMS database and manipulate them with the relational software. This serves two IBM purposes, it is thought. The company now gets to sell users two major pieces of software, IMS and Database 2/data extract/QMF, and the separation of the two systems helps protect corporate IMS databases from being damaged by careless end users. There will, however, apparently not be one all-encompassing corporate database but many. IMS appears to be here to stay.

As William Reedy, manager of database/data communications systems at IBM's NAD puts it, "We plan to continue to support and enhance IMS. Users' investments in that system are golden. We're gonna keep going with it."

IBM notes that some of its customers currently run production IMS systems that handle as many as a million transactions a day, a load that Database 2 clearly wouldn't be able to handle at the same speeds. The firm expects future high-volume, high-speed applications to be written in IMS, leaving end-user queries and report generating to Database 2.

"This announcement is encourag-

ing," says Paine Webber analyst Monash, "because it shows that IBM is making a clear commitment to addressing end-user needs. But it's disappointing that not too much is being offered to help the applications developer who works in IMS. The bridge between the two systems is not particularly powerful."

Industry reaction to the IBM products was mixed. Cullinet Software's stock dropped several points as did that of Computer Associates. Each is shortly due to ship MVS-compatible relational database systems that will compete directly with IBM's new system.

Cullinet Software president Robert Goldman described the introduction as "no surprise. IBM has formally announced that a relational database management system for MVS is on its way. The only real surprise is that it will not reach the market until the third quarter of '84. Even by IBM standards that is a king-size preannouncement."

Echoed Ted Withington, an Arthur D. Little computer industry analyst, "When IBM announces that early, it becomes more a statement of direction. IBM is telling everyone well ahead of time that it intends to be in the future expert systems and decision support business—the unstructured data world of tomorrow."

Indeed, the long lead time may hurt Cullinet and other companies that have been selling DBMS packages with great success. Users may think twice now, industry observers suggest, before ordering an independent's package, knowing that an IBM system is on its way.

Goldman was also critical of the lack of integration between IMS and Database 2: "IBM has still not solved that problem. Don't be taken in by the fact that IBM claims that IMS and the relational system will work in conjunction with each other. The two are not integrated and to all intents and purposes are separate products that are likely to confuse the MIS manager even more than at present."

Oracle Corp., which for several years has been working on a relational database system for MVS computers, also is critical of the IBM products. Says president Larry Ellison, "IMS and Database 2 are not just separate, they are competitors [with each other]."

Oracle's product, which goes by the same name, is due for field testing beginning this summer, says Ellison, who notes that a down-sized version will be offered for IBM's Personal Computer. In fact, recent industry reports have it that Oracle and more recently Cullinet are in discussions with IBM about building a relational database system for IBM to sell on its P.C.

IBM says that general availability of Database 2 and QMF running under MVS is scheduled for the third quarter of 1984. QMF running under VM/SP and data extract is scheduled for shipment in second quarter 1984. The initial license charge for Database 2 is $15,000 with a $2,500 monthly charge. QMF carries an initial fee of $6,000 with a $1,000 monthly charge thereafter, and data extract goes for $3,600 with a $600 monthly charge, the firm says.

—John W. Verity and Ralph Emmett

IBM'S VM/370 FOE

Spartacus Computers, a startup, will soon challenge IBM in the systems software arena.

The ongoing war between IBM and its plug-compatible (pcm) challengers is set to escalate to a whole new theater—operating systems. As already revealed in these pages, Amdahl Corp.'s Aspen project, an ambitious attempt to produce an IBM-compatible virtual machine (VM) operating system, is now in its beta test phase at selected customer sites throughout the U.S. This approach to the pcm market is risky enough, but sources claim a perhaps even riskier one from a young Massachusetts venture is now close to announcement. Spartacus Computers, Bedford, Mass., is ready to aim a new VM/370-compatible operating system (and associated hardware) at the heart of IBM's most inviolate sanctum—the small to medium-sized 4300 user.

Spartacus has just closed a $3 million financing deal with a number of investors as a prelude to marketing. The company is expected to cap two years of development effort by shipping its combination of VM remote processor, workstations, and local network sometime in the coming fall, sources say.

Spartacus president George McQuilken confirmed the financing but wouldn't discuss his marketing plans other than to say that "Something will be happening soon."

The fact that IBM has summarily disposed of most of its 4300-class pcm competition adds a certain spice to the Spartacus venture. A recent DATAMATION/Cowen & Co. survey shows that if ever an IBM user base was safe from competitors the 4300 community is. According to the survey the

A PIECE OF THE ACTION

In its effort to build very fast large-scale IBM-compatible mainframes, Trilogy Systems Corp. has been forced to advance the semiconductor technology on which its computers will be based. Lending credence to the feasibility of a Trilogy design, Sperry Corp. last month agreed to pay $42 million for an option to acquire the technology. It is the kind of confidence vote, accompanied by dollars, that Trilogy must see repeated before it can bring its first product to the market, now scheduled for 1985.

As disclosed earlier in these pages (May, p. 62), the Cupertino, Calif., company, founded in 1980, does not propose to package its logic circuitry as separate IC chips but rather to leave them arrayed on a wafer, a technique called wafer-scale integration. For its $42 million, Sperry acquires the option to use this technology for its own systems, for everything except IBM-compatible products. It also gets preferred stock that represents a 15% equity position in Trilogy Ltd., the parent organization.

Ironically, the cofounder and chairman of Trilogy, Gene M. Amdahl, is said to have left the first company he formed, Amdahl Corp., because he was able to retain only 3% of its equity. So why does he continue to give up equity in order to sell his semiconductor technology?

"We can't ever raise money without giving up ownership," he explains. The company earlier had said it would need $100 million more than originally planned, he adds, "and this is not as much more as we need." Thus the effort to interest others in a similar arrangement continues.

Not long after the formation of the company, Trilogy entered into a licensing deal with the French Cii-Honeywell Bull organization, which also involved giving up a small ownership position. Unfortunately, says Amdahl, it's an expensive process to "advance technology approximately 10 years ahead of its time."

Rather than view these deals as a loss of equity, however, Amdahl sees it as a gathering of "supportive participants." As a startup, Trilogy cannot develop the facilities to do everything, and so it hopes to be able to rely on its licensees for certain things—in the case of Sperry, "such things as very complex and demanding printed circuit board work." Trilogy can neither do this on its own, says Amdahl, nor is it a service readily available from sources in the U.S. But Sperry produces some boards that "meet even tougher specifications than we have."

Still, both of Trilogy's licensees also have the right not to exercise their options. If the technology fails to achieve viability, for example, they can ask for a partial refund. "They advanced that amount on loan," explains Amdahl, "and we repay them if they elect not to exercise. That way we have the use of those resources." And so the pressure clearly is on the fledgling company, which likely will spend upwards of $200 million before it reaches a positive cash flow situation. Success doesn't always come cheap.

—E.K.Y.

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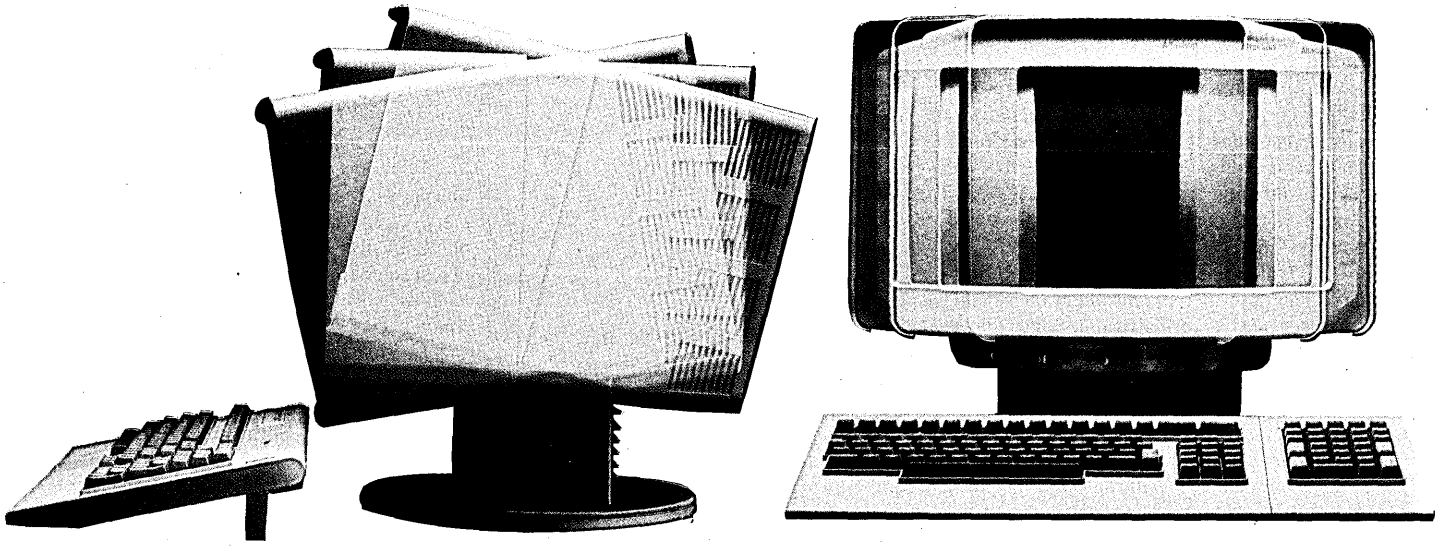

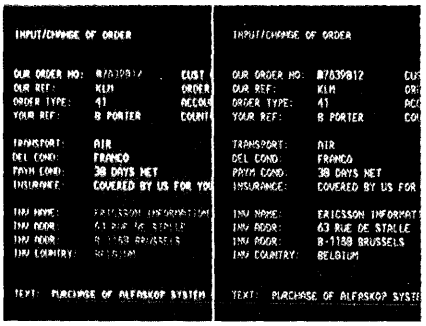

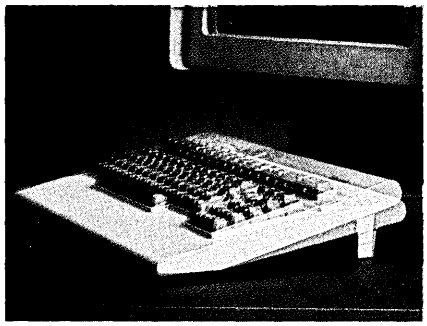

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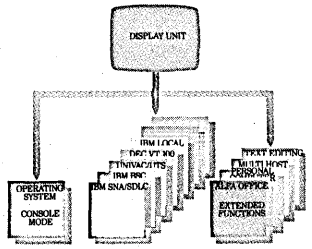
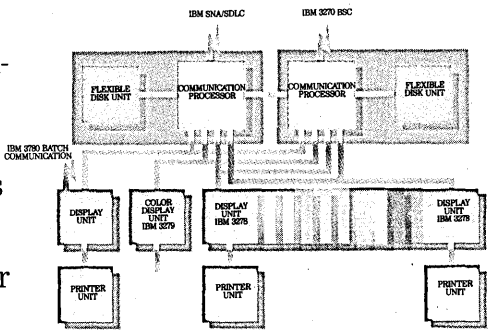


Alfaskop comes with operating system and emulation software, plus a choice of application programs.



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CIRCLE 70 ON READER CARD

pcm knockout ratio at 4300 installations last year was only 0.3%, compared to 5% at the larger, 308X level, where Amdahl operates.

Faced with such a wall of resistance, many traditional pcms past and present have said candidly that it's no longer possible to make money selling machines at less than 2 MIPS to the 4300 customer.

McQuilken agrees: "If you're only trying to exploit weaknesses in IBM's hardware . . . but once you start focusing on their system software, that's a different matter."

McQuilken says that IBM's customers have searched for powerful VM software to distribute their 370 architecture for years. "But they want it to run on small, powerful computers, not on additional large mainframes or superminis costing a fortune," he says. "So it was a given, when we launched Spartacus, that both VM/370 and its host hardware would have to be reduced to offer customers the benefits of miniaturization," he explains.

Though it is for users to judge, it seems as if Spartacus, through a combination of VLSI and mini-Winchester disk drives, has produced a processor that is around one fifth the size of a comparably configured 4331.

In theory, a 1 megabyte 4331 lists for around $80,000, but once the machine is fully configured prices can soar to about $200,000. In addition, the customer often

"People want to run VM on small, powerful computers, not mainframes or superminis that cost a fortune."

pays up to $5,000 a month in software charges.

By comparison a 1MB Spartacus K 102 remote processor/controller will cost under $50,000, and will include the KOS operating system and local network software and 80 megabytes of Winchester disk storage. The system will run at close to one third of a MIPS and will handle five workstation/terminals, sources claim. A top-end 4MB system handling 10 terminals and offering 320MB of Winchester disk for less than $100,000 will also be offered.

It's interesting that about half of the 1MB system's price is the KOS operating system and associated network software; KOS is disk-based and probably takes up about 60MB of an onboard Winchester.

It is believed that the company will sell the operating system separately for $25,000, if that is all the user wants to buy. The company will also offer leasing arrangements.

Top IBM watchers are quick to point out that comparisons with the 4300 are impressive and should offer the Spartacus venture a fighting chance. "But the numbers could change dramatically in the fall," says Ulric Weil at Morgan Stanley, New York, "if IBM announces the 4300 replacements that are being finalized at Boebligen [near Stuttgart], West Germany." The machines, code-named Anton at the low end and Shakespeare at the high end, are expected to offer upwards of three times the throughput of the current 4300 family, and be priced at about $100,000 per MIPS.

Both Weil and Robert Fertig of Enterprise Information Systems, Greenwich, Conn., expect IBM to ship the new midrange family in volume by the end of the first quarter of 1984. Others, notably Boston's Yankee Group, point to the latter half of next year.

Reports have been circulating for some time that some superlarge Shakespeare models (formerly called the Glendale or GL series) that bridge the 2 MIPS to 4

Customers may embrace Spartacus's remote operation feature, a derivative of IBM's Hydra project.

MIPS gap between the 4300 and 308X mainframes and the new MVS extended architecture, MVS/XA, are "imminent" and will thus be announced before the Anton group.

These, it is thought, will have the most corrosive effect on Spartacus in yet another area where it is trying to add value—local networks.

The young company's KOS operating system offers an Ethernet interface (an extra $3,000) that in essence bridges the two worlds of IBM mainframes and office systems. Sources claim that Xerox has managed to sculpt 400 Ethernet local nets at 300 different user sites, and the market is clearly there for more. But once again, the bulk of the industry seems to be on hold, seduced, perhaps, by rumors that an IBM token ring passing net allied to assorted Mitel/IBM PBX equipment will debut in the fourth quarter this year.

The question from IBM users is, will the IBM net be an open standard (and hence Ethernet compatible) or will it attempt to blow the Xerox/DEC effort out of the standards waters? No one knows for sure, so the answer seems to be wait.

There is one other value-added feature from Spartacus that IBM's customers may embrace, namely, the pcm machine's ability to be used in an unattended environment.

This feature, which enables host mainframes to load, program, and monitor the performance of remote K 102s, stems from McQuilken's Hydra development work at IBM. Such "remote manager" software is beginning to pop up on several IBM small systems, notably on a new Series/1 processor and on certain 4300 models.

So far the response by large customers to IBM's provision of this "remote operator console" facility on its 4300s has been poor, as DATAMATION/Cowen & Co. survey material shows. It would appear that at some $150,000 the 4300 is too expensive as an unattended node or "drone." The Cowen specialists also add that IBM has made no effort to market the Hydra software on its current 4300s and may, as McQuilken claims, be looking for a lower-cost machine, "something comparable to the K 102," he says.

"The numbers could change dramatically in the fall if IBM announces the 4300 replacements from Boebligen, West Germany."

McQuilken's 4300 alternative could also appear a very welcome entrant for another reason. During the past 18 months the aging 4300 has suffered much in comparisons with IBM's emerging—but incompatible—System/38 architecture.

"Whereas the 4300 has various hidden costs," says Yankee Group researcher Frank Gens, "the System/38 is a more packaged system, with the database, communications software, and high levels of user friendliness already built in." In addition, the System/38 is less costly to buy and maintain and much easier to operate, he adds.

Sources have previously revealed that IBM is now actively marketing the System/38 at large customer sites as an alternative remote processor to the 4300. Large manufacturing concerns such as general Motors and Bechtel have emerged as possible multiple buyers and System/38 network builders. Now that IBM is busily adding SNA and other communications software, as well as high-level languages and more power, the trend to the 38 can only escalate, observers predict.

"Whether IBM is doing this knowingly or by accident, a strategy does seem to be emerging," Gens confides. "The 38 and the new System/36 are being tailored as the company's small business and office challengers. Our guess is that IBM will eventually give the 4300 a different slant, possibly in the scientific and technical worlds."

By way of example, the Yankee Group expects a $15,000 or so desktop 4300 (the 4301?) to be aimed at the technical professional within two years. This would put IBM squarely into the DEC/HP/Apollo camp and probably into CAD/CAM engineering applications in a big way.

—Ralph Emmett

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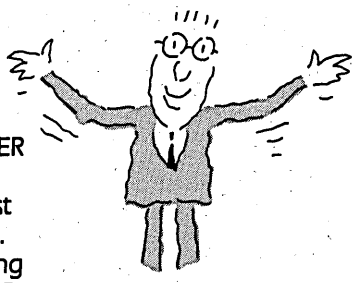

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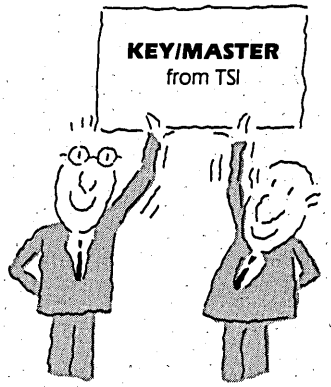

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CIRCLE 74 ON READER CARD

MASS STORAGE

STORAGE STANDARDS EFFORTS

Companies want their formats to be considered de facto standards even if it means sharing technology.

Producers of magnetic storage devices for low-end computer systems are striving to set standards for their equipment that they hope will facilitate the interchange of data and therefore boost sales for everyone.

Despite intense competition between various makers of disk and tape drives, companies are coming together in a number of forums to hash out differences and make their media and data formats compatible with each other. The thinking is that standards, if only de facto, will help everyone sell more and help users move data between different computer systems.

"If there were standards there would be more business for all of us," says Dave Sutton, vice president of engineering at DMA Systems, Goleta, Calif., a maker of 5¼-inch Winchester-type disk drives. "Everybody reads IBM's half-inch tape, but that and IBM's 8-inch floppy are the only two de facto standards around."

Sutton is a member of the ANSI (American National Standards Institute) volunteer committee X3B7, which is faced with the task of determining a standard for cartridge disk drive interfaces. That job will probably not be an easy one, given the large number of competitors in the marketplace and the lack of any single dominant manufacturer promoting a particular standard, according to Bill Carlson, chairman of the committee and president of Media Test Specialists, Milpitas, Calif.

The ANSI committee has already put its seal of approval on de facto standards for 8-inch devices and has begun looking at the 5¼-inch arena, Carlson says. Furthermore, government users seeking wider interchangeability of data have spurred an ANSI steering committee with responsibility for X3B7 to expand the latter's charter to include user data exchange. "We began to wonder if this was really our job and also to question the level of industry interest," adds Carlson, an X3B7 member. "What does the world really want?"

He notes that the committee has come up with a series of questions for the industry that will help it navigate a proper course through the myriad of conflicting issues surrounding all standard efforts. "We'll circulate the questions within the family, to ANSI people and probably to systems integrators. Ultimately the questions may go out to a larger database but that's not our job."

He calls the process of developing standards through the ANSI process slow at best. Sutton goes farther, declaring that chances of a true data interchangeability standard coming out of ANSI are "pretty slim."

DMA Systems would like to see its embedded servo and data header format become a de facto standard and has proposed it to X3B7. It apparently will be considered along with other proposals for 5¼-inch removable disk cartridges. DMA says it also has offered to share its technology with other manufacturers in hopes of establishing a standard.

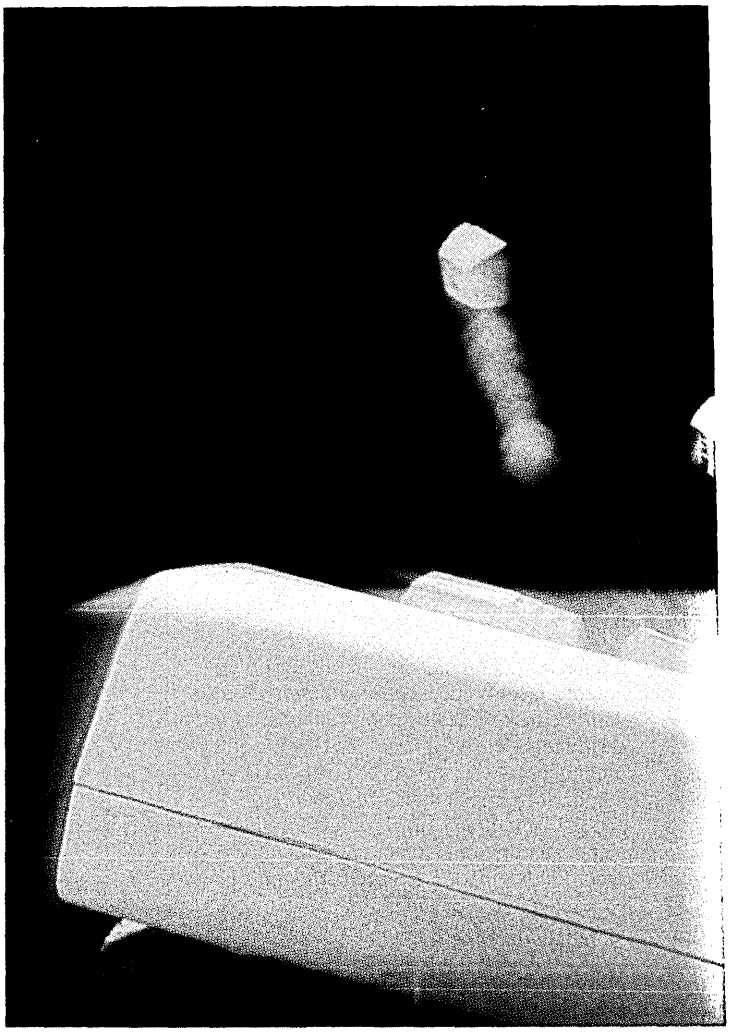
"We've had some interest," comments Sutton, noting that Memorex,

The ESDI allows a 10-megabit-per-second data transfer rate

the Burroughs subsidiary, early this year signed a technology sharing agreement with DMA and acquired a $1.5 million minority interest in the Goleta firm.

Both Memorex and DMA are partici-

How to get your fi



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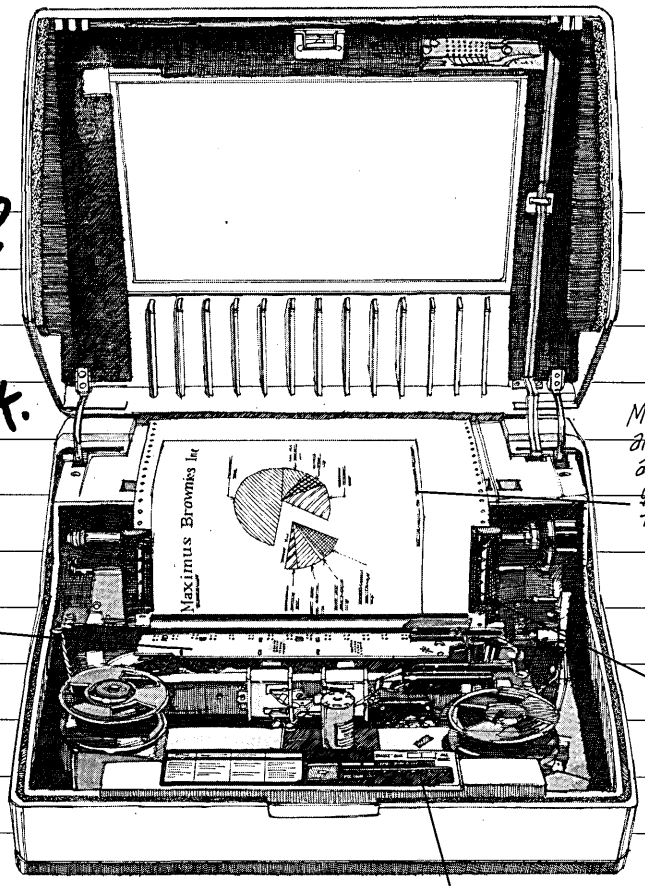

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CIRCLE 77 ON READER CARD

pants in a group of manufacturers that has endorsed a proposed standard for 5¼-inch disk drives and controllers called ESDI (enhanced small disk interface). Other disk drive manufacturers involved are Control Data Corp.'s Magnetic Peripherals Inc., Maxtor Corp., Iomega Corp., Cynthia Peripheral Corp., Disctron Inc., Vertex Peripherals, International Memories Inc., Miniscribe Corp., NEC Information Systems, Micropolis Corp., Priam Corp., Evotek, and Atasi Corp.

Eleven controller manufacturers also have endorsed ESDI. They are OMTI, Data Technology Corp., Data Systems Design, Adaptec Inc., Sysgen Inc., Interphase Corp., Western Digital Corp., Emulex Corp., Advanced Micro Devices, National Semiconductor, and Scientific Micro Systems Inc.

The ESDI allows a 10-megabit-per-second data transfer rate and was written with a number of options to give the system designer, controller designer, and disk drive designer maximum configuration flexibility.

Control Data, which claims its own Intelligent Standard Interface (ISI) has already become a midrange industry standard, said it will propose this for consideration by the ESDI Committee for high-end, low-end, and midrange drives.

In floppies, Amlyn Corp., San Jose, Calif., has taken a stance similar to that of DMA in terms of sharing technology. When it developed its high-density floppy disk recording technology, recalls Tom McCrystal, executive vice president, the company "expected the world to beat a path to our door and it finally appears that's what's happening. It's like giving up some of our birthright but we're moving forward as a de facto standard." At NCC, Amlyn announced second source agreements with Micro Peripherals Inc. and Remex Corp. and said additional announcements would soon be forthcoming.

A big issue in floppy standards is in the so-called microfloppy or sub-4-inch range. Disk/Trend Inc., a Mountain View, Calif., research firm specializing in magnetic storage devices, has projected 1985 shipments of all floppy disk drives at over 12 million units for revenues of more than $5.2 billion. Of these, the firm projects shipment of microfloppies for '85 at 952,200.

Twelve companies have recommended to ANSI that a 3½-inch microfloppy be adopted as standard. These firms are Memorex, Dennison KYBE Corp., Luctor Corp., Remex, Verbatim Corp., BASF Systems Corp., Xidex, Brown Disk Manufacturing Inc., Shugart Associates, Micro Peripherals Inc., Olivetti Peripherals Equipment, and an unidentified Japanese disk drive company.

Although his firm was a participant in this recommendation, Peter Banhazi of Micro Peripherals believes oems needing microfloppies should not wait for a standard but should "pick a technically sound floppy that is available now. MPI is offering a 3-inch floppy based on a Hitachi design.

"Most of the industry is taking a backwards approach by waiting for the standards battle to be resolved by everyone agreeing on a size for microfloppies," said Banhazi. "Why battle over standards that are based on products that cannot be shipped?" he asks, referring to a number of small drives announced but not yet available.

Michael F. Hanley, president of Tabor Corp., Westford, Mass., believes the issue "is not size so much as media format." Tabor is offering a 3¼-inch drive and has said it expects the standards debate to be settled in the marketplace rather than the conference room.

Chances of a true data interchangeability standard coming out of ANSI are "pretty slim."

"We chose to design our drive around the flexible jacket format because it is a proven technology that lends itself to currently available manufacturing techniques," said Hanley. "It also has the most effective wiping action, which cleans the media as it rotates in the drive, and is readily adaptable to a double-sided format."

Adding substantial confusion to the sub-4-inch floppy market is the offering by IBM of its own peculiar drive that shares little with the other leading designs. IBM has so far only offered the drive as an oem product and has not built it into any of its systems products. It is not clear what future the drive has, for despite the company's enormity, it apparently has not thrown its full weight behind the small floppy disk. IBM in fact is currently buying thousands of 5¼-inch floppy disk drives from outside suppliers for use in its personal computing systems line.

A third arena in the low-end storage standards show is in cassette and cartridge tape drives for disk backup. Freeman Associates, a Santa Barbara, Calif., consulting firm specializing in this market, predicts shipments of cartridge drives will grow at a 30% compounded rate from 175,000 units this year to 650,000 units in 1987, with more than half the volume in the streaming category in 1987.

Looking for standards in this arena is the Working Group for Quarter-Inch Cartridge Drive Compatibility (QIC). This group reached final agreement in March on a proposed recording format standard for streaming quarter-inch drives, which is intended to permit interchange of recorded

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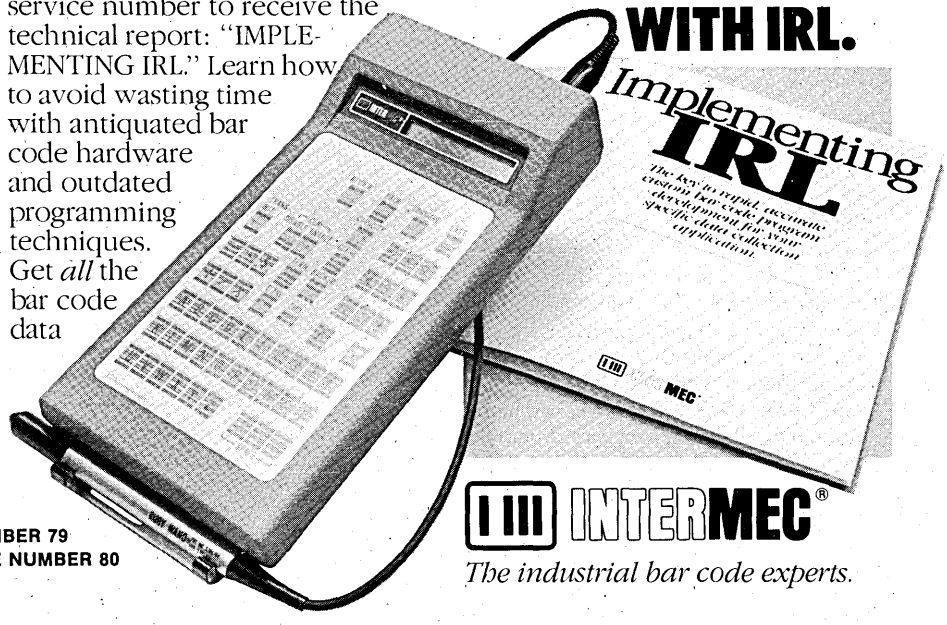

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media. The standard has been named QIC-24. Earlier the group developed a device interface standard it called QIC-2.

QIC members include Archive Corp., Cipher Data Products Inc., Data Electronics Inc., Quantex Division of North Atlantic Industries Inc., Tandberg Data, and Wangtec.

Data Electronics Inc., San Diego, which claims dominance of the quarter-inch cartridge tape drive market with more than 125,000 drives installed, was a founder and an instigator of QIC. "It started informally during NCC in Houston in 1982," recalled Jack King, DEI president.

King said DEI was first with an implementation of QIC-2 and QIC-24 with its QIC Stream II, an intelligent peripheral that provides 20 megabytes of formatted data storage capacity on a 450-foot ANSI standard quarter-inch cartridge. It uses a dual microprocessor-based formatter/controller and a basic drive mounted on a solid diecast frame. He said DEI was first because it guessed early on that the standard the committee would support would approximate the Tandberg interface and it started its engineering for this earlier than its competitors.

King said talks within the working group were circuitous at best since none of the members "wanted to expose their technology. They'd talk about close technologies and opposing technologies but never about what they were doing. There also were legal implications. We had legal counsel all the way through."

DEI, like others in the field, had a flat year closing March 31 with revenues of approximately $25 million, up from $24 million the year before. "We took advantage of the time to consolidate, streamline, and create a new division," says Hal Georgens, chairman and chief executive officer. The new division handles media; it was formed with acquisition of a manufacturing license from 3M and production equipment, know-how, and a customer base from Verbatim.

Among the streamlining moves was acquisition of a robot from Intelledex, Corvallis, Ore., on a beta test basis. DEI uses the robot to load odd-shaped components onto printed circuit boards.

Although DEI offers streamers, King doesn't think "the world is a streaming world." He says he's noticed a steady increase in orders for his company's standard stop-start devices. "Most applications are file oriented and need selective backup for which stop-start devices are the best choice."

Don M. Muller, chairman, president, and chief executive officer of a competitor, Cipher Data Products Inc., also of San Diego, has a different opinion. He claims leadership for his company in the streaming drive market and says that streamers represent 40% of the market now and this this share will grow to 75% next year.

Cipher, like DEI, was a founding member of the QIC group and believes "the result of the QIC standard has been to remove the last impediment to the growth of the quarter-inch streaming tape cartridge market."

Bob Chartrand, vice president and general manager of Tandberg Data Inc., Data Storage Division, which also has a QIC-2/24 compatible offering, believes the market for low-end streaming drives "has just begun."

At NCC, Tandberg introduced two new models in what it calls its QIC-STOR series, the Mark II and Mini-Mark II, both of which are available in two versions: four-track model with 20MB or 27MB formatted storage capacity on 450-foot or 600-foot cartridges, respectively.

Lastly, of course, there are the media. Still another industry group, the Advanced Computer Tape Standards Association (ACTSA), formerly known as the California Tape Standards Association, formulated in January proposals describing materials to be used in manufacturing tape, general packaging recommendations, and the media's mechanical, electrical, and magnetic characteristics. Gerhard Rotter, chairman of ACTSA's specifications group and chairman of the board of Rosscomp Corp., said a series of proposed environmental specifications also was formulated. The proposals have been presented to ANSI.

ANSI itself in March issued a revised standard setting requirements for the physical and magnetic interchangeability of an unrecorded cartridge containing 0.250 magnetic tape. The standard provides for interchangeability of the quarter-inch cartridge among information processing systems, communication systems, and associated equipment.

—Edith Myers

FOREIGN COMPUTING

R&D IN JAPAN

An exclusive report from Japan about how the government there works with industry in funding research in computing and other areas.

A nine-year, government-funded R&D project leading to the design of a supercomputer for scientific applications is under way in Japan, one of several national projects in

numerous technologies. The Japanese are aiming for a system that operates at 10 billion floating point operations per second, or 10 gigaflops.

When the project was started in April '81, the goal was to produce a machine 1,000 times faster than the Cray-1 and Cyber 205, the fastest of the current breed, explains Tatsuo Tanaka of the Agency of Industrial Science and Technology (AIST) in Tokyo, but recent announcements by Japanese vendors make that speed "not as dramatic." Still, a factor-of-10 advance was expected by using new semiconductor devices and a 100-time advance through new software to take advantage of parallel architectures. The project is to run through fiscal 1989 and cost some $100 million.

This is only one of seven national R&D (so-called large-scale) projects currently under way in fields as varied as chemistry, optics, energy, and manufacturing. Of those seven, the earliest, of which began in 1973, two are scheduled for completion as late as '89—the supercomputer project and one for a system that would recover manganese and other deposits from the ocean floor. The combined budgets to date of the seven projects come to more than $1 billion at today's exchange rate.

Tanaka, who is councillor for technological affairs at AIST, an arm of the powerful Ministry of International Trade and Industry (MITI), says that in addition to the large-scale projects, the agency also oversees research into new energy sources, the so-called Sunshine Project, and energy conservation technology, called the Moonlight Project. Perhaps most stunning of all, however, is the latest to be undertaken.

The large-scale computer project of the early '70s appears to have paid off in the success of certain IBM-compatible computer lines in Japan.

In the late 1970s MITI determined that for too long Japan had been playing catch-up in the world market, taking technologies developed abroad and trying to improve upon them. While the nation has fared quite well in those pursuits, it has nonetheless been floored by a number of external developments like the oil price hikes imposed by OPEC nations. Japan is resource poor, is facing a growing population of aging people, and needs some way of improving the standard of living of its people despite these drawbacks and setbacks. What's required, it was decided, is for the country to develop strengths in technologies that will be significant in the decades ahead, allowing the nation to capitalize on its high literacy rate and keep a growing population gainfully employed.

In 1980 MITI put its money on three broad fields. One, called new materials, in-

ICOT LEADS THE WAY

Japanese companies tend to thrive on the NIH (not invented here) syndrome, the one that says we'd prefer to do it ourselves, thank you. If it's at all possible, a mainframe maker will produce its own systems and applications software rather than commission some outside organization to do it, and will strive as well to achieve vertical integration in its manufacturing operation. Thus the dominant computer manufacturers are also merchant suppliers of ICs.

With this finger-in-every-pie approach, it is understandable that a large organization would be unable by itself to fund advanced research in all new areas of technology, hence MITI's Agency of Industrial Science and Technology (AIST). Although AIST does more than fund R&D activities in the private sector, this accounts for a large part of its budget, which in the last fiscal year came to more than $500 million.

Among the most important recipients of that largesse are the six main computer makers. Those same companies, joined this time by Matsushita Electric and Sharp, are also engaged in studies of the so-called fifth generation computer system. As such, they are members of the new Institute for New Generation Computer Technology (ICOT), which qualifies them to share an additional $11.5 million during this fiscal year for research into areas such as logic programming, expert systems, natural language processing, and relational database machines.

While most of that research is conducted at the separate companies themselves, each has also sent engineers to the ICOT research center, which is headed by Dr. Kazuhiro Fuchi, formerly with MITI's Electrotechnical Laboratory (ETL). A year after the lab's opening, Fuchi has gathered some 40 engineers from member companies, most of them between the ages of 28 and 31. He himself is 47. Leaders of the ICOT research projects, all in their 40s, are from ETL and from Nippon Telegraph and Telephone (NTT).

In addition, ICOT has initiated a program to invite researchers from abroad to work in Japan for short intervals. Five have come so far, says Fuchi, two from the U.S. and one each from Canada, West Germany, and Israel, staying for as long as one month. Fuchi would like to be able to entice some top-notch researcher to stay for a year but laments the lack of funds to do so, and adds that anyone with those qualities would not be able to stay away from his or her work for that lengthy period.

ICOT's budget currently is about $11.5 million, up from less than $2 million last year, but sources say Fuchi's lab this year will get only about $3 million of that. The remainder is divvied up among the eight member companies. Fuchi expects the total budget to grow again next year, then tend to plateau. Asked what the member companies are contributing to the kitty, Fuchi said they pay very little, merely contributing for office furniture costs at the lab and rental of the lab quarters in Tokyo.

Fuchi, who sees his lab serving as the core research group of the fifth generation project, believes it is important to encourage others to engage in this type of research. He cites a conference on logic programming sponsored by ICOT in early '83 at which some 200 participants from academia and industry showed up and at which papers were presented by ICOT researchers and others. He says when a conference on the same subject was held in 1982 in Japan, fewer than 100 persons showed up, and if one had been held in '81 maybe only 10 would have come.

Logic programming is currently big in certain quarters in Japan because PROLOG is the language of choice in the fifth generation project. Indeed, a personal PROLOG computer is to be developed, perhaps seen by some as a step up on the Lisp machines available from U.S. manufacturers. Indicative of the widespread involvement in logic programming research among university and industry people in Japan is the fact that some 35 papers were submitted for this year's conference in March.

There are no immediate plans to sponsor other conferences, Fuchi continued, but he is thinking of holding another international meeting during the next fiscal year.

It was in October, 1981, of course that Japan held its historic conference to announce the ambitious project, inviting participants and observers from around the world. It was preceded, however, by a study made by the consulting firm of Arthur D. Little and commissioned by MITI in 1978, presumably a survey of technological trends in information processing.

"I don't think it had a great influence" on the course of the project, Fuchi says of the little study, but in 1979 MITI formed a study committee comprised of technologists from ETL and the nation's universities. A year later, people from industry joined, and three subcommittees were formed—for hardware, for software, and for social implications. Their reports were presented at the 1981 conference.

The project is now in its first three-year phase, devoted to the study of basic technologies. A middle stage will be for developing subsystems, and the final phase for developing the total system.

Speaking about the Arthur D. Little survey, Fuchi says, "Those reports are a very good summary," but adds that most of the things mentioned were "already known by researchers." He nonetheless acknowledges that summarizations from the report were handy for preparing reports made to MITI administrators.

—E.K.Y.

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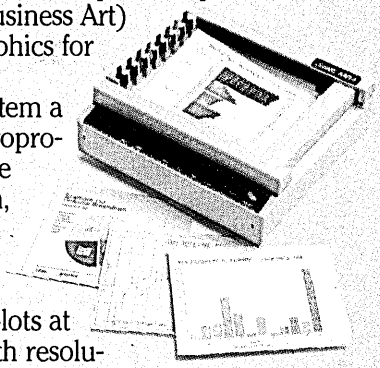

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cludes ceramics, plastics, synthetic metals, and composite materials, and is budgeted to receive $13.6 million in the current fiscal year for research. A second field, new electronic devices, will get $6.2 million this year for studies into such things as superlattice devices, three-dimensional ICs, and ICs that operate in severe environments. Finally, biotechnology research will get some $5 million. These are sums, says Tanaka somewhat defensively, that are "very, very small" compared with R&D funds provided by the U.S. Defense Department to U.S. industry.

As in all AIST research projects, however, the money is designed not to develop commercial products but rather to elevate the capabilities of private companies and produce breakthroughs in basic technology. These large-scale projects date back to the late 1960s. One of the first was an effort to help Japan's six dominant mainframe manufacturers produce more than small- and medium-scale processors and get into large-scale machines like the big boys from the U.S. That project ran from 1966 through 1971 and chewed up about $28 million of government funds.

The Japanese in the early 1970s chuckled embarrassedly when questioned about the large-scale computer project, saying that everyone recognized it as a flop. To the extent that no operating mainframe could be showcased when the project ended, perhaps the effort was a disappointment to many. For the amount of government funds consumed by the participants, considering there was nothing to show for it, the dismay of observers is understandable. But the fact remains that the Japanese during the 1970s did come up with several marketable large-scale processors, and today they have taken significant domestic market share away from such companies as IBM and Univac. Thus these research projects may not produce instantly recognizable results, nor represent the most efficient usage of research monies, but the benefits to the participating companies and institutions cannot be denied.

A scientific supercomputer project was started in 1981, involving the so-called Gang of Six.

Of the completed large-scale projects, the largest funding went for the pattern information processing systems project (PIPS) that ran for 10 years and delved into pattern recognition, scene analysis, and voice recognition and synthesis. It's arguable whether chips that enable automobiles to talk to their occupants are the epitome of progress, but systems that recognized handwriten kanji and industrial robots with vision owe much to PIPS.

And there's certain to be more, for PIPS studies continue. Major beneficiaries of that money were the nation's six mainframe makers, Fujitsu, Hitachi, NEC, Toshiba, Oki, and Misubishi Electric, which together managed to consume some $100 million. No one said it was going to be cheap.

It was the kind of R&D funding that none of the vendors could have mustered on its own, and this continues to be one of the government's rationales for playing the role of a financial angel. These subsidies, it says, overcome the inability of private companies to spend huge sums for long-range R&D programs, the outcomes of which cannot be predicted.

With this in mind, the AIST started its scientific supercomputer project in 1981. It involves the same Gang of Six—Fujitsu, Hitachi, NEC, Toshiba, Mitsubishi, and Oki—as well as one of the agency's 16 research centers, the Electrotechnical Lab (or ETL). The latter is performing research into Josephson junction technology, the so-called high electron mobility transistor, and

Robotics is an area the Japanese are particularly interested in as they eye future international markets.

gallium arsenide devices. Because of the money being put into this research, there is no separate VLSI budget within the fifth generation computer research project.

An early AIST document says that among the ETL's goals are 16K memory chips with access times below 10 nanoseconds and logic devices with more than 3,000 gates per chip and delay times as low as 10 picoseconds. Although that research is still in its early stages, NEC last April announced a supercomputer that runs at 1.3 gigaflops, scheduled for first shipment in early 1985. The machine reportedly uses 64K RAM chips with access times of 3.5 nsec and logic circuits of 1,000 gates with a delay of 250 picoseconds per gate.

While the AIST is chartered to disburse funds to domestic manufacturers for research into technologies deemed invaluable for the nation's future, it would be erroneous to think this is its sole mission. The agency promotes the so-called Japanese Industrial Standard and as such interfaces with the International Standards Organization. It also promotes joint international research in such fields as geology, ceramics, and metrology.

MITI decided Japan had been playing catch-up for too long and needed to lead the way itself.

At last year's Versailles summit conference, international research as on the agenda, and Japan suggested joint studies on robotics. Such a project was started by the AIST this year, the study of advanced robotics for use in severe environments, to perform rescue operations, and for underwater use. Some $170,000 has been budgeted for this first year, just to survey the field and perform some preliminary conceptual designs. According to Tanaka, it is Japan's hope that arrangements can be made to share research results with labs in other countries and even to consider the exchange of scientists.

—Edward K. Yasaki

JAPAN PROMOTES SOFTWARE

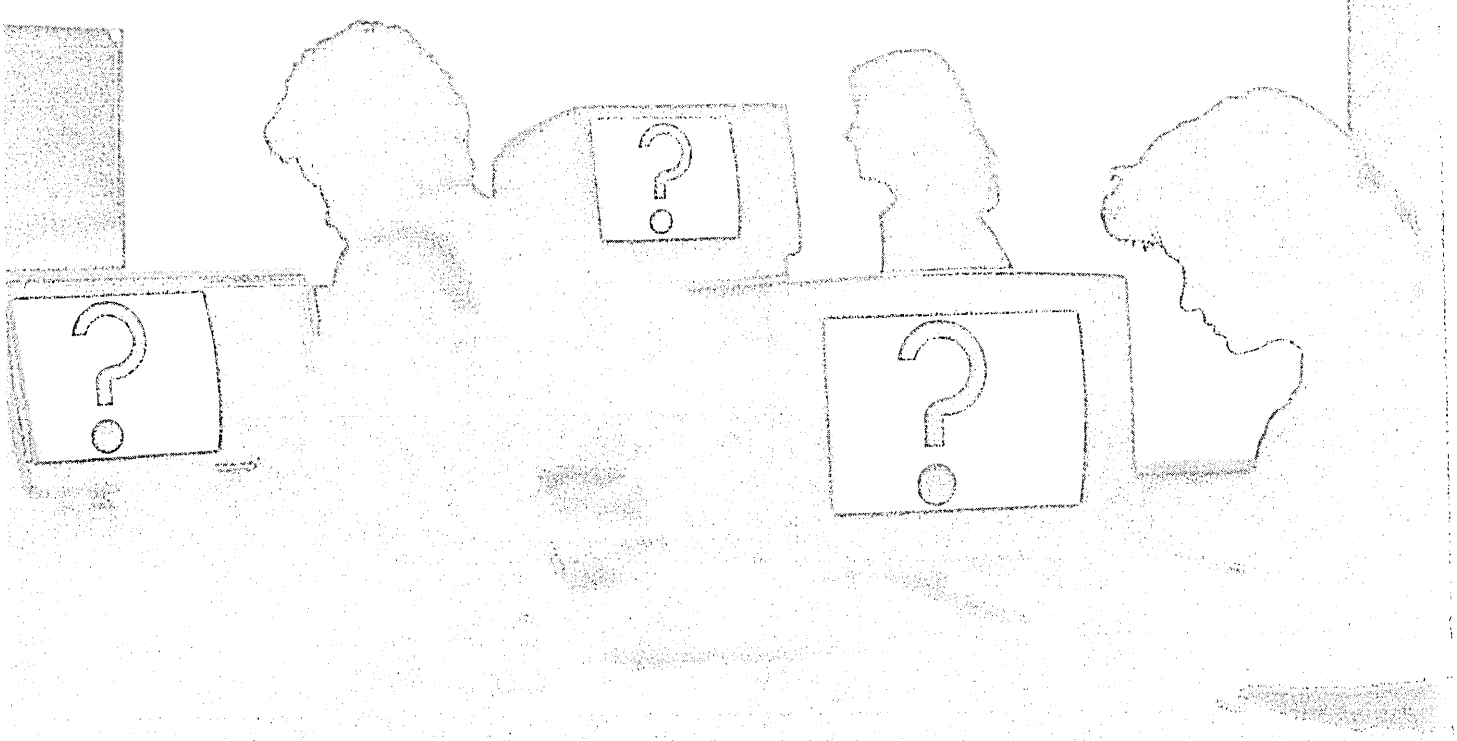
Clients share company's package development costs.

The fastest growing software and services company in Japan is Toyo Information Systems Co., based in Osaka, which had revenues last year of some $42 million. About a third of that comes from software development contracts and sales of software packages.

One of those packages, an interactive graphics system called FEMAS that performs pre- and post-processing for a finite element analysis program, has chalked up sales of more than a million dollars so far, a significant milestone for a country that deigns to use packages. The story behind the development of FEMAS provides an insight into how the government is helping promote software package sales in Japan.

The story starts in 1970, when MITI established a system for funding the development of packages and placed it under the direction of its Information-Technology Promotion Agency (IPA). Since the government is unable to provide funds to any one company, IPA required a developer to be joined by several customers or prospects for that package.

In the case of FEMAS, TIS showed up at the disbursement office with seven client companies. Each agreed to put up some $1,000 toward the development cost, in exchange for which each was to be allowed to buy the finished product at a discount, in this case for $12,800. It was to be a significant discount over the final price, which is $51,000. Anyway, IPA provided an interest-free loan to TIS, which was required to re-



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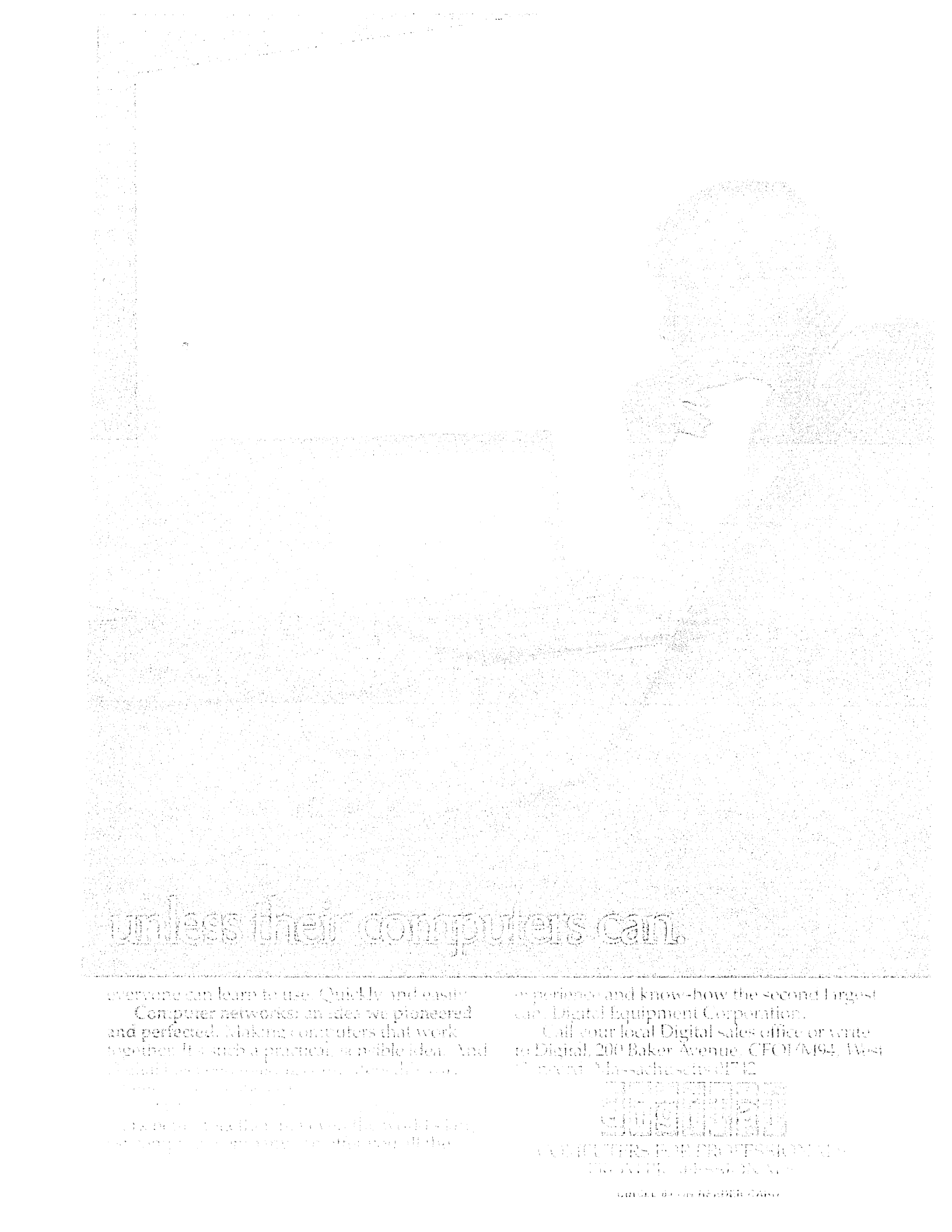
unless their computers can.

pay only 70% within five years. About two years ago, sales of FEMAS exceeded $1 million, and in March '82 the company became one of only two Japanese firms to receive the ICP Million Dollar award. The other recipient was Software ag of Far East Inc. for its A-Auto package, which automates some computer operations functions. To date, TIS has sold more than 50 of the FEMAS systems.

Because of the success of FEMAS, 43 companies signed up when TIS proposed a geological soil analysis package called SIGNAS. It was released last January, but in the first four months of this year TIS was able to sell only three more, for a total of 46.

When word of a new package venture gets out, a gang of companies wants in on it.

According to Masao Kawamura of TIS, the optimum size for a charter group is 15. That would comprise a manageable group that could discuss its specific needs and draw up the final specs for the systems; it would also enable the software company to sell a minimum 30 packages and make a profit on the venture. But the problem, Kawamura explains, is that when word of a new package venture gets out, a gang of companies want to get in on it from the beginning. This complicates the job of determining what the system will do and also makes it difficult to realize a profit from the venture. As Kawamura expresses it, it's like pulling too much fish from a pond and not leaving enough to catch later on.

Perhaps because of this, not all TIS packages are developed with a loan from the IPA. Scheduled for release to customers later this year is CADAP, which is designed to aid in the development of graphics programs. Although no IPA funds were involved, 27 companies managed to get in as members of this group, confident that the package will be as useful as previous releases from TIS.

There seems to be no doubt, too, that the success being experienced by TIS in software package sales derives in large part from its expertise in scientific-engineering software, which along with systems software are the only packages that sell well in Japan. The company, which has been selling only in the domestic marketplace, has plans to begin selling also in the U.S. Meanwhile, says the firm's sales vice president, Kazuhiko Yamashita, the company intends to develop one or two new packages each year. Picking up on Kawamura's simile, Yamashita likens the Japanese market to the state of Minnesota with its 1,000 lakes and says TIS has to decide which lakes to fish in.

—Edward K. Yasaki

MICROCOMPUTERS

NBI HORIZONS EXPANDS

The feisty word prodessing company has unveilied a strategy to get into new office markets.

Perhaps it's too much to expect a $100 million word processing equipment maker to have all the answers for the confused world of office automation. After, all, that world embraces data processing, word processing, and a number of other disparate functions that users tend instinctively to believe only an IBM, Wang, or Xerox might be able to guide them through.

Nevertheless, NBI of Boulder, Colo., claims it has the products to help both the clerical and professional workers of that mythical office world in a meaningful way. The company in late April introduced a series of new products that will bring it more fully into the data processing-

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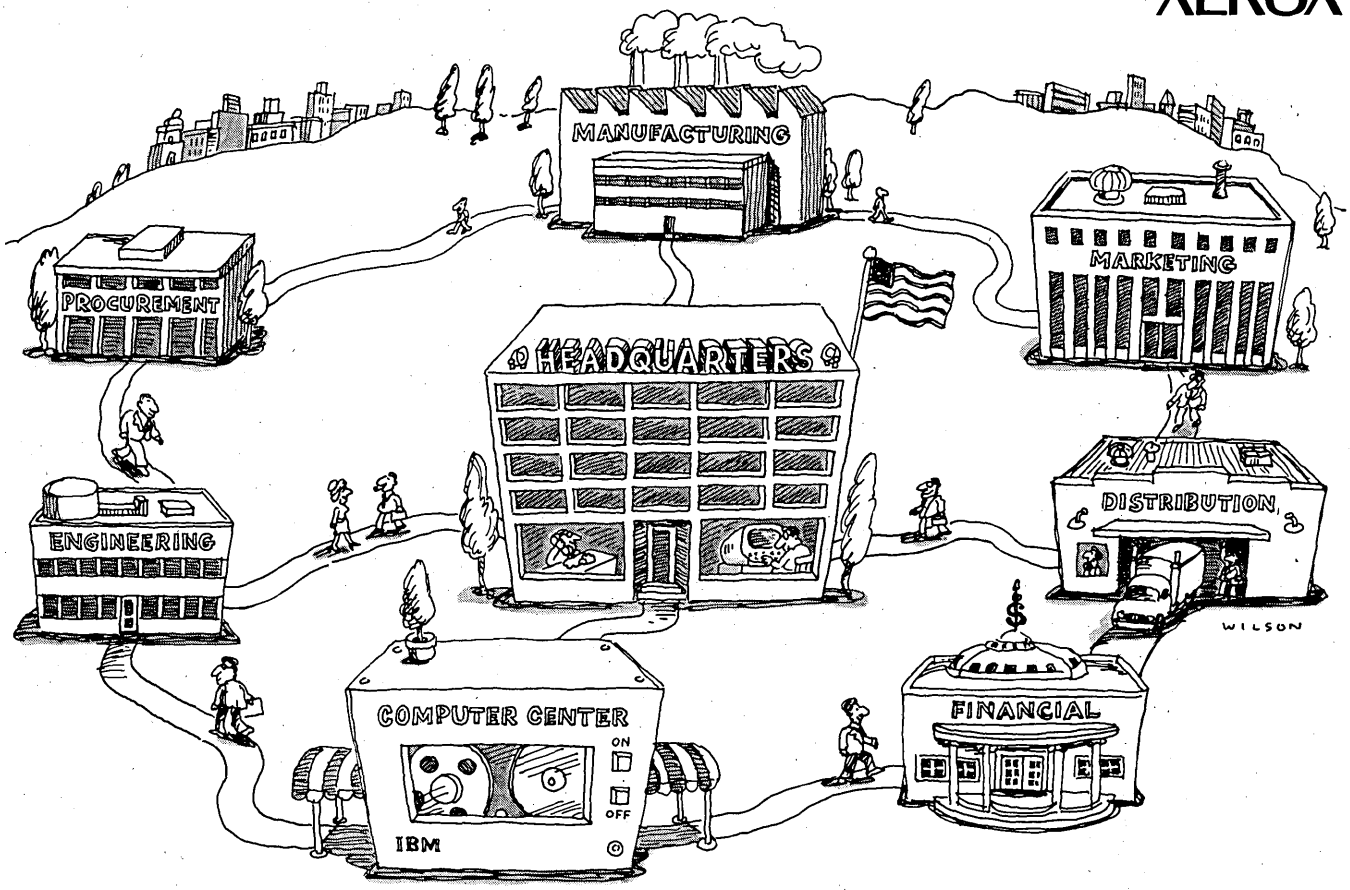

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dominated sector of office automation. A personal computer designed to be software compatible with IBM's P.C., a high-end word processor, and a high-resolution workstation were introduced along with a new networking scheme that will tie the firm's various devices together.

NBI, company officials said, is intent on expanding beyond its traditional word processing business. That business has been a lucrative one, no doubt, but the firm has been put on notice by recent competitive announcements—such as IBM's Displaywriter getting dp capabilities. Apple's introduction of the Lisa workstation, and Wang's multifaceted approach to office electronics—that it must diversify if it intends to stay in business.

Outwardly, at least, the company seems to be on the right track, although it may have trouble establishing an identity beyond the highly successful word processing image it has nurtured for 10 years. As Advanced Office Concepts' Amy Wohl, a noted office analyst, points out: "The dp center has become the driving force behind office automation [OA] purchases." Her contention, borne out by others, is that the choice of mainframe dictates the pace and type of change in end-user departments, including offices.

"There are few OA buying decisions where the central dp site doesn't play a decisive or leading role, because everybody is fighting to avoid an uncontrolled flood of small computers in large organizations," she says.

Equally crucial, says Wohl, is that the OA buying decision is increasingly centralized and based on a single large vendor. "That way the customer can hope for better discounts and support and a greater understanding of his total system," Wohl adds.

Because of this trend, Wohl argues, there has been a tendency for word processing companies like Wang, and now NBI, to decide they must get into the dp and OA businesses and posture themselves as "total system suppliers." The danger, warns Wohl, is that they will overreach themselves.

Tom Kavanagh, NBI's president, agreed with Wohl's first point about the crucial role of the large dp center. "That's why we have a marketing organization," he quipped, "so that we can build up credibility in the dp world."

Kavanagh said that Wohl's second point needed to be clarified: "Of the 200 to 300 VIP groups that have been through my door, I haven't talked to any that insisted on just one vendor for everybody—this, if anything, is what they are trying to get away from!

The Boulder, Colo., firm introduced a workstation that is claimed to outperform Apple's much-heralded Lisa.

"It's true that customers appear to want a primary supplier and a couple of secondary niche companies," he continued, "but the last thing they want is a one-vendor proprietary solution. They don't intend to get locked into anything."

Such reasoning was apparent in the New York announcement. The company said it would support the Ethernet local net scheme "because it is the only generally agreed-on standard at present." NBI added that Ethernet hadn't been its first choice—"That's still sitting on a shelf unannounced." Though the company didn't say as much, its first choice had been an IBM-compatible ring network scheme, but sources explain that IBM's local net has been repeatedly delayed because it was originally developed as a proprietary solution and IBM is now trying to make it open.

In a sense, the breadth of NBI's announcement is misleading. "It probably gives the impression that we're trying to shove one enormous system down the user's throat. That's not our intent. We're just as interested in enticing the user piece by piece, and allowing him to tiptoe into office automation. We don't insist that he roar in," said the NBI president.

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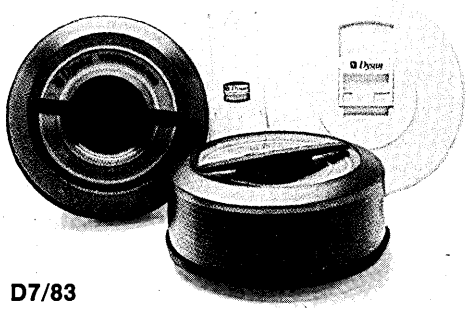

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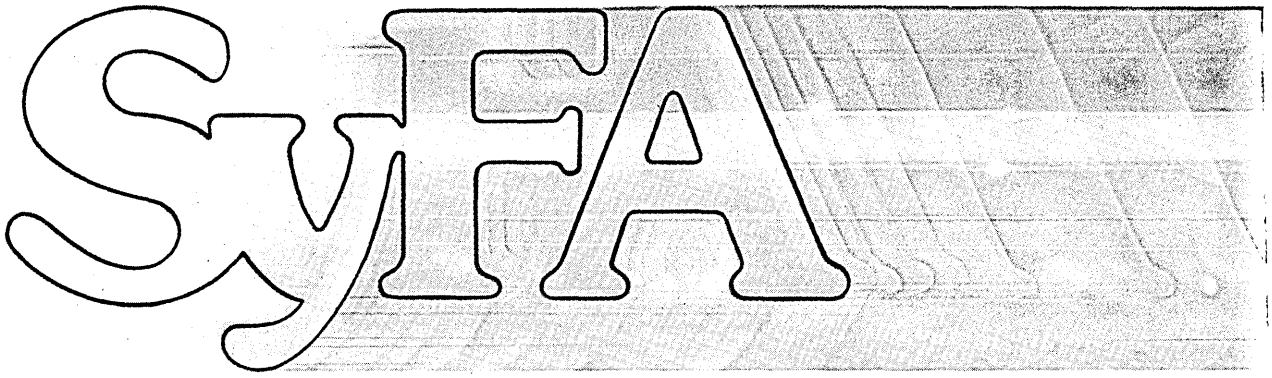

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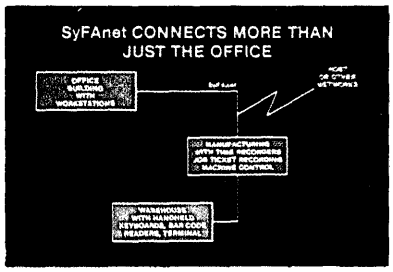

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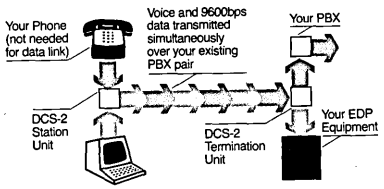

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By way of example, the company said that NBI's Net offered options for IBM P.C. and 3270 terminal attachments, NBI Net will handle up to 100 IBM P.C.s at a time with software left unmodified, the company claimed.

If the user wishes, he can buy the new NBI personal computer and get twice the performance of the IBM equivalent and twice its color graphics resolution. The company also added that 250K of memory is standard in the machine's $2,995 list price.

Though Kavanagh identified three "worlds" of the office, it must be stressed that NBI has so far only been active in the first of these: the clerical and secretarial sphere. The company has built a solid reputation around its OASys standalone word processors.

By extending its old OASys architecture to include the new PC, NBI now has an approach to what it calls "the casual professional." But it is in the third world of the "superprofessional" that a whole new architectural approach for the 1980s, System One, has emerged. Its first implementation is called the Integrated Work Station (IWS), a Unix/68000-based system that offers a combination of dp, word processing, graphics, data communications, and decision support. With its user friendliness and powerful graphics, IWS bears a passing resemblance to Apple's Lisa. At $12,500, it also has a similar price. But IWS offers more processing power in its display than Lisa has in its whole system, NBI claims. Other comparisons prove equally invidious to Apple: NBI claims four times the processing performance of Lisa, twice its screen resolution, a screen update time that is 10 times faster, and full virtual memory.

The main difference resides in the power of the Unix/68000 combination, say NBI engineers. The company clearly expects Unix to become the industry standard operating system for workstations in the years ahead.

NBI is pegging its future on a new system architecture that relies on a Ethernet-like local network.

The Motorola 68000 chip has also been used to build probably the most crucial component in the NBI package, the integrated system server (ISS). ISS essentially acts as a bridge between OASys and System One, the old and the new. It acts as a large-volume storage device and offers such facility-wide functions as calendars and electronic mail for all who are attached to NBI Net. ISS will be the last element in the total package to be shipped to customers, probably in the second quarter of 1984, Kavanagh told DATAMATION. Prices will start at $29,500.

For now there will be a peaceful coexistence between the two architectures, but as the decade progresses, NBI hopes to migrate greater numbers to System One.

It's fair to say that NBI has put everything it has into this announcement. Its future has been staked on one big play. The company has already begun to swing its support organization away from its sole focus on word processors and tune it into the technical complexities of a richly varied network of new products.

That the company felt rushed to show off future products to shareholders and the marketplace was evident in the state of its IWS workstation, which was still in its prototype stage seven months before first customer shipments. The workstation's desktop unit, able to display only a prerecorded set of screens, was quietly attached during the press demonstration to a rather cumbersome box that, according to NBI officials, contained the system's essential electronics. That circuitry, they claimed, would eventually be reconfigured to fit entirely within the desktop enclosure.

The OASys 2000 personal computer, the company claimed, could not be shown at the press conference because its journey by air from Boulder had been "delayed by a snowstorm."

Wohl seems to feel that NBI will rise

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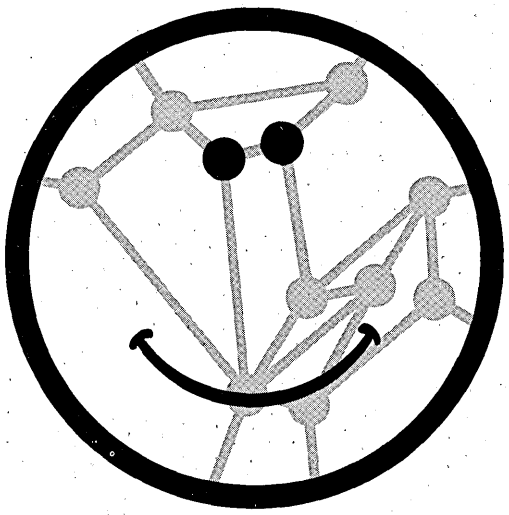

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to the support problem—no easy task, as the much larger Wang had demonstrated. "Their toughest problem will be marketing," predicts the OA expert. "They need to build an image quickly, and that usually takes size and a lot of money."

"I'm convinced that we're big enough and sound enough," stresses Kavanagh. He says that the company has $40 million in cash and could generate $60 million more in a hurry, if needed. "Furthermore, we have no bank debt."

—Ralph Emmett

ONE STEP AHEAD OF BELL

Rolm Corp. beats American Bell to the punch with a combined phone and terminal.

Early this year, New York City-based Northern Business Information (NBI) was concerned about what it called Rolm Corp.'s "almost dangerously conservative" strategy for the future.

But NBI, a market research firm, conceded that Rolm could conceivably make another such leap (like the one it made in '75 from military computers to PBXs) in the future, using its PBX technology to develop an entirely new product line.

The Santa Clara, Calif., firm has done just that. On May 26, Rolm introduced what it calls its Cypress Concept, initially embodied in the Cypress personal communication terminal. This unit combines an electronic telephone and intelligent terminal and sells for $1,950.

Rolm's 1975 leap into the telecommunications market ultimately brought the company 15% of the PBX market and placed it second in that market to AT&T.

Now, with Cypress, Rolm believes it is a step ahead of American Bell Inc. ABI has hinted at a Cypress-like product called Getset (general electronic telephone set) that is part of its Epic (executive planning information and communications) system. Epic has been in trial at Bell Labs since 1981, but neither it nor Getset has been formally released. Both, however, are expected to be unveiled some time this year.

The Rolm terminal is not a desktop computer. "It won't run VisiCalc," quips Janice Carnes, marketing manager, but she hints that future models in the family probably will.

The existing unit has three primary functional components: a smart ASCII terminal, an electronic telephone, and a set of personal services designed for managers and professionals. These include a phone list, reminders, a calculator, and "call me" messages. As a terminal, the unit features a high-resolution 9-inch display, a detachable alphanumeric keyboard, stored terminal profiles, automatic log-on, VT100 compatibility, Rolm's IBM gateway, and variable data rate. It can handle voice and data simultaneously as there are no dedicated data lines or any special setup required to make a data call while on a voice call or vice versa. It runs on existing telephone wiring.

The keyboard has both standard key caps and standard typewriter key spacing. The 68 keys available provide all the standard functionality of an ASCII terminal plus an interface via dedicated 3270 keys to the Rolm IBM gateway which gives it access to data stored in IBM or plug-compatible mainframes.

Terminal profile information, including phone number, data rate, parity and echoplex, is predefined by the user or a technical support person and stored in the Cypress personal data module.

Program function keys can be controlled by the host computer for use with applications programs. The position of the cursor on the Cypress screen also can be addressed and read by the host computer.

—Edith Myers

BENCHMARKS

NCR COMMUNICATES: NCR has gone into the telecommunications business. At a press briefing at the International Communications Association Conference in Anaheim last month, the one-time cash register company announced formation of a telecommunications subsidiary, NCR Telecommunications Services Inc. President of the subsidiary, G. James Bracknell, said it will offer telecommunications services developed for corporate use to customers and outside firms. Initial offerings include Thrifticall Card, a long distance telephone service initially offered in the Dayton, Ohio, area and due to be available in San Francisco in August and New York in October; National Net, a point-to-point data/voice transmission services; and CallTrak, a hardware and software system designed to track all outgoing calls and provide call accounting information.

PBX SHOPPING: IBM said it would buy 15% of Rolm Corp., a Santa Clara, Calif., maker of private branch exchange (PBX) equipment, its second major investment in a computer company after last December's buy into Intel Corp. IBM and Rolm plan to work together to make sure their respective products work together effectively. The pact was seen by industry analysts as jeopardizing an agreement in principle IBM made with Mitel last July to jointly develop a computer communications switching system. IBM said it is "examining" that agreement after making its deal with Rolm. Rolm is a strong challenger to American Bell in the sales of Data/voice PBXs and will likely gain considerable market credibility from its linkup with the leading computer manufacturer. IBM is expected to gain a stronger foothold at Rolm customer sites, many of which are already IBM users. IBM is to invest $228 million in Rolm and gain two seats on the firm's board. No joint marketing plans were disclosed, but such activity is not precluded by the agreement, according to industry sources. Analysts saw the Rolm-IBM partnership as further evidence that IBM seeks involvement in all aspects of the computer market and is not shy about rectifying weaknesses in its own product line with help from outside companies.

IBM-DIGITAL PACT: The nation's two largest computer companies joined hands to contribute some $50 million worth of equipment, personnel, and software development work to Massachusetts Institute of Technology. The deal was seen as a way for each company to develop expertise in educational computing and to work out methods for their respective computer products to work with each other. William Filip, IBM's general manager of academic information systems, was quoted as saying, "We have no intent to create proprietary products out of this activity. Any products that do emerge will likely be essentially educational materials to improve curriculums." The pact is to hold for five years during which time the two companies will develop systems both for science and humanities education. DEC is to contribute some 60 minicomputers to the engineering side of the project while IBM will donate about 1,000 personal computers for nonengineering departments. The three-way deal follows similar announcements of joint projects at Brown University and Carnegie-Mellon.

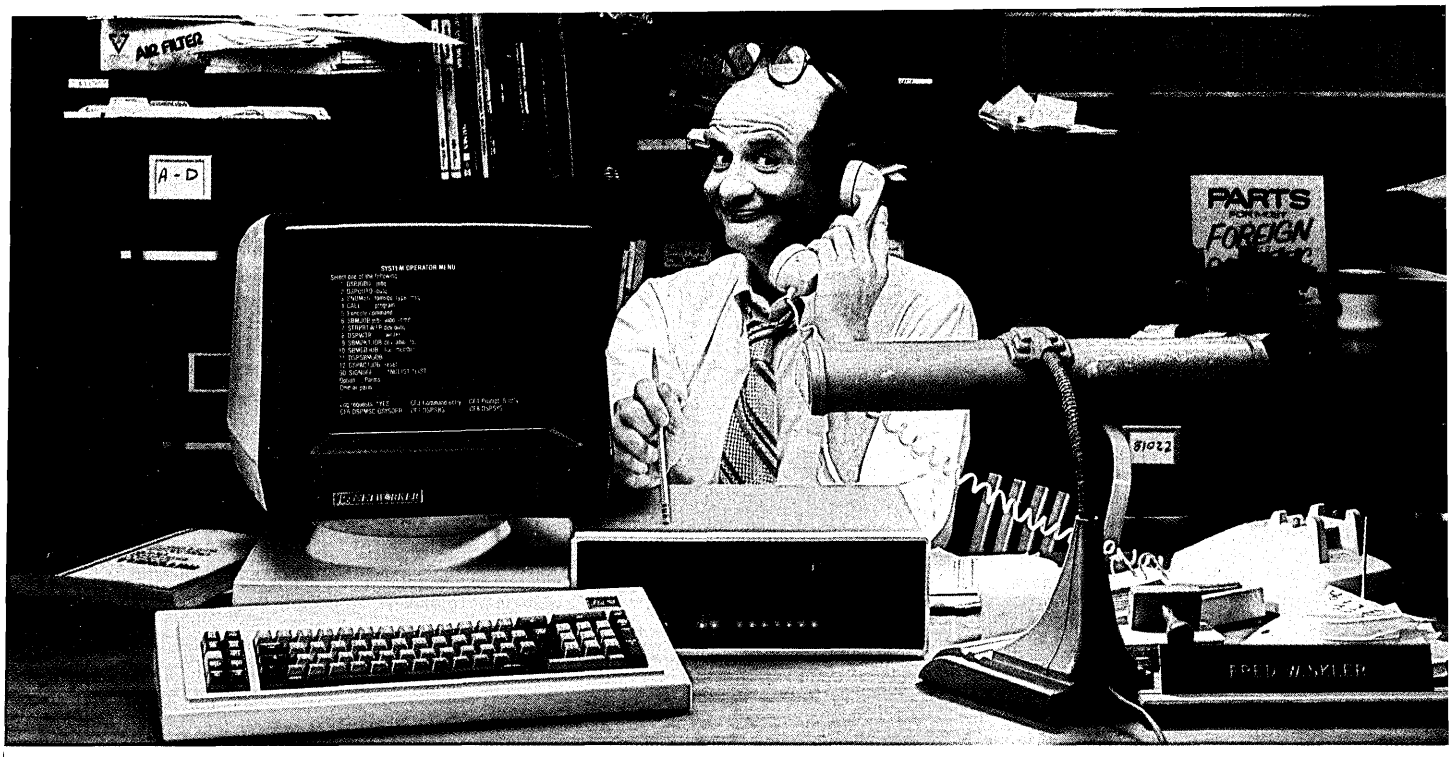
MAIDEN SPEECH: Senator Frank R. Lautenberg (D., N.J.), former chief of Automatic Data Processing, Clifton, N.J., said in his first speech before the Senate that the computer is reinforcing disparities between the poor and the affluent in the United States. Computers, he said, are proliferating more rapidly in homes and schools in wealthy districts, leaving the poor to become "illiterate" in the new technology. "In an age that demands computer literacy, a school without a computer is like a school without a library," the junior senator said. Lautenberg, whose election was helped by computer industry colleagues, said he chose the subject of the "information age" for his first substantial speech because he wanted it to provide the framework for his tenure in the Senate. He offered no solutions to the problem of the information-poor, but noted that poor school districts are averaging 25% fewer computers per student than other districts.

COMMUNITY COMPUTING: Apple Computer said it has awarded grants totaling $206,000 to establish computer networks involving 35 community organizations nationwide. Eight microcomputer networks will be installed, serving interests ranging from infant health care to employment opportunities for older citizens. The company said the grants were part of a quarterly plan under which proposed networks come up for review. A typical network is one that helps waste recycling centers in Washington, D.C., New York City, St. Paul, Minn., Boulder, Colo., and Berkeley, Calif. Apple said it provides equipment and training and helps groups running the networks to find and develop proper software for their particular needs. Several software companies also donate programs.

BUYS MATHEMATICA: Martin Marietta said it will acquire Mathematica, the Princeton, N.J.-based developer of the Ramis II database management system. The aerospace firm plans to spend about $31 million to buy Mathematica, which is understood to have just over 800 copies of Ramis installed worldwide. The system is also used through some 20 timesharing networks. Mathematica had sales last year of about $36 million, about $16 million of which came from sales of Ramis. The after-tax net for the company was $1.4 million, and, faced with rising R&D costs and a shrinking consulting business, Mathematica was prompted to sell out to Martin Marietta Data Systems. The latter, according to Thomas J. Lawton, editor of *Computer Services Report*, Belmont, Mass., had revenues last year of $244 million, about half of which was derived from within the conglomerate itself.

MOVING ON: It seemed only a matter of time before Stephen Jerritts, who was asked to step aside as chief of Honeywell Information Systems last September, would resign his sideline post as corporate senior vice president. On June 1 he signed on as president and chief operating officer of Lee Data Corp., a fast-growing maker of 3270-like terminals. Among the factors prompting his demise at Honeywell, Jerritts said, were differences on the future course of Honeywell in the computer business, more specificially, differences on strategic thinking and investment levels. Time had come for a change. After spending 34 years in the company of IBM, GE, and Honeywell, Jerritts describes himself as an "operations" type of person, one who likes to get his "hands into things." What he doesn't like, he said, is sitting on top of a large heap and working through committees and task forces. So late last year Jerritts started thinking about a new career. He wanted a younger company, something in the range of $100 million with an established market niche and a growth-minded board. Meanwhile, Lee Data, a four-year-old company with revenues approaching the $50 million mark this year, has grown by concentrating on a fairly small marketplace and on a narrowly focused product.

SATELLITE LINK: Faced with the need for increased capacity over its public packet-switched data network, GTE Telenet Communications Corp. recently activated a satellite link between switching centers in Chicago and Los Angeles. Providing a direct 56Kbps transmission path, the link represents the first part of a program that will, company officials say, ultimately result in a tenfold increase in the capacity of the Telenet network. Customers will not need to make any procedural, hardware, or software modifications to existing systems, according to Peter C. Waal, vice president of marketing and planning for the Vienna, Va.-based company's network services unit, because the internal Telenet protocols compensate for the different transmission techniques. The channel was supplied by GTE Satellite Corp., which began offering satellite transmission service between earth stations in Houston, Chicago, and Los Angeles earlier this year. A fourth station in New York is being added this summer.



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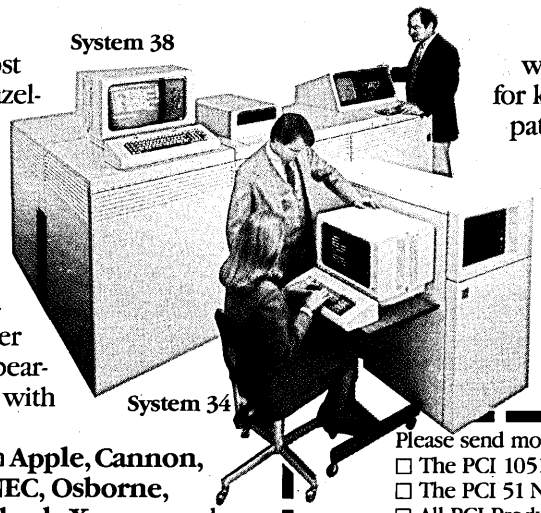

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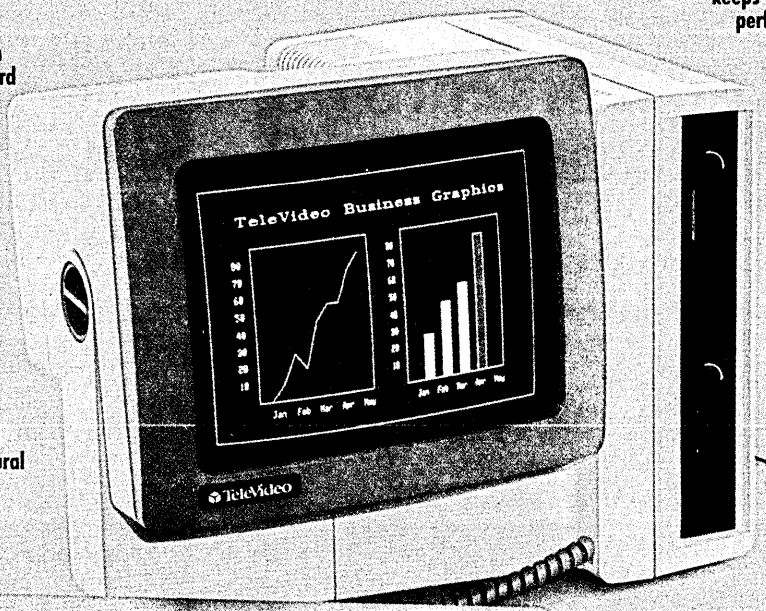

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CIRCLE 97 ON READER CARD

Application-dependent networks are cumbersome and wasteful. But how do you graduate to the next phase?

THE CORPORATE COMMUNICATIONS CONUNDRUM

by Jan Johnson

In the beginning, data communications was simply one of many elements within the almighty application. Datacom didn't really have an identity of its own; it was just another tool a designer might use in getting a specific job done.

But times changed. Automation swept over the business world. Batch processing gave way to on-line processing and new applications were requested daily. Terminals of all shapes and sizes multiplied, appearing everywhere: in the home office, in branch offices, and on counter tops in airports, fast-food chains, and warehouses.

Datacom networks have become a critical element in the day-to-day operations of a great many companies, and as a result, data communications has come to be respected in its own right. Managers who might have once considered their networks a necessary nuisance now have aspirations for them. Now there is a splendid array of modems, muxes, and network management tools, and it is generally agreed that networks should be independent of applications and, ideally, multipurpose in function.

Unfortunately, reality is not yet up to speed. Many dp professionals find themselves still tangled in the legacy of the early days—a growing jungle of single purpose networks, with multiple protocols, multiple devices, and no corporate standards. Those sophisticated datacom tools are still more a part of the problem than they are the beginning of a solution. The fact is that, in many companies, data communications is underfinanced and out of control.

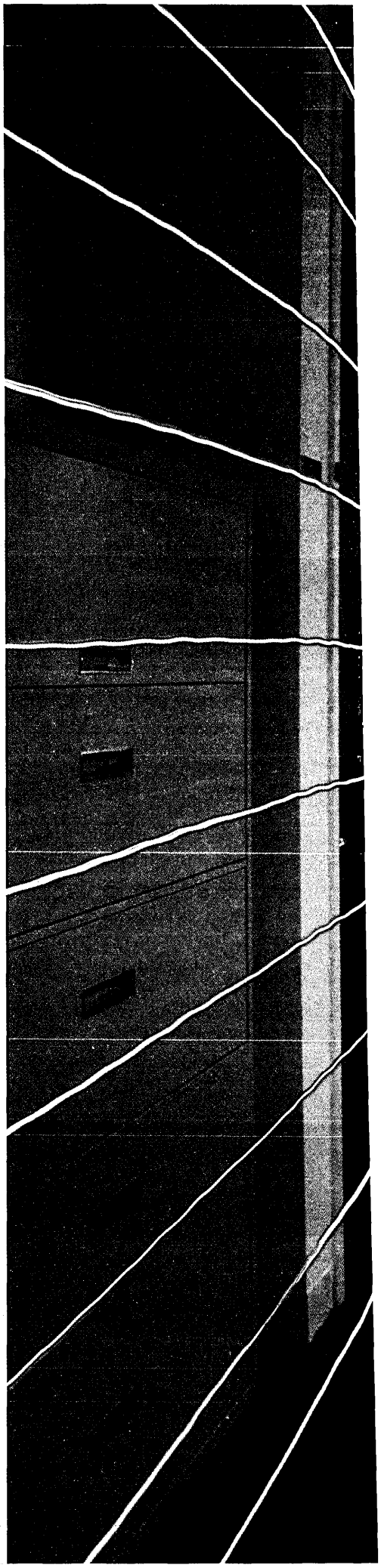
"Those in the big companies usually understand the game," counters a communications specialist with GTE/Telenet. He defines "big" as shops running 30,000 hours of communications a week, handling, say, 100 simultaneous users. But the others—those who don't have a handle on even the simplest network characteristics, such as peak hours and the types and numbers of devices on-line—are likely to find themselves lost without a machete amid the marketing underbrush of datacom vendors.

Put six vendors on a podium and each is likely to proclaim a market leader position. But ask them "in what?" and it turns out this business can be segmented into some astonishingly small niches. Don't be surprised to find a "market leader" in four-channel statistical multiplexors with 8-bit microprocessor intelligence and some diagnostics capabilities. Someone else is likely to lay claim to the 8-channel intelligent stat mux market.

Network management and control is another realm rife with claims of technological one-upmanship, and the detail to which vendors take this will leave your head spinning. For instance, General DataCom Industries, Danbury, Conn., sells a diagnostic unit that "wraps around" a modem. It is independent of the modem, with its own power supply, and GDC claims the device is able to test more thoroughly than competitive offerings; for one thing, it can test the modem's driver. Other vendors build the diagnostics inside the modem, thereby eliminating an extra power supply.

General DataCom uses a surveillance technique called polling to query its modems for failures. That function is interleaved with whatever else is going on between the controller console and the devices on-line. Surveillance does not stop when a test is taking place. In fact, GDC claims it can conduct up to three simultaneous operations over the subchannel, one of which should always be surveillance, according to James Nordquist, product line manager.

Which brings us to another popular dispute. Most companies move their diagnostics data over a subchannel carrier separate from the main channel that carries production data. This is called an out-of-stream method. IBM, however, moves its diagnostics using an in-stream method, mixing diagnostics data with production. Does the in-stream method degrade throughput of the production data, as some vendors claim? Stay tuned.



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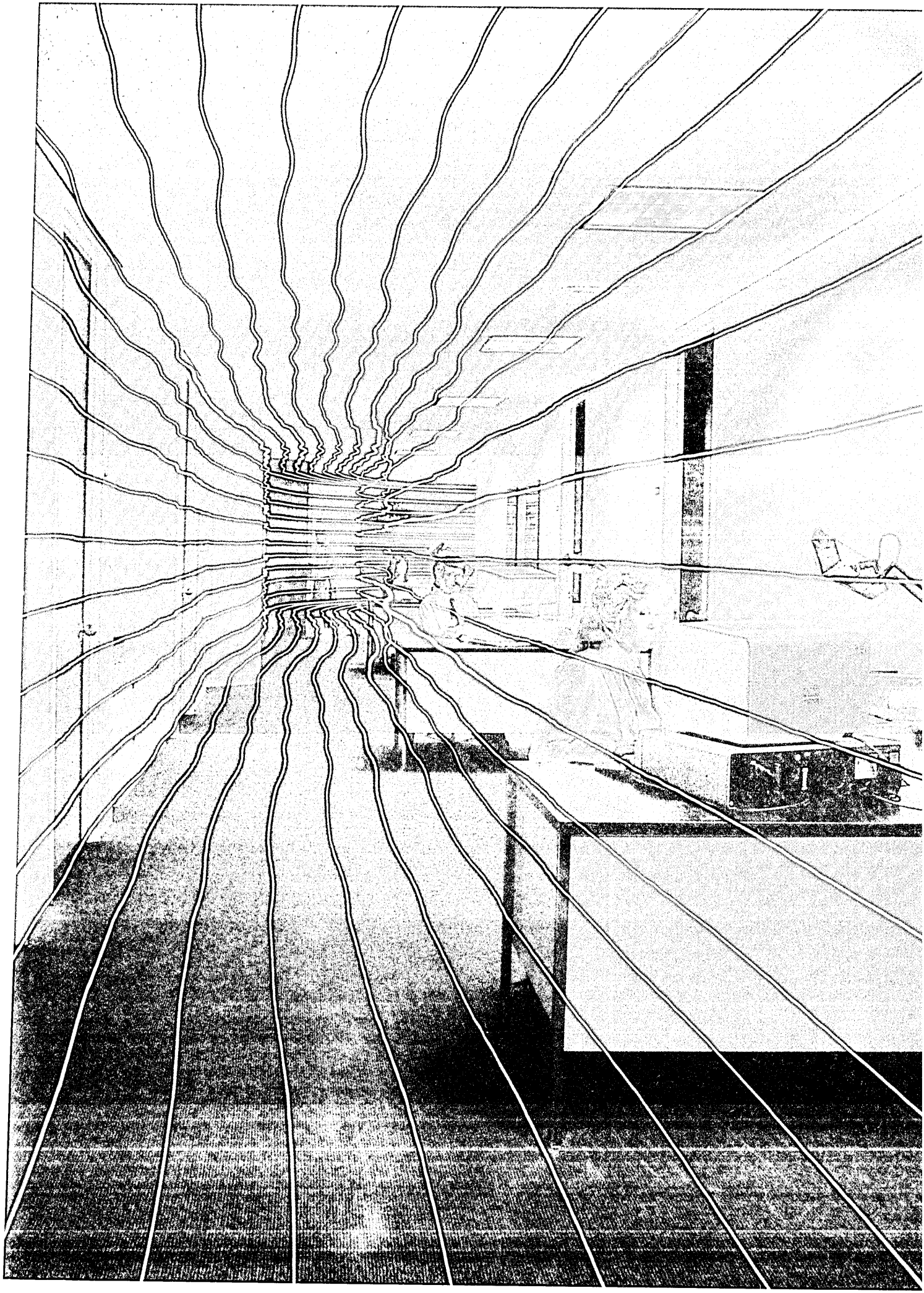

LAST GASP POLLING TECHNIQUE

Meanwhile, back to solicited versus unsolicited polling. Racal-Milgo, Plantation, Fla., uses an "unsolicited" technique, commonly referred to as "last gasp." In the Milgo system, if something goes wrong, the device immediately sends an unsolicited alarm. "If we are out there running a test and an error occurs somewhere else, the 'Mayday' will override the test and come into the control center," explains Alex Durr, manager, systems marketing for Milgo. "It used to be an interrupt task, but we changed that so now the device looks to see if any data are coming down the line, then slides the alarm signal in and keeps the test going."

That may be mostly true. But what about a certain test that a competitor had cited as a problem for Milgo? "If we are running an end-to-end bit error rate test, there is no way to get the alarm out but to interrupt the test," admits Durr.

Intelligence is another tug-of-war, which is a shame because it's so important. More smarts out there in the net mean more traffic/failure statistics sent back. More smarts at home at the network management console increase the system's ability to manage and make sense of all the incoming data. A well-thought-out network management system can be invaluable. Programmed to note certain performance parameters, it can pick up a problem before it knocks out one or more users. Programmed to produce certain network loading reports, the management system can take a lot of the guesswork out of planning network growth.

But again, users are likely to get tangled in the underbrush. Vendors run on about which Bell line specifications they collect—like line noise levels or harmonic distortion. They talk about how detailed the failure notification is—whether it's pinpointed down to the drop level or to a specific modem address with some details about the specific type of failure that has occurred. They explain how often that information is captured and how easy it is to change those monitoring parameters or create or call up reports on the stored information.

Happily, this melee of claims and counterclaims does show some signs of abating. Paradyne, for example, entered the fray with a sales face loaded with IBM experience and a strategy of offering good old Big Blue-style "solutions," technical details aside. "I think when we came into the modem business, the Milgos and GDCs were not used to this type of marketing approach," says Jerry Kendall, senior vice president, U.S. marketing and customer service, Paradyne Corp., Largo, Fla. "They were used to selling to the technical types and we set a whole new tone." Other vendors that appear to be moving ahead with a systems approach to network management are Intertel Inc., Andover, Mass.; General DataCom; and Codex, Mansfield, Mass. (see box above).

Nevertheless, many users—some people say it's most—remain at the idiot-light stage of network management. Quite often the first notification that something is amiss is an irate phone call from a cut-off user. When you consider the growing number of on-line users, and what it means to a company when those users are down, the potential seriousness of the situation begins to sink in.

COST VERSUS DOWNTIME

Cost is one reason MIS shops have been slow to go with more sophisticated network equipment. Network management units, for instance, range in price from roughly $15,000 to $90,000 and up for a sophisticated system that generates reports. According to at least one user,

A VIEW OF THE VENDORS

After the invention of packet switching and ARPAnet, people began to think of a network as having an identity of its own "as opposed to being a collection of applications," recalls Howard Frank, president, Contel Information Systems, Great Neck, N.Y. That forced IBM to rethink its concept of a network, says Frank, and "led to the development of SNA." And that set the rest of the industry in motion.

Vendors are currently in a state of transition, with leading companies rapidly shifting from a single purpose network, component approach to a multipurpose network, integrated systems strategy.

Changing product strategies reflect those shifts. Codex, for instance, is evolving its line of multiplexors into intelligent "nodal processors," explains Mike Zak, director of market planning, Network Control Products Operation, Codex Corp., Mansfield, Mass. The key to product differentiation, advises Zak, will be the software that drives the microprocessors in the nodal architecture.

As part of Motorola, Codex is well positioned, both financially and strategically. According to those close to the company, Motorola wants to be an information systems supplier, not just a modem player. This data processing/data communication strategy, which perhaps owes something to American Bell's Net 1000, is evidenced by Motorola's 1981 purchase of Four-Phase.

Paradyne, building from its Pixnet and Response product base, has added intelligent multiplexors and crts to its systems product strategy. It too is moving ahead with a data processing/data communications approach. Pixnet, on the datacom side, allows a number of different devices to talk to each other, while Response is a 32-bit minicomputer that functions as a distributed network processing system, doing local processing and acting as an intelligent switching device. "We see ourselves as providing a total network solution," says Jerry Kendall, senior vice president, U.S. Marketing, for the Largo, Fla.-based company. "We are moving into packet switching and have purchased the rights to an X.25-based packet switching product."

Paradyne is already competing with Telenet and Tymnet in the private network market. Although a Telenet source admits that Paradyne is "killing us on price," the product is considered significantly inferior to the capabilities that Telenet can offer.

Lagging Codex and Paradyne are General DataCom Industries Inc., Danbury, Conn., and Racal-Milgo, Plantation, Fla. But "GDC is showing strong signs of moving in a systems direction," comments John Pomfert, project director, data communications, for the market research firm of Frost and Sullivan. While GDC is perceived as having an "adequate" to "competitive" technology, its service and distribution channels need some work, say industry sources.

Intertel is another company with a systems strategy. "We are looking to the day of distributed processing where you can sit at a terminal and call a program stored at some remote computer," says David Hetrick, vice president, marketing. The company comes to the game with competitive network monitoring and control systems and an open-systems attitude, which gives it an edge in dealing with multiple vendors' protocols. Its weakness is its size and access to capital.

Yet another small company with a sound strategic direction but limited funds is Infotron Systems, Cherry Hill, N.J. Its approach has been to take its mux and grow it into a network concentrator. "The concentrator becomes the bridge and we are writing specific protocols that go into the concentrator, such as X.25, SNA, bisync, and async," said Chuck Kanupke, director of marketing. "What we are currently offering is a concentrator that uses stat mux techniques but also has some protocol handling capabilities."

Everyone is leery of IBM and American Bell, even though AmBell has yet to get Net 1000 up and running, and IBM has some product technology shortfalls. "IBM has come into this business from an application perspective," says Codex's Zak. "IBM looks at the network as a logical entity rather than a physical entity, a collection of lines, connectors, and interfaces subject to environmental conditions," Zak says.

"IBM does not do a good job of line interrogation," adds Alex Durr, manager, systems marketing, Racal-Milgo. "All they tell you is that there is trouble with the phone line. You have to go to Bell to get it worked out. If you can tell Bell what the parameters of the line are, however, they seem to get to it faster." **—J.J.**

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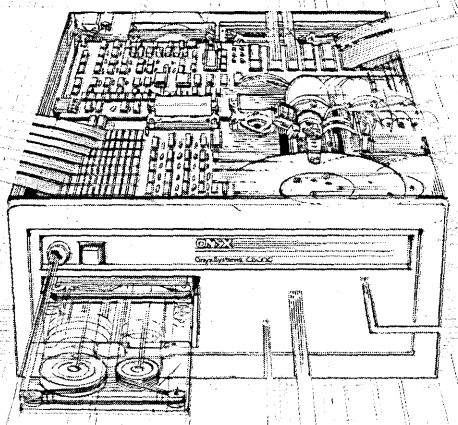

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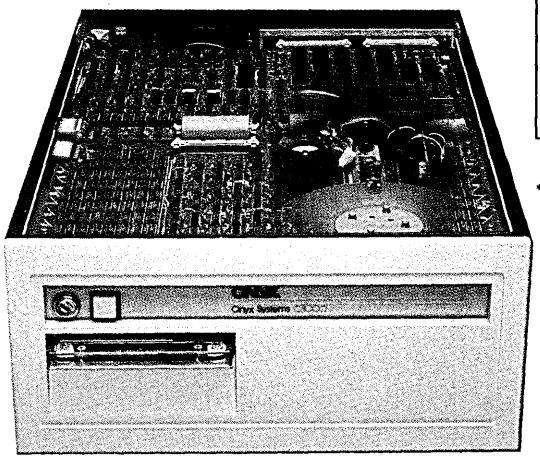

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Put six vendors on a podium and each is likely to claim a market leader position.

however, these shops shouldn't let the price deter them. "A network management system may be expensive to put in, but consider the man-hours used in troubleshooting, the customer loss, and the employee aggravation over not having an on-line terminal up," says Fran DeSear, data communications department manager, Western Savings, Phoenix. "The cost of downtime is likely to more than override the equipment cost."

Western Savings uses a combination of an Intertel EMS-1 diagnostics unit and teleterminals, made by ISC Systems Corp., Spokane, Wash. The ISC terminal, says DeSear, has a diagnostic feature that indicates whether the modem, a line, or a communication board in the cpu has gone bad.

But the decision to buy a network management unit is not, of itself, a solution. Indeed, it's likely to plunge the practitioner even more deeply into the network jungle. So what's the machete that will enable users to hack through the underbrush? The answer is a familiar one: a long-range plan with top management support.

"Companies are still in the very first stages of networking," says Phil Enslow, professor, information computer science, Georgia Institute of Technology, Atlanta. Enslow is also active as an industry consultant. Typically, he says, "what we find is that most networks today are single purpose networks and that a total corporate network consists of a whole lot of pieces designed incrementally and glued on together. They are an ad hoc design, with no structure and no sharing."

Unless users buckle down to some serious long-range, corporate-wide planning, Enslow says, they're in for severe problems. "Companies are getting themselves into positions where they are totally dependent on their vendor to describe the scope of problems they are able to solve, instead of taking control of their own destiny."

"It's suicidal if you don't have a plan," says an emphatic Sam Harvey, president of RHS & Associates, a Haddonfield, N.J., consulting firm that specializes in strategic planning for computer communication networks. "By planning," he adds, "I mean sitting down and projecting where your communications needs are going to go over the next 10 to 20 years—voice, data, video, fax, everything. It is an absolutely vital step. Without it you will be floundering all over the place."

Like Enslow, Harvey advises that top management must be involved if a company plans to cross that conceptual boundary. Practitioners now have to consider faster modems, voice compression techniques, faster switches, intelligence turning up everywhere, plus the migration toward a digital voice network and the prospects of merging voice and data. How can they hope to cut through the overwhelming array of product offerings without a corporate communications plan? How else can a company take advantage of the cost savings to be had by sharing resources such as private lines, terminals, and peripherals?

SETTING COMPUTING STANDARDS

Economies of scale are not foreign to corporate thinking. Companies everywhere have hashed out standards used in manufacturing, purchasing, and elsewhere. It is high time that kind of thinking is applied to networks, say numerous consultants. Companies have got to face the serious task of setting communications and computing standards. If they don't, they're likely to find themselves lost in a jungle of expensive high-speed networks.

A company may wake up to find it is supporting several T1 lines and satellite links with thousands of terminals and phones hanging off each, when a more rationalized network, one based on corporate standards and the shared resource concepts, would make much of that equipment redundant. There is a tremendous amount of wastefulness in single purpose networks, reminds Enslow. And, he adds, they are inflexible. "Most were not designed with expansion in mind, so they become very expensive to expand."

To be sure, the conceptual crossover to a corporate communications system does raise some political questions; that's one of the reasons you need executive support. Many a manager will be loathe to surrender control of "his" network. "Suppose you are a division manager with P&L responsibility for the rental car operation of a large corporation," says Ira Cotton, a senior associate with Booz, Allen & Hamilton, Bethesda, Md. "The vp of information resource management may see some economies of integration. If the vp messes up my operation for a week, he may not see much change, but I will."

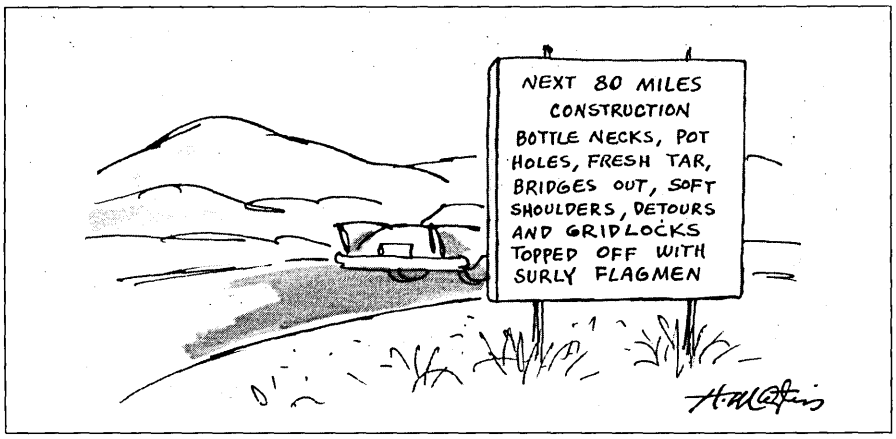
So how do you get upper management's attention? "Talk about the total cost of information processing," advises Harvey. The problem here is that few MIS operations have much information on the costs or the use of the networks. Thus, the first order of business for those seeking upper management support is to begin to get a grip on network operations. They can do this by means of user surveys, cost analyses of communication expenditures, and studies of private lines versus a public link for certain communication needs.

THE TOUGH STUFF BEGINS

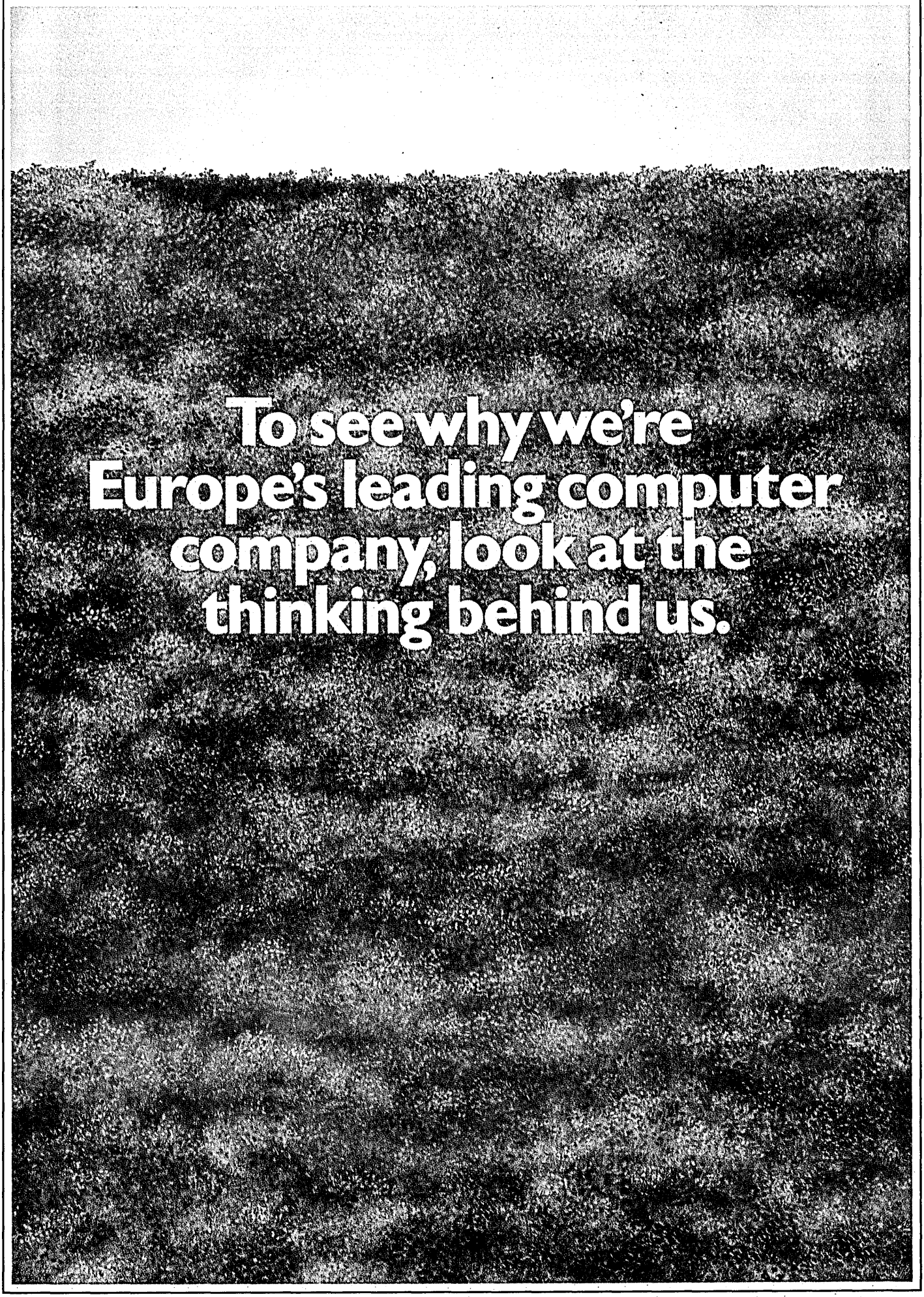
Once the commitment of upper management is in hand, the tough stuff begins: deciding on a corporate direction and a corporate network architecture. "A network architecture," says Enslow, "is the complete set of rules, procedures, specifications, and so on that defines how you provide and utilize services in a distributed computing environment." Among the issues that have to be addressed: what service will be provided—virtual circuits, data grams, real circuits, broadcasting service, multicat and/or priority service? How do the data have to look? How fast can they be sent? How do you address them? What do the headers look like? How do you determine who can talk next? How many messages can be sent before an acknowledgment comes back?

Enslow suggests that companies look to the ISO model as a base, a starting point. "The ISO model exists as a vehicle to help you begin studying the problem, not necessarily as a complete answer."

Planning may appear to be an overwhelming task, but consider the alternative—a jungle of networks and a tangle of vendor undergrowth. Instead of being led by a vendor's capabilities, companies can take the initiative and slash through that underbrush by telling their vendors, "This is where I want to go. These are the services and capabilities I want. Now, what can you do for me and at what cost?"



CARTOON BY HENRY MARTIN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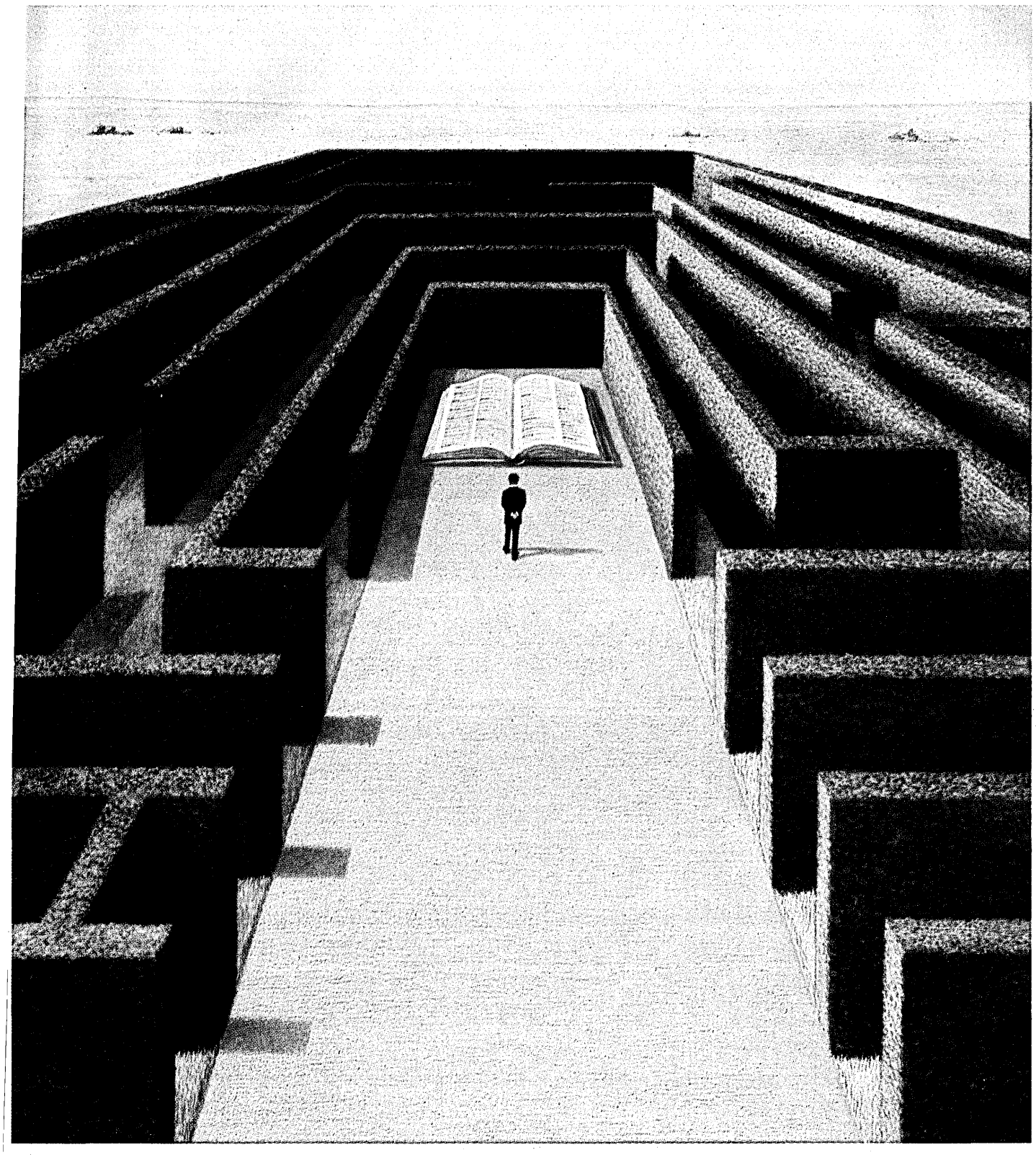

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Adequate protection for networks involves safeguards for the entire information system.

NETWORK SECURITY

by Rolf T. Moulton

Communications networks provide a security advantage for multisite organizations with distributed data processing because widely scattered facilities are less vulnerable to power outage, natural disaster, and attack than one central facility. But distributing facilities requires additional security precautions. These may be thought of as the overhead costs of doing business, or as severe liabilities that require substantial safeguards and controls.

Security vulnerabilities increase as the communication link gets longer. This is because of the different communications modalities that are available and the real dollar costs of each one. The link distances can be grouped into four categories:

1. The intrabuilding network may be considered a standalone category or as part of a local area network. The communications links used within a building are the easiest to control because, depending on the distance between each communicating device, they can be totally organization owned and inspected. The most common transmission media include twisted wire, coaxial cable, and fiber optic lines. The intrabuilding link security problem increases when the organization leases lines or uses voice dial-up circuits. Here the security problems become similar to those of the local area category because the organization has relinquished control.

2. The local area network may be entirely within a large building, an industrial complex, or a small area of a city. Its communications links can be user-owned cables (including fiber optics), microwave circuits, leased lines, and voice dial-up. The possibility for communications interference or line taps is greater than in intrabuilding. Line taps, while rarely reported, are easy to install and difficult to prevent.

3. Domestic networks via commercial carrier, including value-added networks, increase link security problems. Unless private lines are used, data are transported totally by vendor media. This may be a plus where packet-switching networks route various pieces of information via different circuits, but it is a drawback where satellite transmission is concerned. Satellites provide the least degree of data security because transmissions may be intercepted by anyone in the area with an appropriate antenna.

4. International networks have all the security vulnerability of domestic networks with two additional problems: they are subject to transborder dataflow limitations and, sometimes, data encryption is not allowed. In addition, many foreign countries have poorer-quality communications networks than those available in the U.S.

With any size network, the first step toward establishing a control strategy is for management to set a policy from which control criteria can be developed. Some controls may already have been instituted. Their adequacy, however, is not known until they are properly evaluated or tested with respect to the overall control strategy, current communications technology, and the organization's evolving network growth.

It is advisable for the network security officer to consider five major issues:

- data security policy
- risk and vulnerability assessment
- access control and authorization
- data encryption
- audit and reporting

DATA SECURITY POLICY

The organization's information processing philosophy is perhaps the most important factor in developing a network security plan. Its policies, together with applicable legislation and regulations, determine how much the organization will rely on data communications, what data will be transmitted, what system users will be allowed to do, who will be responsible for network security, and what budgetary constraints will be placed on security-related improvements. Each factor must be considered as part of the total operation.

Organizations involved in high-level security projects may restrict which computer systems are used for certain application programs. Ultrahigh security precautions can be so severe as to include physically disconnecting some or all network access to the system prior to application processing. At some point, however, these extraordinary procedures may become technically obsolete or operationally unrealistic.

Policies and procedures play a very practical role in network security. The lack of such policies may result in employees or other individuals believing they can engage in activities that would compromise the entire system.

Recently, in New York City, the lack of a clear policy definition prevented the prosecution of an accused computer abuser. This case, uncovered by an auditor, involved an individual who admitted using his employer's computer for his own personal activities ("Weg Strikes Back," *Computerworld*, Sept. 6, 1982). The responsibility level of the accused, and later acquitted, individual was such that he also had access to many of the organization's files. It was argued that he did not compromise security because no security policy existed. This type of liability exists in many organizations.

An effective, enforced data security policy is the best foundation for a network security plan. The technological issues must be presented simply so that sound business control policies are not overlooked.

The second item listed previously, risk and vulnerability assessment, is a procedure for identifying threats to a system, defining what the vulnerabilities and consequences to the organization would be if those risks were exploited, and identifying and evaluating the effectiveness and adequacy of the controls already in place. Both the communications network and the sites involved must be included.

Assessment of the network requires various levels of technical expertise. The first step is to document the user's network with respect to communications policies and procedures, lines in use, vendors, link transmission media (satellite, fiber optic, microwave,

The most elaborate network security plan will fail if either the host or remote site is a weak link in the chain.

wire, etc.), and other related equipment. This offers a side benefit to the organization because it forces a review of the system and may point out ways to reduce communications costs.

The network documentation can also result in immediate detection of computer misuse. I participated in one abuse investigation that was initiated after a new data center director discovered more communications lines were in use at a facility than had been reported. We found that the former data center director and his assistant were operating a timesharing service bureau on their employer's computer with dedicated line service to customers at their employer's expense. Both suspects in that case were convicted.

The network physical security assessment need not be a time-consuming activity. Robert Johnston has developed an extremely useful checklist to speed up this procedure. It is available through the Computer Security Institute, Northboro, Mass.

Site security must also be assessed. The most elaborate network security plan will fail if either the host or remote site is a weak link in the chain. The computer equipment surrounding the network must be in a protected environment. One need only ponder the value of a bank's 24-hour automated teller machine (ATM) located on a deserted street at night to understand the problem. Is the user concerned with network security or personal safety during a cash transaction?

Access control and resource use authorization are two interwoven concepts in network security. Access control deals with the system or network's ability to identify who the user is. Anyone with the proper code or secret ID can pass for an authorized user. Authorization refers to the resources that are available to the authorized system user after system entry. The user may not realize that two steps have been accomplished because of the rapid passing from access to authorization.

Once again, ATM technology provides a simple example. The ATM user initiates a terminal session by inserting a card into a reader. Level one access has been reached and the user communicates a request (such as "how much money is in my account") to the system, which may or may not be granted based on system authorization tables.

Level two access control procedures could begin with a request for cash, after level one access has been established. Now, the security system is more concerned about the user. It will normally request more from the user, such as a password or personal identification number (PIN) that must be entered before the system will proceed.

Level two access is accomplished after the system has accepted the PIN. Reentry of the ID card may also be required at this time. The system then verifies that funds or a line of credit is available and may be released. This funds check is an authorization procedure.

"We tell them it's for their protection, but actually it's because they steal the silverware."

CARTOON BY JACK E. SCHNEIDER

The National Bureau of Standards' FIPS (Federal Information Processing Standard) Publication 83, "A Guideline on User Authorization Techniques for Computer Network Access Control," provides a detailed description of many access control devices and effective use procedures. It provides the following summary:

- Access controls should be used as part of a comprehensive program in security and risk management.
- Access controls should provide a degree of protection commensurate with the value of the resources being protected.
- Each user should be assigned a unique identifier or user name.
- Useful bases for verifying a person's identity are something the person knows (such as a password), something the person has (such as a card or key), or something about the person (a unique personal attribute).

The appropriate access control device may be difficult for the user to define. It must be capable of rejecting imposters while having a minimal rate of rejecting authorized users (Type I error). It must also have a high rate of accepting authorized users and a low rate of accepting imposters (Type II error).

In a secured area, with hardwired devices and trained personnel, the choice of access control device may be simple. But what happens to access control security when dealing with dial-up devices or where the potential for line tap is high? Security headaches get bigger as the stakes get higher.

In addition, microcomputers have affected access control security. Consider the following problems: micros can be programmed to emulate security codes, can repeatedly dial and attempt access, and can check access at a network node level and then pass an "authorized access" on the next node or host access point.

MODIFYING FOR SAFETY

Data encryption is the process of changing original data (cleartext) into data that have been modified (ciphertext) so that they cannot be understood until the ciphertext is decrypted into cleartext (see "Safeguarding EFTs," Feb., p. 148). A good description of this procedure was provided by Dennis Brandstadt of the National Bureau of Standards in the Honeywell Information System's "Computer and Privacy Symposium Proceedings" of April 1979. The NBS' formal description of the data encryption standard (DES) is technically more accurate, but is itself somewhat cryptic:

"The DES algorithm is a recirculating 64-bit block product cipher whose security is based on a secret key. DES keys are 64-bit binary vectors consisting of 56 independent information bits and eight parity bits. The

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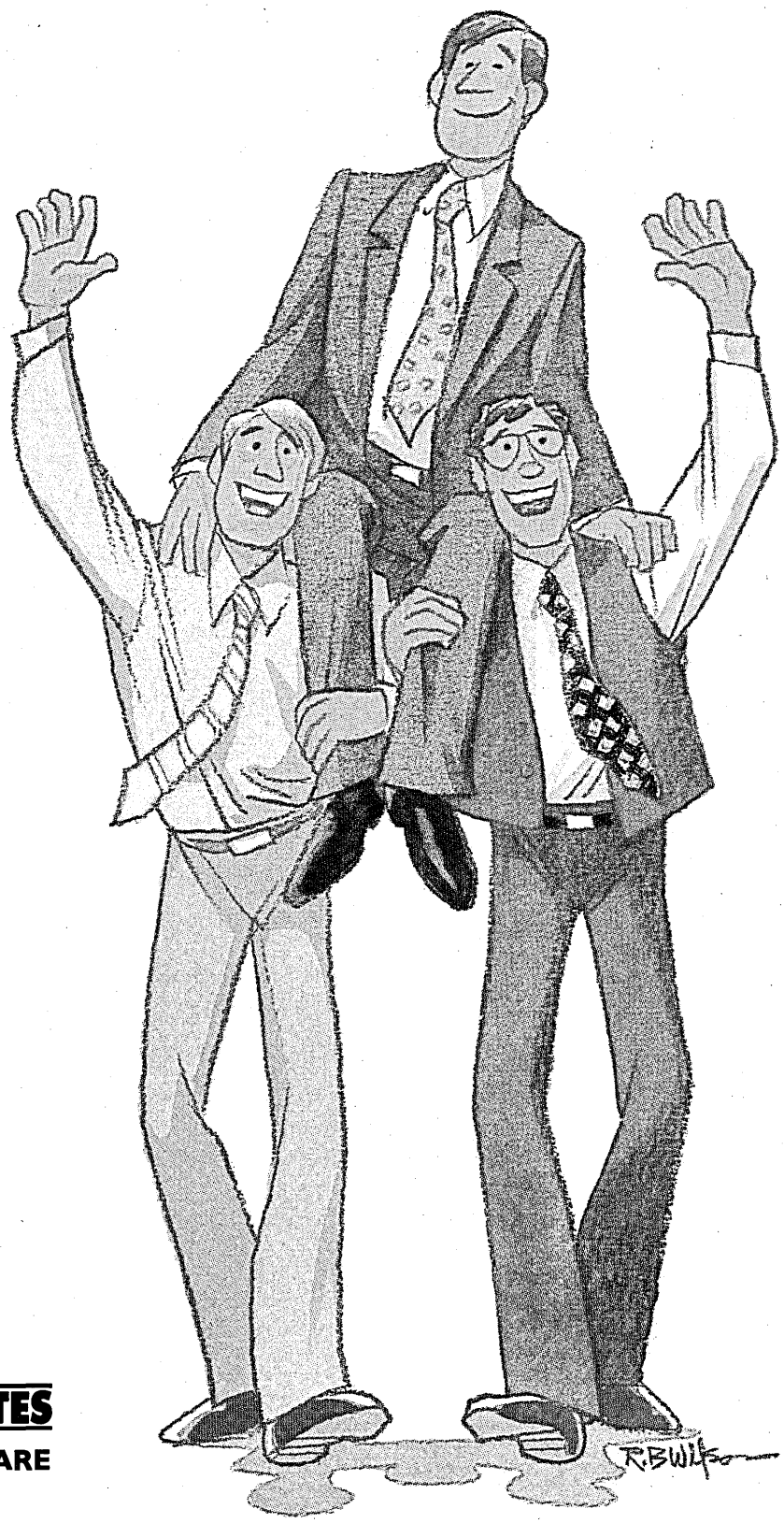

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Encryption, however complex the process may seem, is the only realistic way of protecting data in transit.

parity bits are reserved for error detection purposes and are not used by the encryption algorithm. The 56 information bits are used by the enciphering and deciphering operations and are referred to as the active key. Active keys are generated (selected at random from all possible keys) by each group of authorized users of a particular computer system or set of data. Each user should understand that the key must be protected and that any compromise of the key will compromise all data and resources protected by that key.

"In the encryption computation the 64-bit data input is divided into two halves each consisting of 32 bits. One half is used as input to a complex nonlinear function, and the result is exclusive OR'ed to the other half . . . . After one iteration, or round, the two halves of the data are swapped and the operation is performed again. The DES algorithm uses 16 rounds to produce a recirculating block product cipher. The cipher produced by the algorithm displays no correlation to the input. Every bit of the output depends on every bit of the input and on every bit of the active key."

Encryption, however complex the process may seem, is the only realistic way of protecting data in transit. Few security managers would argue the need for system protection, but selling management on the full costs and system resource implications are the real problems to be solved prior to installation of any cryptographic products.

Management must be prepared to weigh the costs and benefits of protecting the organization's information system (data, programs, and assets controlled and administered by computer) to decide whether encryption is worth the expense involved.

For example, users will have to justify new performance levels because system response will be reduced to some extent. Additionally, users may be responsible for encryption key management. Will they be prepared to assume this security function or will the security staff control key access?

The information systems manager will have to procure new hardware and/or software to use cryptographic security techniques. A larger staff and more training will be required to maintain the cryptographic systems and keys as well as to perform the associated security management functions.

Since cryptographic systems use cpu cycles, they degrade overall system performance and response time. The degree to which performance is affected depends upon the specific hardware and software in use. Consequently, the prospective user should demand that vendors demonstrate exactly what effect their product will have on the user's system—prior to purchase, lease, and installation.

AUDIT AND REPORTING

The last component of any effective security program is audit and reporting. The security of the entire information system, including the network, must be thoroughly audited by qualified personnel if integrity and reliability are to be achieved and maintained. This is usually unpleasant for the information systems staff. The network security manager, however, must either insist on an audit or be ready to perform the "prepare two letters" task so often joked about by information processing directors.

The audit may be performed by the organization's auditors (if they are qualified), the data security director, or by a competent consultant. Performing the audit is only the first part of auditing. The second part is notifying management—and sometimes law enforcement or regulatory officials—of the findings in a comprehensible audit report.

Management is never happy to learn that system security deficiencies exist and that money is needed to correct them. Timely reporting of such deficiencies and the prompt remedy of any problems will save the organization money, prevent lawsuits, and reduce the personal visceral turmoil that results when a security deficiency turns into a significant violation.

Reporting is also necessary when a security violation results in broken government regulations or laws. Corporate unwillingness to report and prosecute computer abusers costs stockholders and consumers money, and does little to encourage lawmakers to introduce remedial legislation. Prosecution, where warranted, serves as a deterrent to those considering computer abuse, and may provide compensation to the victim of a computer abuse. Prosecutions also provide legislators with an impetus to develop appropriate laws to define and deal with computer abuse. *

Rolf T. Moulton is a CDP, CISA, faculty member at Pace University, and a director of DPMA's New York City chapter. He is director of the computer security services unit, New York City Department of Investigation.

Mr. Moulton has gathered an extensive list of reading materials related to network security. Readers interested in obtaining his reference list should contact him at the Department of Investigation, 130 John St., New York, NY 10038.

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—Bob Regan
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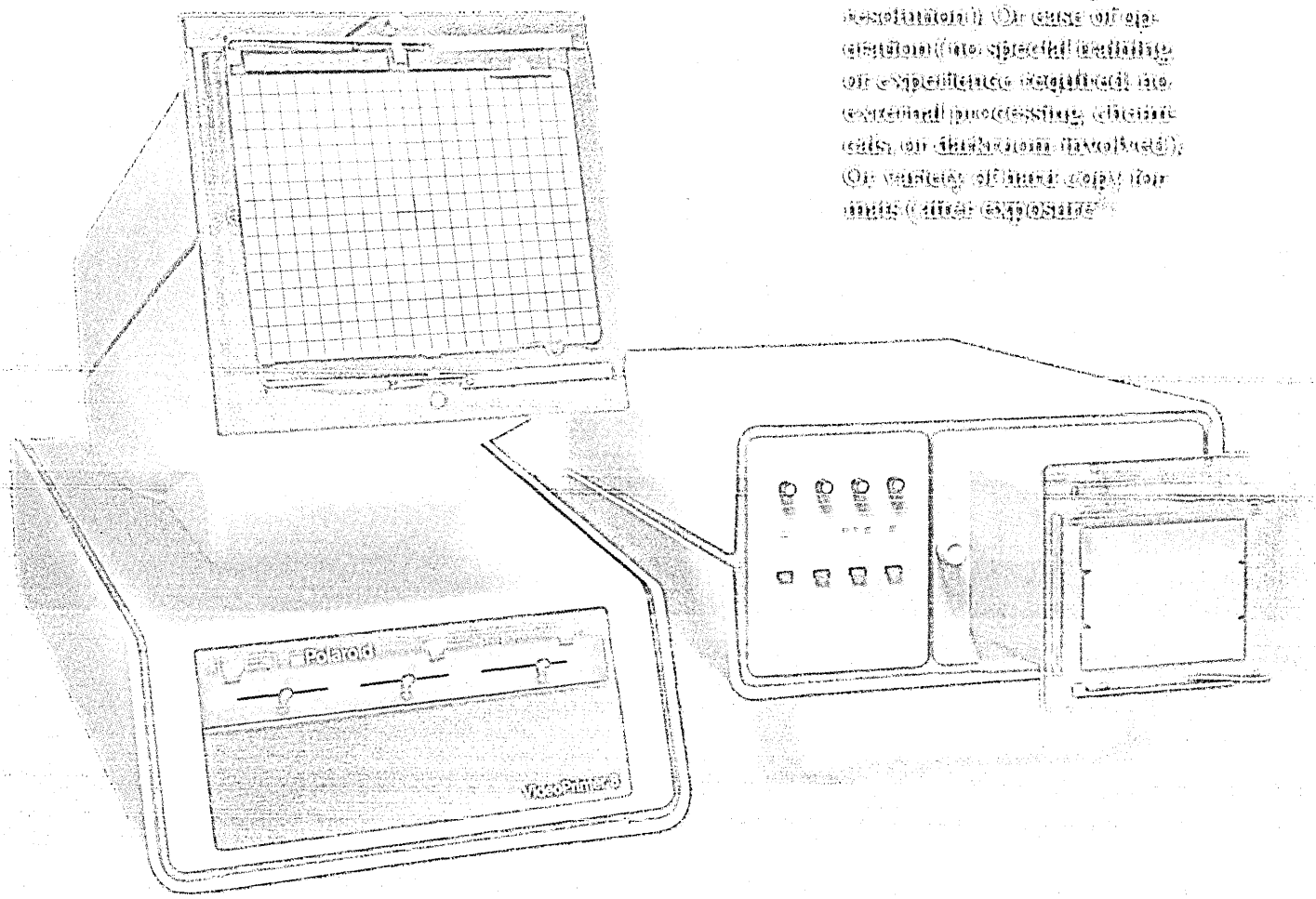

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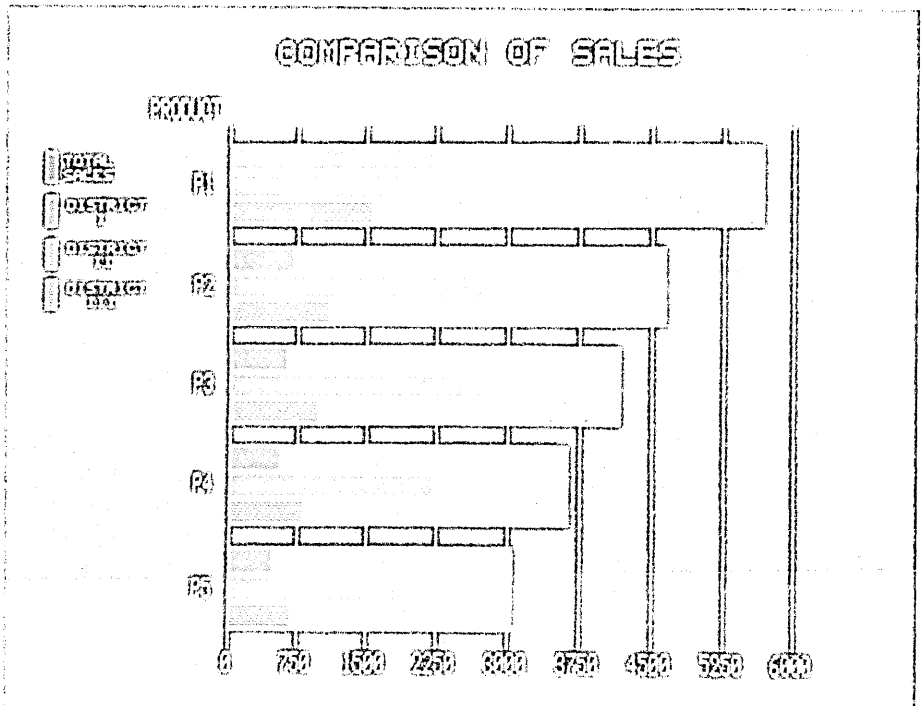

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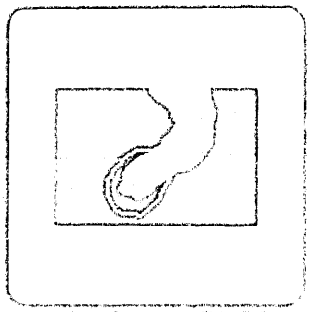

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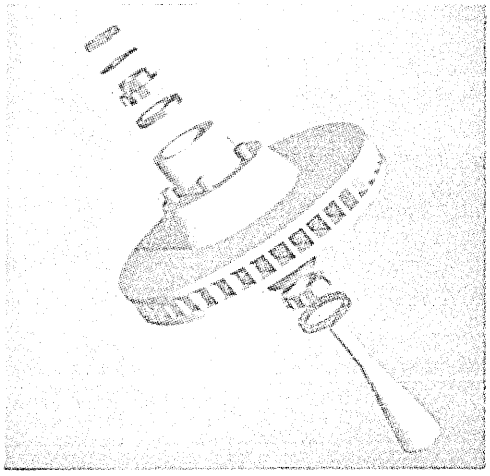

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RELATIONAL DATABASE SYSTEMS FOR MICROS

by Robert Bowerman

The microcomputer relational database management systems now on the market present the dp manager with a threat and an opportunity. If the micro RDBMS is ignored in favor of a more traditional, large-systems approach, the users are apt to grow restive. They're aware that the new products can do many of the things an on-line system can, and they know that developing large systems takes time. Thus, they're likely to strike out on their own, and an uncontrolled influx of database systems, quietly purchased with petty cash, will erode the dp manager's authority.

Even if the dp manager agrees to go the micro route, problems may occur. Development methods appropriate for large systems won't work here. Slipshod analysis will produce muddled systems that soon become unmaintainable. And lack of integration work will render the system's useful life very short.

But if the threat sounds dire, the opportunity is correspondingly large. Relational database systems for microcomputers are a sound way to give users the functions they've been waiting for. Properly implemented, they can help the dp manager cut through the applications backlog and move his organization into effective distributed computing.

A good way to manage the introduction of microcomputer RDBMSs into the corporation is to form a special team to handle the new technology. The team needs the support of top management because it will have to assign priorities to jobs for different departments, and also recommend operational

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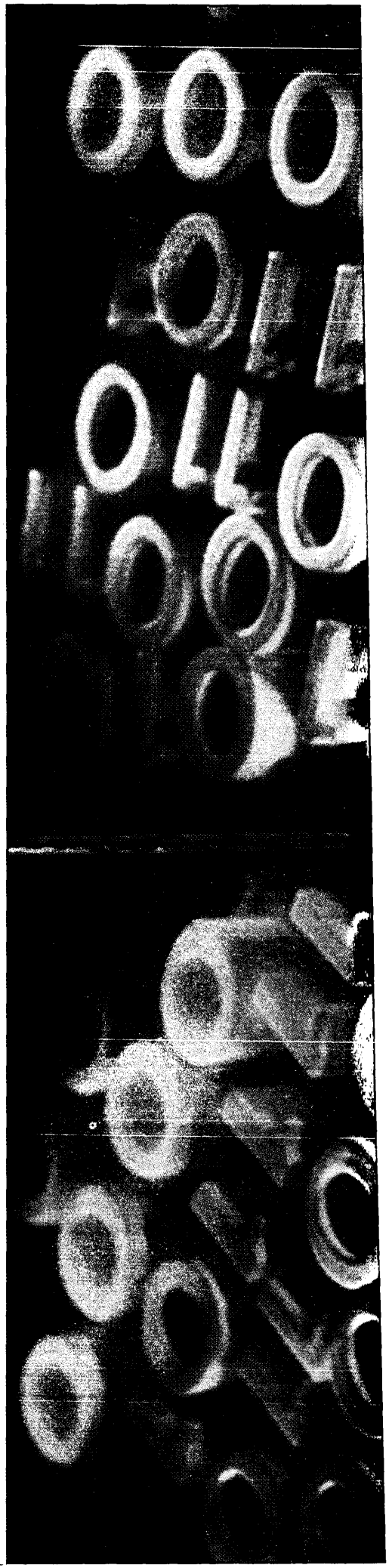

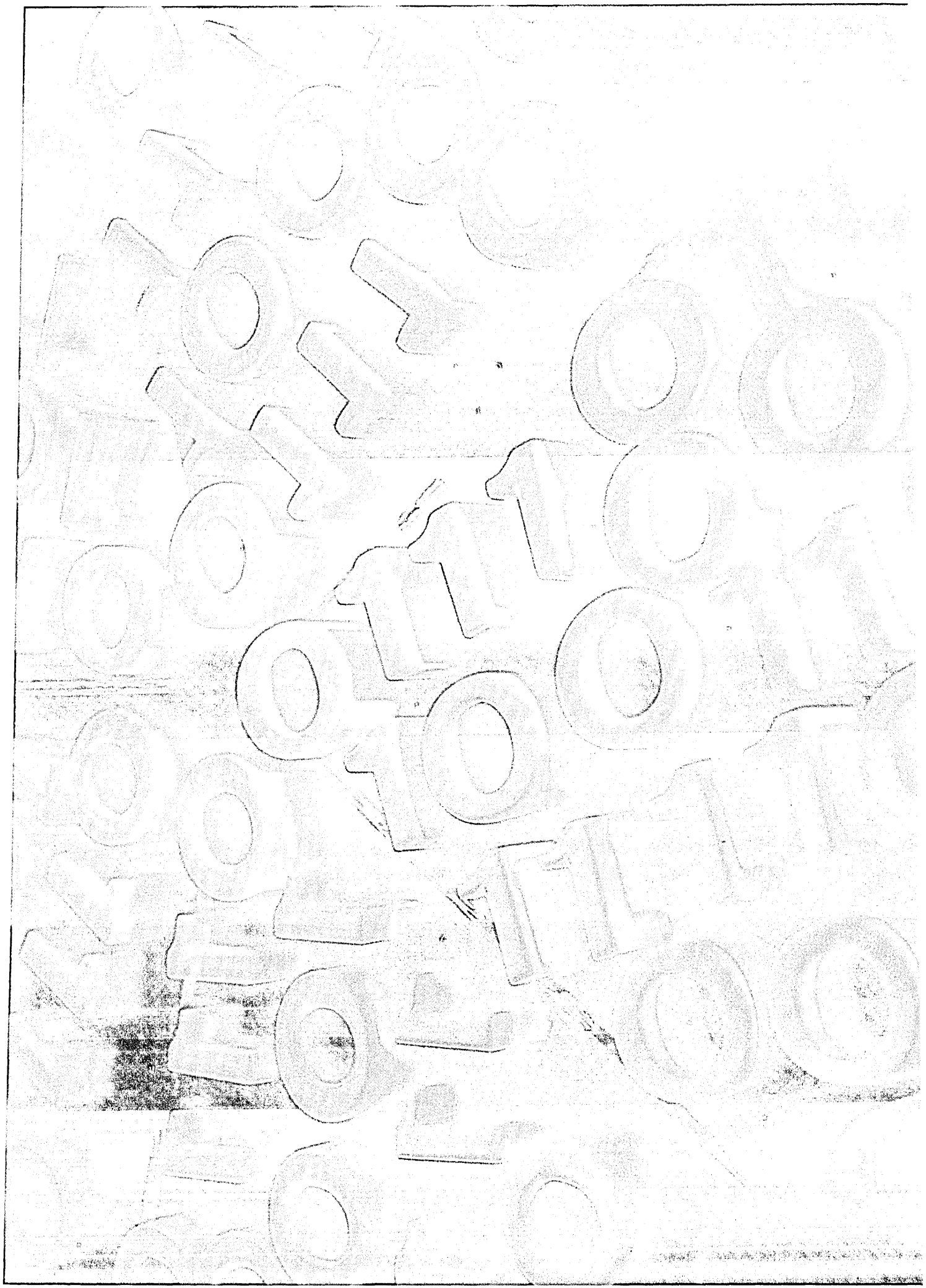

The three main analysis methods are dataflow diagrams, the relational model, and algorithm structure diagrams.

changes. The team should be assembled from representatives of the dp and user departments, plus outside consultants. Individuals should be on loan to the team for just six months to keep it dynamic and up-to-date.

To purchase hardware and software, the team needs a budget—at least the price of a mainframe. Because the team will have to move from department to department, portable facilities are important. Attaché cases full of hardware items such as floppy disks and soldering irons are appropriate. Product literature will be needed, as will materials for analysis and presentations. Once the team has been established, with the right members and budget, the real work of reducing the backlog can begin. Management must first of all understand the specific life cycle needed for microcomputer RDBMS developments. This process differs from the traditional life cycle for large projects, and also from the increasingly popular fast prototyping life cycle. Using an RDBMS it is possible to have a life cycle with the following phases:

- Inception—covers the business problem, possible solutions, and the selection of the most cost-effective solutions.
- Analysis and modeling—delivers a model of what the current systems do, with emphasis on the relational concepts.
- Equipment selection—covers the selection of RDBMS and hardware to run it on.
- Implementation and testing—involves installing the equipment and putting the relational model onto the RDBMS.
- Hand-over—involves training users and giving them responsibility for the new system.
- Evolution and integration—covers maintenance of the system throughout its operational life. Emphasis is on "gluing" software for integration of the system into the rest of the corporation's business.

Both the microcomputer RDBMS and fast prototyping life cycles are faster than the traditional life cycle because they involve fewer and simpler steps. The microcomputer RDBMS life cycle emphasizes analysis in lieu of low-level design and implementation, whereas fast prototyping emphasizes low-level design and implementation in lieu of analysis.

The important RDBMS property here is the distinction between function and system interior, or in other words, between what the system does and how it does it. The system's top layer follows the well-behaved relational model, making it easy to understand and use. The bottom layer contains all the nonlinear physical structures required for the efficient handling of disks. The bottom layer is hidden from view. The top layer provides external appearances of logical data structures, which are called virtual views. It is this separation of logical and physical considerations that makes the special RDBMS life cycle possible.

Because an RDBMS hides all implementation details, it becomes possible to take the relational model of the current manual systems and simply tell the RDBMS what that model is. Once the model becomes known to the RDBMS, the RDBMS gains the properties of that model and takes on its behavior. Thus the new computerized system is quickly created. This is how the low-level design and implementation of that design are bypassed. It is function, not design, that is implemented using RDBMS.

ANALYSIS AND MODELING

Since it was the first life cycle phase that resulted in the creation of our hypothetical RDBMS team, the team begins its work with phase two, analysis and modeling. The three main analysis methods are dataflow diagrams (DFDs), the relational model, and algorithm structure diagrams (ASDs).

Dataflow diagrams are derived from user interviews, which identify the activities performed in each department. The team should copy or photograph the information systems (documents, log books, wall charts, telexes, telephone messages) used to perform each activity. The major categories of data on each information system should be noted, as these show up on the lines of the DFDs.

When drawing DFDs, the team should start with the most frequent activities (e.g., customer transaction) and end with the less frequent activities (e.g., year-end summary). For large departments a high-level DFD can be drawn first, and then each bubble can be broken down into its component bubbles. The completed DFDs are reviewed with the users and signed off.

The relational model is created from the dataflow diagrams. The columns of the table are each labeled with the name of a data element. The rows of the table represent specific occurrences of objects. During the analysis phase only the column headings are identified. A paper form is used to document the relations. The form has a heading showing the name of the relation, and three columns labeled key, data element name, and data element type. The base of the form should have a space for data volume and data frequency.

The DFD data have to be broken down into data elements and then regrouped into relations. It is a human decision whether to group such items as data/time of an event as one, two, or five data elements. The type of each data element should be identified. Examples of type are money, device identifier, real quantity, and location code. Normalizing the relations is necessary to prevent anomalies that can occur in storage operation due to inserts, deletes, and replaces. Anomalies occur with unnormalized relations independent of the storage medium, be it paper forms, blackboards, or databases.

The relational model on these forms is the key deliverable of the analysis phase. The relations should be walked through with users and signed off.

The third step of structured systems analysis for an RDBMS is to study the transforms on the DFDs and draw up the nontrivial ones as algorithm structure diagrams. Transforms that can be performed using the interactive query language (IQL) provided with an RDBMS need not be expanded into ASDs. The transforms to look for are those involving calculations and the archiving of data. Calculations may be needed for validating input data, central manipulations, and the production of summary reports. An example of a central manipulation from a fast-food system is to find the cost of a plate of food from its recipe and ingredient prices.

ASDs complement the relational model. They show the separation of algorithm from data, allowing the data to be implemented on an RDBMS. The algorithms tend to be trivial, but a few programs may be required to enhance the IQL. ASDs are pictorial, as are DFDs and relations, so they are easily understood by users.

Once the analysis has been completed and the model of the current system is available, an appropriate microcomputer RDBMS can be selected. The team should know the details of the RDBMS market, because the right choice can save considerable design and implementation time.

THREE KINDS OF DBMS

A DBMS can be either hierarchical, network, or relational. One definition of relational is that no user-visible links preexist between tables, and that links between tables are created dynamically upon request. Both hierarchical and network DBMS require preexisting links known to the user. Due to the need for such links, hierarchical and network DBMSs require complex physical design work and are much harder to understand and use.

There are systems on the market where links do not preexist and cannot be created. These should be called file management systems rather than DBMS.

A fuller definition of relational has three parts, covering data structure, manipulation, and integrity. A fully relational structure should support first normal form relations, where every primary key is uniquely valued. The structure should also require that every attribute field has a defined pool of possible values. Eight manipulations are reqired for a fully relational system, namely

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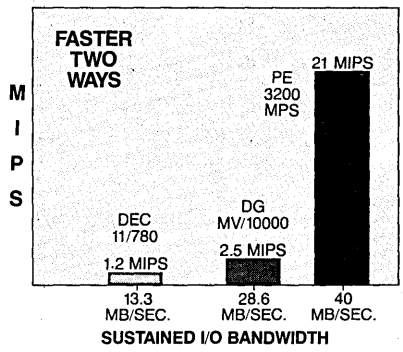

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Hierarchical and network DBMSs require complex physical design work and are hard to understand and use.

select (rows), project (columns), join (tables together), intersect, union (to add data), subtract (to remove data), product, and division. Two integrity rules are also required: primary keys must not be null, and foreign keys must preexist as primary keys elsewhere.

The answer to the question of whether a system is relational or not is never black or white, but rather a matter of grays. All currently available RDBMSs are partial implementations of the full definition. Support of all the manipulations is rare, but an example is Ingres from Relational Technology Inc., Berkeley, Calif. Support of the integrity rules is rarer. Some systems, such as FMS-80 from DJR Associates, Tarrytown, N.Y., and MDBS III from International Software Enterprises, Arlington Heights, Ill., barely deserve the title of relational because joins are complicated operations. They are discussed here because of other merits.

By analyzing 140 of the currently available microcomputers in terms of their microprocessors and operating systems, four distinct market segments can be identified. As a generalization, the four segments can be described as: 1) 6502/BASIC systems; 2) Z80/CP/M systems; 3) 8088 MS-DOS systems; and 4) 68000/Unix systems.

Segment one is characterized by Apple and Commodore, the second by Cromemco and North Star, the third by IBM and Grid, and the fourth by Fortune and Onyx. Historically the trend of microcomputer vendors has been to move up from segment one towards segment four with corresponding increases in power and price.

An analysis of 24 microcomputer RDBMSs shows the software market segmentation following the hardware. There are no RDBMSs for market segment one, probably due to lack of performance rather than lack of demand; an RDBMS is greedy for cpu, RAM, and disk resources. It is interesting to see the success of the spreadsheet calculator products in segment one. Spreadsheets like VisiCalc require a high bandwidth link between the screen and RAM that is well provided for in integral display micros like Apple II.

Examples of segment two RDBMSs are Condor from Condor Computer Corp., Ann Arbor, Mich.; MicroRapport from Logica Inc., San Francisco, Calif.; and dBASE II from Ashton Tate, Culver City, Calif. Examples of segment three RDBMSs are Grid File from Grid Systems Corp., Mountain View, Calif., and LogiQuest III from Software Products International, San Diego, Calif. Examples of segment four RDBMSs are Mistress from Rhodnius Ltd., Toronto, Canada, and Sequitur from Pacific Software Manufacturing Co., Berkeley, Calif.

The price of an RDBMS for segments two and three is around $700; the price for segment four is around $1,400. Minicomputer and mainframe RDBMS prices are on the order of $35,000. RDBMS price tends to be around 15% of the hardware price. The micro RDBMS market is probably not that sensitive to price, as new system releases with increased performance occur regularly.

The promotion of the microcomputer RDBMS to date has been limited. Market segment two has received the most promotion, especially from the market leaders dBASE II, FMS-80, MDBS-III, and Condor. Out of the 24 systems available, it seems that the least relational have some of the biggest promotion budgets. Half of the 24 get almost no mention in the trade press. The recent movement of Tandy and Apple into microcomputer market segment four suggests that competition between Unix RDBMSs will increase. The competition for market segment three is also expected to heat up as several new RDBMS releases are anticipated from Logica; MicroRIM, Bellevue, Wash.; Pacific Software Manufacturing Co.; and Oracle Corp., Menlo Park, Calif.

The RDBMS software is distributed in the same channels as the hardware. The software companies tend to be a lot smaller than the hardware companies, so corporate customers should be careful to pick a vendor capable of providing national and international support. It is interesting to note that IBM has not yet selected an RDBMS to distribute with the P.C.—it could be that the firm is saving this slot for a microcomputer release of SQL/DS. A few microcomputer vendors are distributing RDBMS along with their hardware. Examples are Altos distributing Oracle and Xerox distributing dBASE II.

SEVEN PRODUCT FEATURES

The fourth aspect of the marketing mix is product. The most important feature is the interactive query language, which provides on-line access to the databases. IQLs typically use easy-to-learn keywords that build up to give free format commands. Frequently used command sequences are put into macro files for repetitive use. A full IQL supports all eight of the relational manipulations described earlier. Many IQLs support select, project, and join for queries, but have different manipulators for updating the RDBMS.

A high-level language (HLL) interface is essential for implementing nontrivial algorithms to operate on the data in the RDBMS. Some of the smaller RDBMSs, which fit in 64KB (dBASE II and FMS-80, for example), lack an HLL interface. The smaller RDBMSs tend to have facilities to embed algorithms in the IQL, but may be limited to additions as in dBASE II. HLL interfaces are easier to use if they have embedded commands rather than CALL subroutine statements. A few of the larger RDBMSs such as SQL/DS and Ingres use the same commands for the IQL and the HLL interface.

Report generators make a useful addition to the IQL and the HLL interface to assist in the provision of programmerless applications. Many IQLs provide limited facilities to print the results of queries; however, specific report formats may be required. An example of a powerful report generator is ACE from Informix, which will produce any format of report based on data from any number of relations. Screen generators are similar to report generators. Custom screens for rapid data entry and special queries may be required. Screen generators have more validation features than IQLs for data entry. Performix for Informix is an example of a good screen generator. Many RDBMS vendors, such as ABW Corp., Ann Arbor, Mich., and Logica, have announced new screen and report generators to enhance their IQL and HLL interfaces.

There is no real reason why the performance of an RDBMS should be any worse than that of a hierarchical or network DBMS. It may be that hierarchical and network systems have been more finely tuned for performance because they have been around longer. For each DBMS there does seem to be a trade-off between portability and performance. The RDBMSs that have good performance, such as MicroRapport, tend to achieve this by bypassing the operating system with machine-dependent access routines. The performance of MicroRapport is also due to its use of the hashing access method, an alternative to the more common binary tree access method. The industry is sure to achieve more impressive RDBMS performance by further optimizing access methods.

A second aspect of performance concerns the overall level of function that is fitted into a given volume of RAM. It seems that the RDBMSs that fit into 64KB of RAM do so by leaving out some aspect or other. The IBM P.C. with its 128KB of RAM is attractive for RDBMSs. Most RDBMSs that have been ported to the P.C. from CP/M, however, seem to have been passed through a translator, and thus contain no extra functionality. The RDBMS being rewritten for the P.C. or ported down from Unix should offer more functionality. Another promising development for a fuller function microcomputer RDBMS is the recent release of CP/M-plus, which supports bank-selected memory of over 128KB.

Portability of software is an increasingly important issue for the dp manager, as corporate investments in software rise. Two of the ways of increasing the performance of the RDBMS, writing in assembler and bypassing the operating system, are not good for portability. The more portable RDBMSs are

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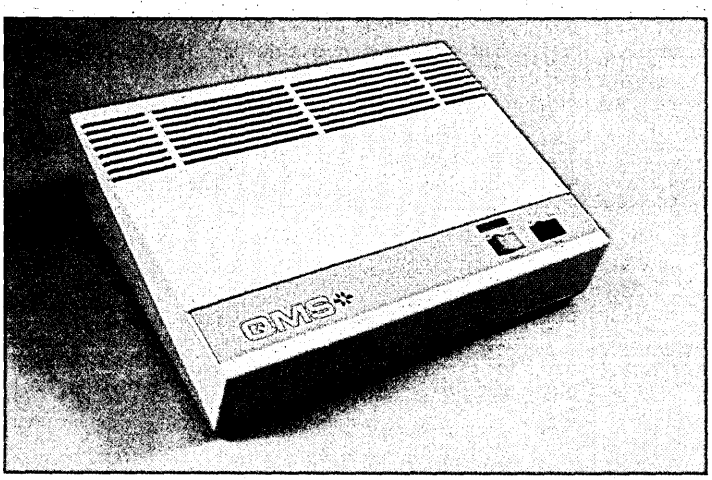

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There is no real reason why the performance of an RDBMS should be any worse than that of a hierarchical or network DBMS.

those written in a high-level language. C has gained a lot of popularity for portable systems programming. MDBS III, for example, has been rewritten in C from assembler for use on a variety of 16-bit machines.

Maintaining the integrity of data requires several things of the RDBMS. When new columns are added, the existing data should remain intact and queries and programs that use those data should not need altering. Most RDBMSs have this feature, but a few, such as FMS-80, require that all the data be reentered. Another aspect of integrity is the need for record-locking when data are shared. Data-sharing may occur over a local area network or on a multi-user system. Record-locking prevents two users from updating the same record in different ways, which would result in inconsistent data. A third aspect of data integrity concerns the integrity rules that are part of the relational model. Sequitur, for example, is relationally incomplete in that it does not identify primary keys. Oracle, by comparison, can force primary keys to be unique. A fourth aspect of integrity is backout and recovery in the case of system failure. Backout and recovery require the use of transaction logging, which is rare for a microcomputer RDBMS, although it is provided by MDBS III.

As this sketch of product features indicates, the RDBMS team will have to spend a lot of time keeping up with the field. There are ample opportunities for new product offerings, and the rate of change can only be expected to increase. Once the team is knowledgeable about the microcomputer RDBMSs available, it should be a comparatively simple task to select an appropriate system to implement the logical model.

STEPS TO IMPLEMENT THE RDBMS

The implementation phase brings together three things: the logical model from the analysis phase, the equipment selection, and the life cycle, which provides the overall framework for the project. The implementation phase consists of purchasing and installing the equipment, agreeing on any screen or report layouts for the generators, and coding up commands to the RDBMS. The final result should be thoroughly tested. Procedures for data administration should be established to cover backup and security.

During the implementation phase the team will have to interact with a number of organizations. Purchasing microcomputer equipment for corporate use draws attention from the vendors' national account representatives, and because the market is evolving so rapidly; an optimal configuration will involve equipment from several vendors. The team's main job is systems integration; it will have to install the equipment.

The main groups to keep on good terms with are the user departments. The team should have strong project management to obtain authorizations for changes. It is during the implementation and hand-over phases that management support is especially needed. If the preliminary work has been done well, the implementation and hand-over phases should be rapid and smooth.

The integration phase of the RDBMS life cycle is the most challenging one. A microcomputer RDBMS offers a splendid solution to a certain class of business problems. The rapid development, however, is limited to the handling of alphanumeric data on standalone microcomputers. For a microcomputer RDBMS to be part of the corporation's total information processing picture, several kinds of integration must be accomplished. Microcomputer databases must be integrated with the central corporate databases for proper data administration. Other kinds of information, including text and graphics, need to be combined with the fixed format alphanumeric data. Other colorless applications processors such as spreadsheet calculators and word processors will also have to operate on the stored data. On the level of systems programming, the operating system, the HLL, the applications processors, and the data communications interfaces must all be linked with the RDBMS to form a coherent work environment.

Corporate executives will find microcomputer workstations with integrated software extremely useful. For example, selected data can be collected from a variety of local and remote databases. The data can then be manipulated and the results displayed in graphic form, annotated with textual descriptions, numeric summaries, and freehand diagrams. The final copy can be distributed by electronic mail and printed exactly as displayed in a variety of locations. Such patterns of integration need to be built around an RDBMS to provide the necessary flexibility and power. There are some product offerings that provide a level of integration, but there is room for considerable enhancement. Examples are 1-2-3 from Lotus Development Corp., Cambridge, Mass.; MBA from Context Management Systems, Torrance, Calif.; Apple's Lisa; and the Grid Compass. The Grid software system is the only one built around an RDBMS, and it offers a reasonably integrated set of business functions. For corporate use the Grid Compass and the Apple Lisa can act as powerful building blocks, but they should be seen as starting points; integration with the corporation's existing data systems is required.

The team should work on integrating microcomputer RDBMSs with central corporate databases. A coherent data administration strategy should establish a single source for each data element. It should be known which occurrence is the master and which ones are copies. Reformatting programs are needed for moving data from one vendor's RDBMS to another. There are benefits to be gained from using the same vendor's RDBMS on all machines, from large to small. There are at least four portable RDBMSs that run on a wide range of machine sizes, namely Rapport, Ingres, Oracle, and Rim. These systems can act as powerful building blocks for creating a distributed data processing environment. This approach provides standalone applications first, then ties them together to smoothly introduce ddp.

FUTURE TRENDS ANALYSIS

To predict future trends in the field of integrated software systems, it is useful to look at the background of two market innovators, Apple's Lisa and Grid's Compass. Both of these companies have gained considerable inspiration from the Smalltalk language developed by Xerox. Smalltalk presents real benefits to end users in that it integrates many of the functions just described. Smalltalk is designed to mirror the way people think. Smalltalk integrates different kinds of data such as text, alphanumerics, and graphics under a common user interface. The high-level language and operating system aspects of Smalltalk are totally unified as one object-oriented architecture. This architecture provides a unified field for further integration, especially of RDBMS and data communications networks. It is quite conceivable that Smalltalk will become the fifth microcomputer market segment. The 16- and 32-bit virtual memory microprocessors soon to be available lend themselves to implementations of the Smalltalk virtual machine.

Whatever the future developments in this field turn out to be, the dp manager will need to keep abreast of them; otherwise, he runs the risk of uncontrolled development engendered by the users themselves. But with the right analysis and design methods and an awareness of the corporation's information handling needs, he can make the micro RDBMS work for the benefit of management, users, and the dp department—which is to say, for the organization as a whole.

Robert Bowerman is a systems consultant for Logica Inc. in San Francisco. He was previously head of computer services for MERU Research Institute in England and Switzerland and has also worked as a database administrator and programmer for Esso Petroleum. He specializes in microcomputers and methodology.

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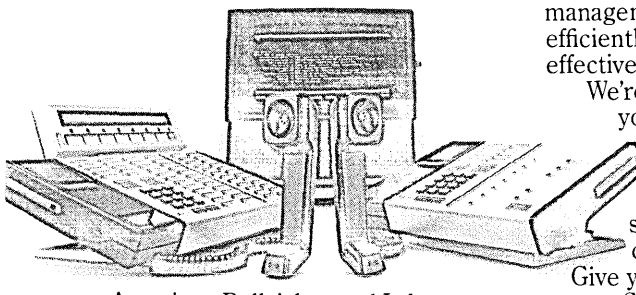

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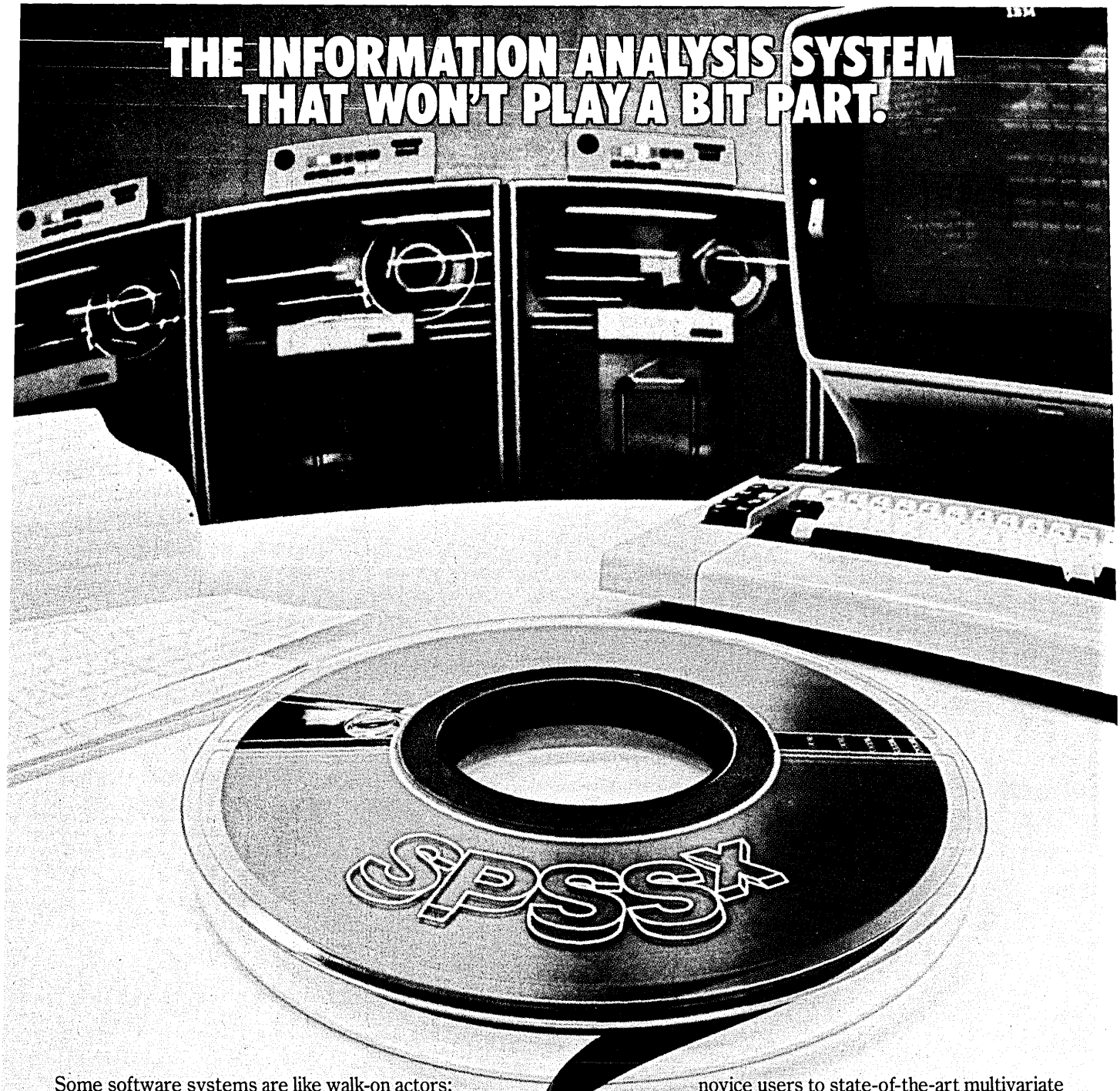

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Britton-Lee's chief designer provides a rationale for these devices and explains how they work.

WHY DATABASE MACHINES?

by Robert Epstein

A database can be the most valuable of corporate resources. But unless the database is fully accessible to everyone who needs to use it, it's being wasted. Database machines are powerful tools for making databases accessible in a variety of environments and are often the most cost-effective form of database management system (DBMS). This article explains why that is so. It describes the problems that database machines solve, and tells how they solve them.

When thinking about database machines, there are three important elements to consider: host computers, database machines, and database storage, which is usually disk based (see Fig. 1). The host computer can be a mainframe, a minicomputer, a personal computer, or a combination of the three. The user of the system actually interacts with the host computer. This means the host accepts requests for information from a user and passes the request to the database machine for processing. The database machine examines the database and returns the answer to the host. Thus, the database machine performs all aspects of data management while the host provides the interface to the computer user. The advantages of a system based on a database machine are:

Shared database. Many different hosts can share the same database. The hosts can be from different vendors and consequently have different characteristics.

Faster database access. Since the database machine is a special purpose computer, it can be engineered for higher performance. Database machines can perform database operations much more quickly than a host computer can.

Network database server. As computer networks become more commonplace, there will be a need to provide a shared database resource to all the computers on the network. A database machine is sophisticated enough to function as a database server on a network of computers.

Offload host. Sophisticated data management requires large programs and consumes a large percentage of the capacity of a host computer. By moving the work out of the host and into a database machine, the host is freed to perform other tasks such as accommodating more users or application programs.

Reduced cost. Database machines cost substantially less than the host computer resources they offload. Frequently, a smaller host computer can be used or the lifetime of an existing host computer can be extended.

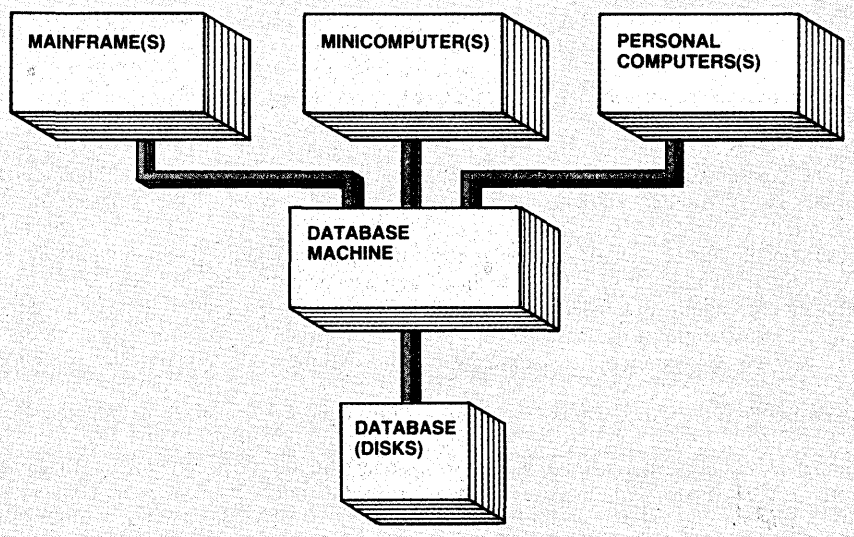
Efficiently supported relational model. Relational databases are known for their power and flexibility, but also for their slow performance and heavy use of computer resources. Database machines can be optimized to efficiently support the relational model.

Database machines appeal to both the users of a computer system and to designers at oems and systems houses. The user is interested in the price, performance, and capability a database machine adds to an existing environment. A database machine gives an oem a choice of host computer and a rapid integration of database management into existing applications.

What problems do database machines

FIG. 1

THE DATABASE MACHINE AND MULTIPLE HOSTS



CHARTS BY CYNTHIA STODDARD

Database machines cost substantially less than the host computer resources they offload.

solve, and how do they solve them? In what follows, we will discuss how Britton-Lee Inc. addresses these issues. Britton-Lee designs and manufactures a complete DBMS system called the Intelligent Database Machine (IDM).

SHARING BETWEEN COMPUTERS

There is a growing trend in data processing toward having multiple mainframes, minicomputers, and personal computers. These multiple hosts all need access to the same database. The database machine operates independently from the host computer, making it an ideal solution to the problem of sharing data between different hosts. Each host can access the database independently.

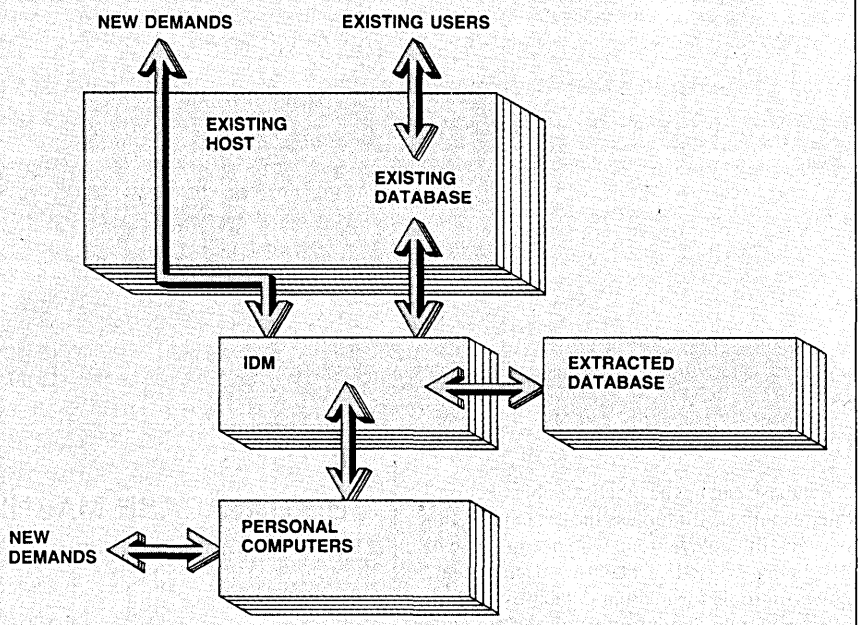
The problem of sharing databases between many hosts is frequently referred to as "distributed data processing." Sometimes the problem of distributed data processing is solved by using a distributed database, which has a portion of the database residing on every host. When a database machine is used, the database can be centralized in one location yet shared by all hosts. Contrast the approach of a shared centralized database to a distributed database for solving the distributed data processing problem. If the users of the system are not geographically separated, a distributed database is not necessary. The hosts can be distributed but the database can be centrally located. This is advantageous because a centralized database is simpler for users to understand, for programmers to manage, and for administrators to design and maintain. (For example, database backup occurs in only one location rather than many.)

Specific problems occur in the multiple host environment that database machines such as the IDM address. For example, these computers all have different data type representations. An IBM mainframe uses EBCDIC for character representation, while the IBM P.C. uses ASCII. When a host computer connects to the IDM, it tells the IDM what character set it uses and other details of its data types. After that, the IDM does all necessary translation as data move into and out of the host computer. As a result, all host computers can share the same database without concern for how the data are stored.

In a distributed processing multiple host environment, controlling access to the database is a necessity. The IDM allows a system administrator to control who can read or change the database. For example, it is possible to prohibit personal computer users from updating the database but permit them to read specific portions of it. This controlled sharing of a database is well suited to the personal computer/mainframe environment.

FIG. 2

ACCESSING AN EXISTING DATABASE



Database management is firmly entrenched in the mainframe world but has not become as widespread in the mini and micro world. The reason is simple: it takes a very powerful computer to run a database management system and provide multiple users with an acceptable response time. Database machines provide a solution to this problem. In the mainframe environment, database machines offer a substantial cost reduction. In the minicomputer environment, they offer substantial performance improvements. Database machines are cost effective in the personal computer environment if the machine is shared among several personal computers.

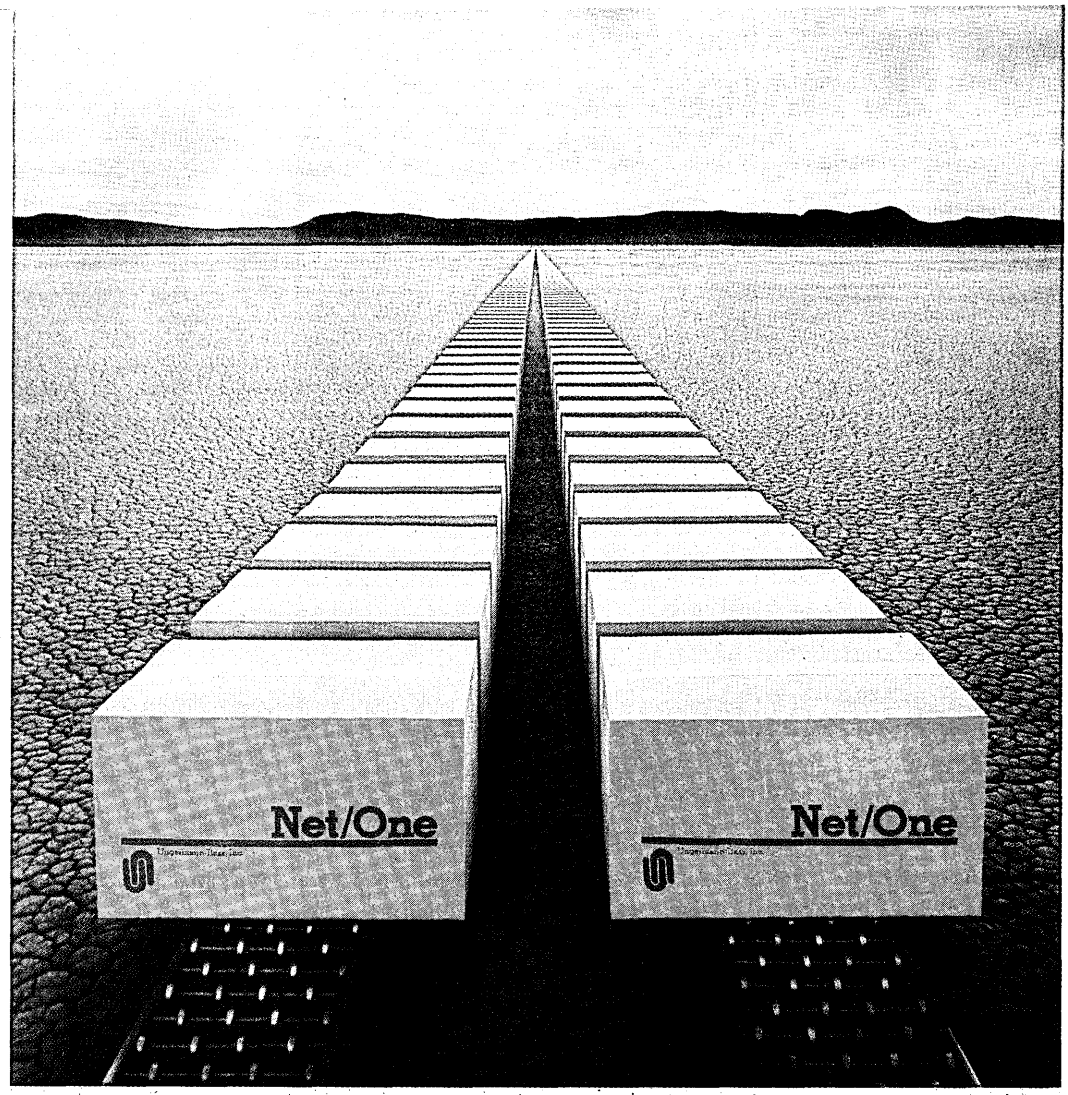
A reasonable measure of a computer's performance is the cost per MIPS (million instructions per second). On a mainframe this cost runs from $100,000 to $400,000. By contrast, a database machine such as the IDM costs about $10,000 per MIPS. The reason for the price difference is quite logical: the database machine cannot perform the tasks that the mainframe can. For example, the database machine has no special demand paging memory hardware, or special floating point number-crunching capability. The database machine can do only one thing—database management—but it can do that very quickly at low cost. For example, the IDM 500/2 contains a specially designed, high-speed processor that can search a database faster than 30,000 tuples (records) per second.

In the high-performance minicomputer world, a typical computer costs about $150,000. It is not uncommon for a software relational system with just a few users to consume in excess of 50% of a minicomputer's resources. The cost of database management on a mini is thus $75,000 for hardware plus the cost for the software. A database machine such as the IDM 300 costs about $60,000 yet exceeds the performance of the software-based DBMS by 200% to 300% in typical applications. The IDM 300 consumes very few host resources in the typical multi-user environment.

In the personal computer world, the database machine must be shared among many PCs or between the PC and the mainframe or minicomputer in order to be cost effective.The performance advantage, of course, is great; the PC user sees the same high-performance database as the mainframe user.

Database machines have something to offer all three environments. While offloading the hosts they either reduce cost, increase performance, or both. Cost economies come from specialization. The database machine software is simpler to write and maintain. The database machine hardware contains only those components needed for database management. Specialization also improves performance. The hardware and software are designed to perform a single, well-understood task—database management.

Many installations have their databases controlled by traditional, and possibly



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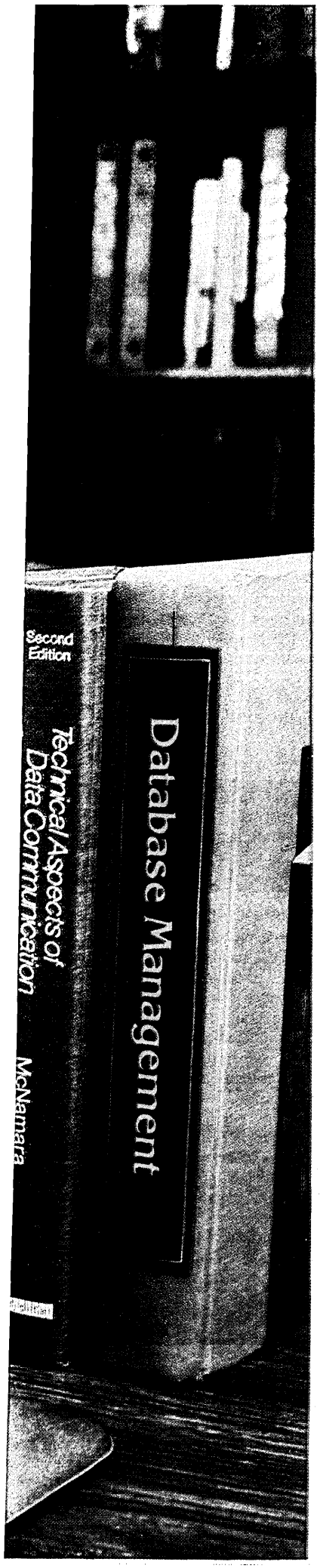

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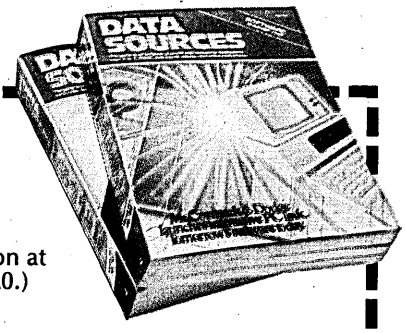

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Designers have only scratched the technological surface of the performance capabilities of database machines.

inflexible, DBMSs on their mainframe or mini. There is a substantial investment in that current database and it is not practical to change it. The system is inaccessible to most of the corporation except through the data processing department. The dp department typically cannot process all the requests for information it receives because the computer is already overloaded, and, in any event, there aren't enough hours in the year to satisfy all the requests. Yet they cannot continue to deny their users timely access to the database. A database machine makes it practical to periodically extract the existing database out of its jail and load it into the database machine (see Fig. 2.)

The existing users, database, and host are not changed. The existing database is periodically extracted from the host and copied to the IDM. New demands can be met by either allowing personal computer users to directly access the IDM or by allowing new users to access the IDM through the existing host computer. The extracted database can be examined with minimum resources on the host computer, without affecting the existing applications and without fear of inadvertently changing the existing database. This frees the dp department from the burden of having to handle every request for information. The user gets a safe environment in which to query the database. That's important because the art of getting information from data requires that users have the freedom to pursue any inquiry they care to ask.

RAISE THE LEVEL OF TOOLS

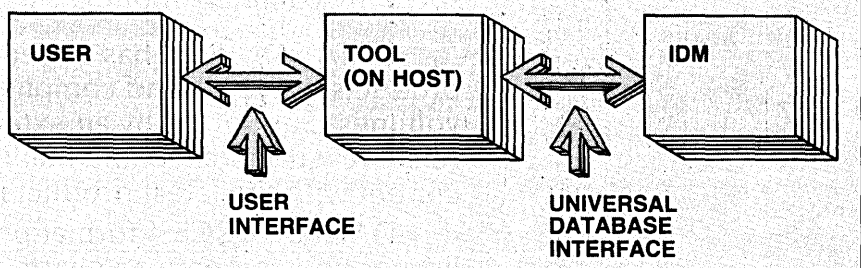
The demand for information continues to exceed the number of available programmers. The solution is not to train more programmers, but to raise the level and capabilities of tools available to the nonprogrammer computer user. These tools will demand greater performance and flexibility from DBMS. Database machines contribute to the solution of this problem by providing a universal interface to a database and by providing the performance needed to answer the sophisticated questions that users will ask.

The IDM provides a "universal database interface," which is illustrated in Fig. 3. The host provides the user interface and the IDM processes the database request. The IDM does not need to know what the user interface is. The tool does not need to understand the issues of database management; it just needs to transform the user's request into the universal database interface.

The ultimate success of a computer system depends on the user interface. If it is easy to use, the system will be successful. While each group of users has its own particular user interface requirements, they may all have very similar database requirements. Thus the IDM has been designed so that oems can design tools that address a particular application and user. For example, programmers want to access the IDM using a high-level query language from a high-level programming language such as FORTRAN, COBOL, PL/1, C, or Pascal. Financial planners like to access the database from a spreadsheet or from a financial form of their own design. Casual users like a system that guides them through the database and explains what is there. The same user interface or tool will not satisfy all groups, yet they all want to use the same database.

FIG. 3

A DIVISION OF DUTIES



In the personal computer world, there is an ever-growing list of interactive programs for nonprogramming professionals. These programs tend to lack a good database access method. The marketplace is just now starting to see such tools tied into databases. Vendors of PC software will use database machines because they are easy to integrate into their existing programs and they provide a high-performance database without using another host computer.

Nondatabase files must also be shared. For example, a PC user may want to share a newly created document with another user on a different PC. Database machines also provide a file server. Thus users who want to share their files with other users need only store the file on the database machine instead of their own computers. Of course, all files could be kept on the file server, thus reducing the need for local storage on every PC. This is especially beneficial since PC users are limited to the relatively small disks available for PCs. With a database machine it is possible to centralize the disks into one place and provide a large disk storage shared among many PCs.

There is an advantage to having the database server and file server on the same machine, namely, that the database system can be used to manage the pertinent data about the files. Such activities as document control and management are natural database applications. For example, the user may need to know "what correspondence have I received about this account?" Information about documents can be kept in the database together with the name and location of the relevant document.

FUTURE OF DATABASE MACHINES

Database machines are being successfully used today to provide high-performance shared databases to a variety of mainframes, minicomputers, and small computers. Corporate data are needed by everyone and the demand for information requires databases that are accessible to all host computers. The database must respond to increasing demands while remaining affordable. Due to its high degree of specialization and host independence, the database machine can provide shared, affordable, high-performance database management.

In the near future, productivity tools primarily intended for personal computers will become integrated front ends to database machines. As computer networks become common and standardized, database machines will be able to directly connect to the network, providing a database and file server capability. They will increase in reliability and fault tolerance. This is only natural since an ever increasing array of computers and users will be depending on database machines for all their data.

Designers have only scratched the technological surface of the performance capabilities of database machines. As software techniques and advances in VLSI circuits continue, database machines will increase in performance much faster than host-resident, software DBMSs. ❁

Robert Epstein is vice president for product development at Britton-Lee and led the design team for the IDM. He has a PhD in EECS from the University of California at Berkeley.

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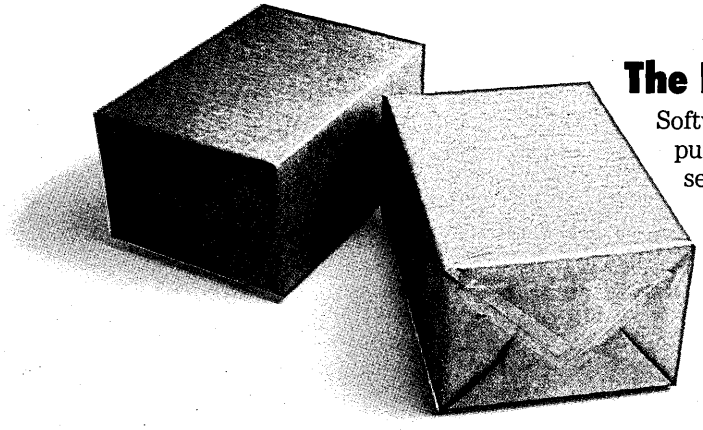

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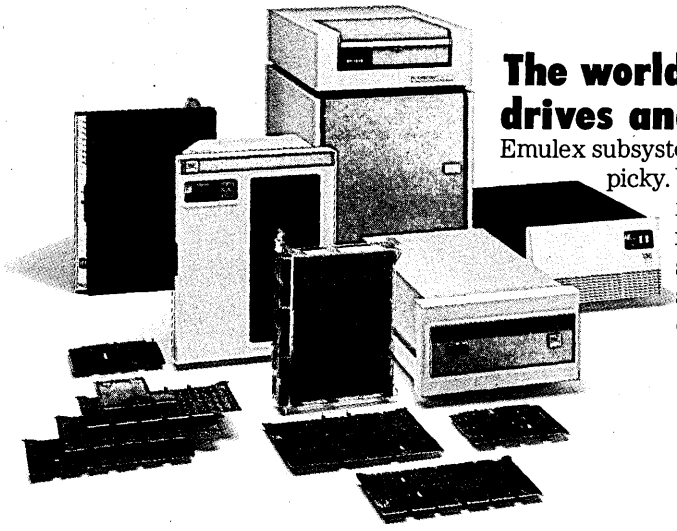

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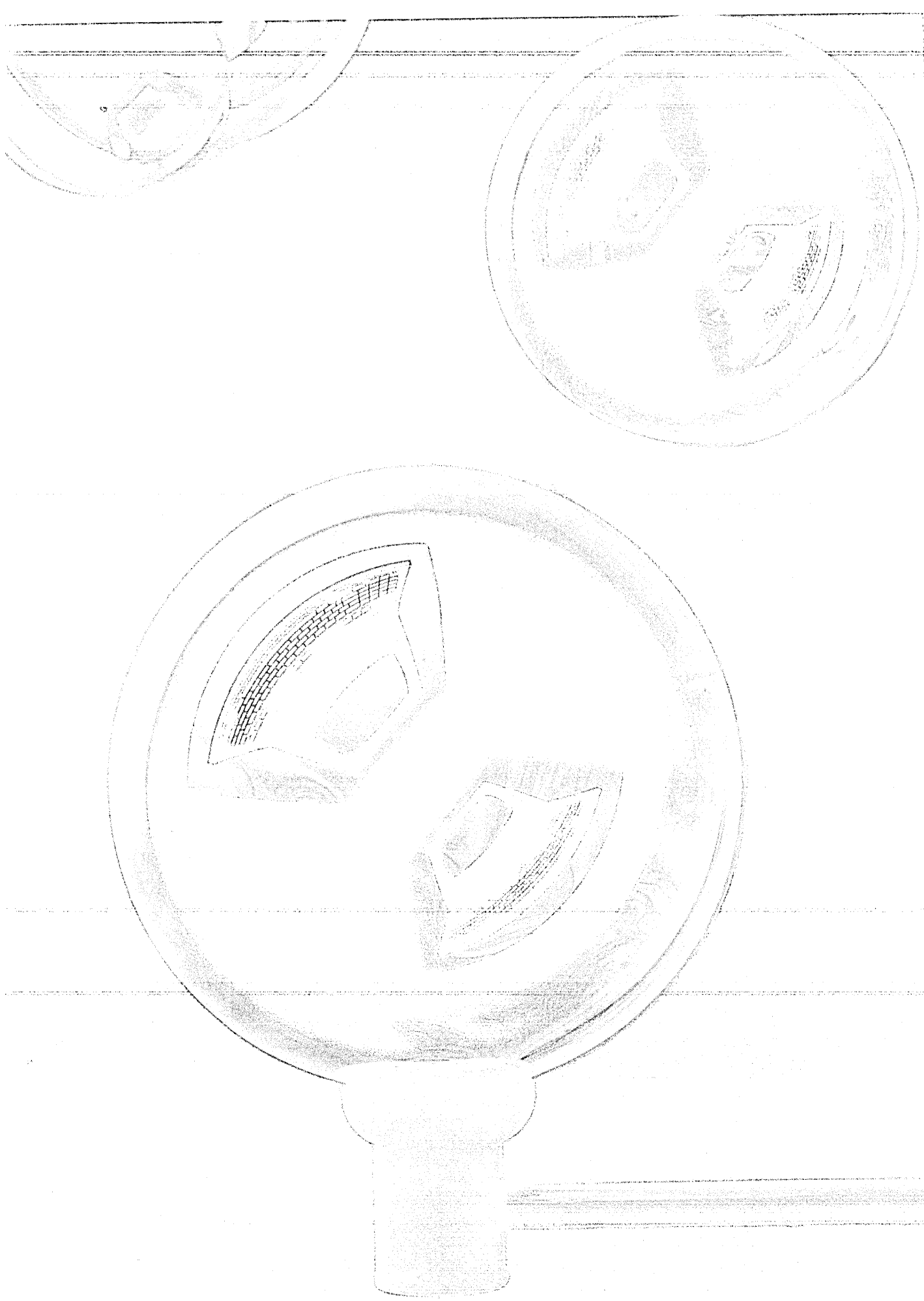

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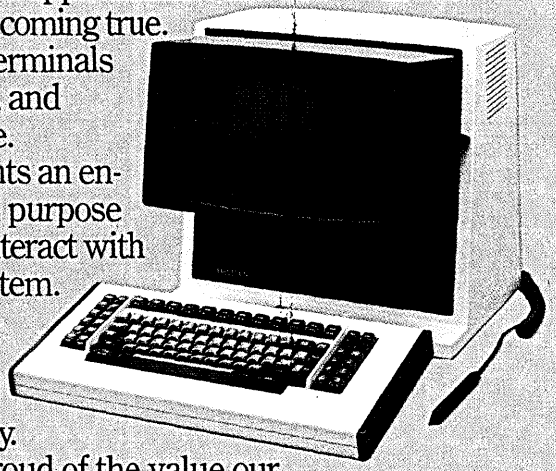

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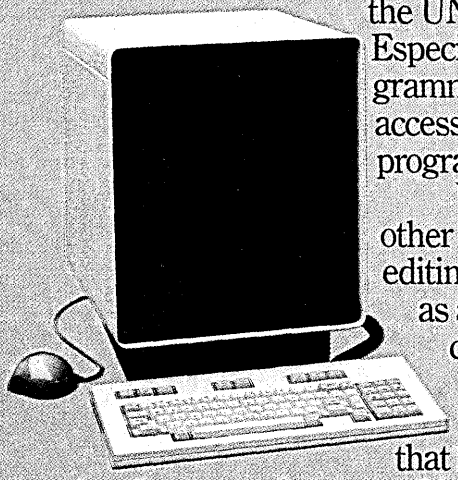

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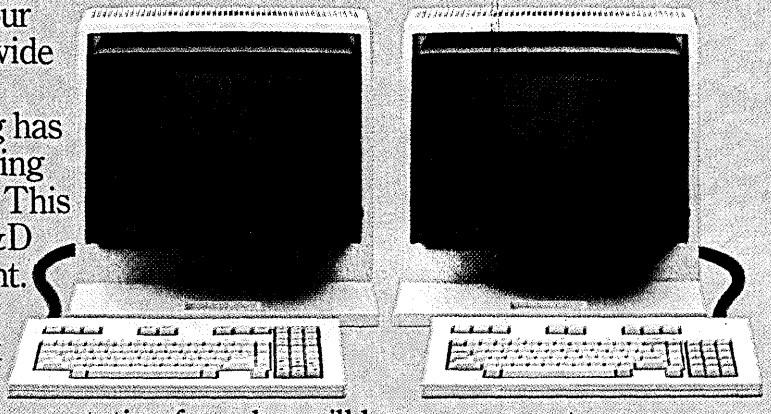

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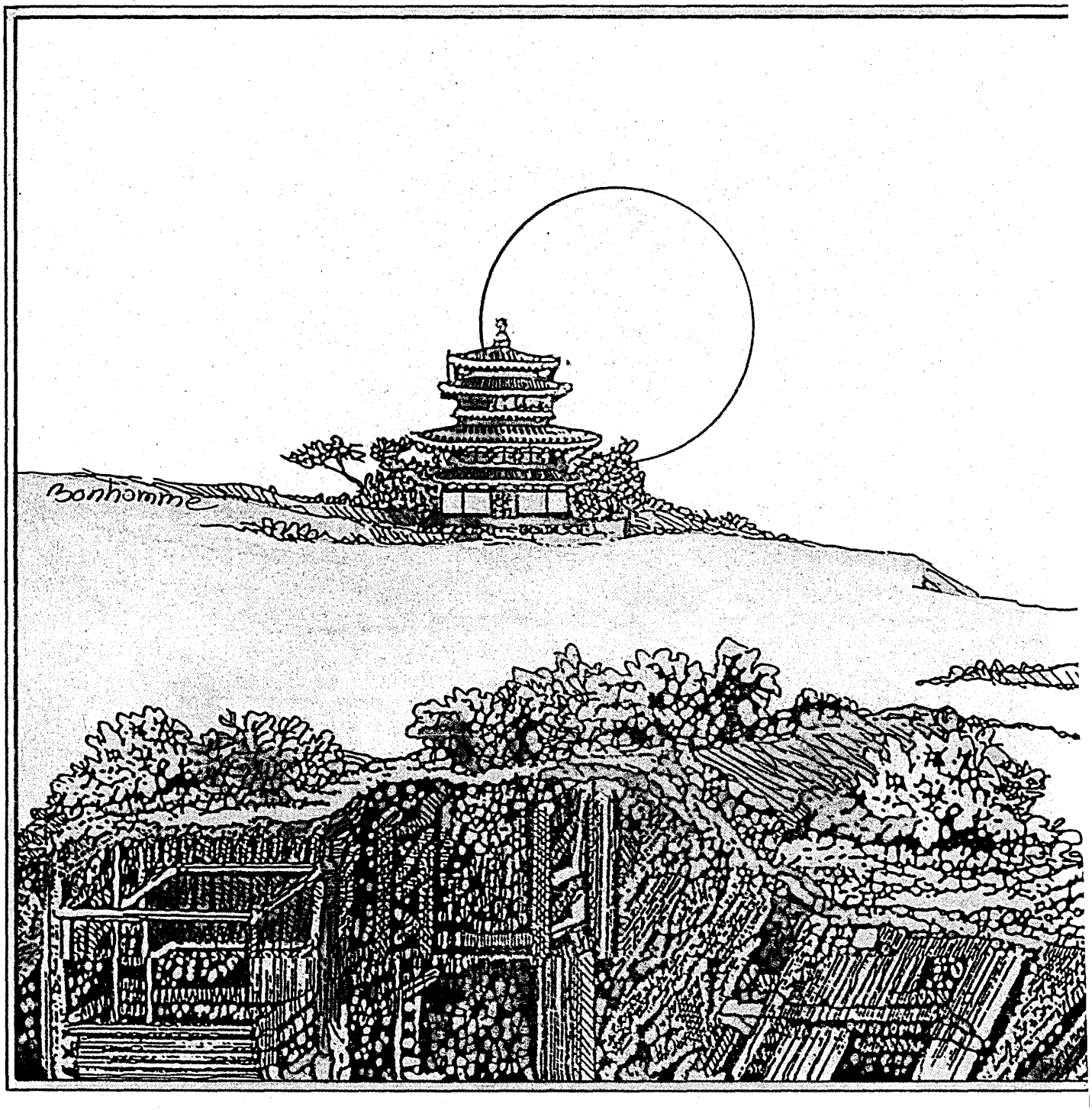
An AI expert examines some of the technical underpinnings of the Japanese project.

FIFTH GENERATION FOUNDATIONS

by Larry R. Harris

That the Japanese are planning to build a fundamentally different type of computer, called the fifth generation computer, is well known and widely discussed. Western reactions to the fifth generation project have varied considerably. Press coverage has been extensive, meetings have been called in Europe, and funding policies have been changed in the U.S., but most people in commercial data processing still believe the project contains more than a few patches of blue sky. The purpose of this article is to describe the Japanese fifth generation project in terms of some current approaches to data processing. By citing existing working systems that figure in



key areas of the project, I hope to impart some understanding of exactly what the Japanese are trying to achieve and what their chances of success really are.

The fifth generation project combines research in a number of areas in computer science and artificial intelligence. Rather than describe these areas in the same way that fifth generation does, I will organize them in a natural progression that will relate better to current methodologies. The following five topics represent the best sequence for coming to grips with what the project is all about:

1. Knowledge bases
2. Knowledge base query
3. The inferencing machine
4. Natural language query
5. Expert systems

By explaining each of these areas and showing how they relate to current systems, I hope to bring the project into clearer focus.

Knowledge bases. The Japanese and most AI researchers use the term database to refer to a type of information storage that is fundamentally different from the structured databases common in dp today. To avoid confusion, I will use the term knowledge base to refer to the type of information storage used in these systems. A knowledge base consists of two components: an unstructured set of facts and inference rules for determining new facts.

The primary distinction between a database and a knowledge base is that databases have a predetermined structure, whereas knowledge bases consist of a set of unstructured, almost isolated facts. The paths by which the facts are related in a knowledge base are determined "on the fly" as needed to solve a particular problem. The relationships between data items in relational and network databases, by contrast, are designed into the database in advance.

Another critical distinction between the two is that databases store all of their information explicitly, whereas the bulk of the information in a knowledge base is inferred from a few basic facts using the inference rules.

It is important to resist the temptation of the theoretical argument that the two are

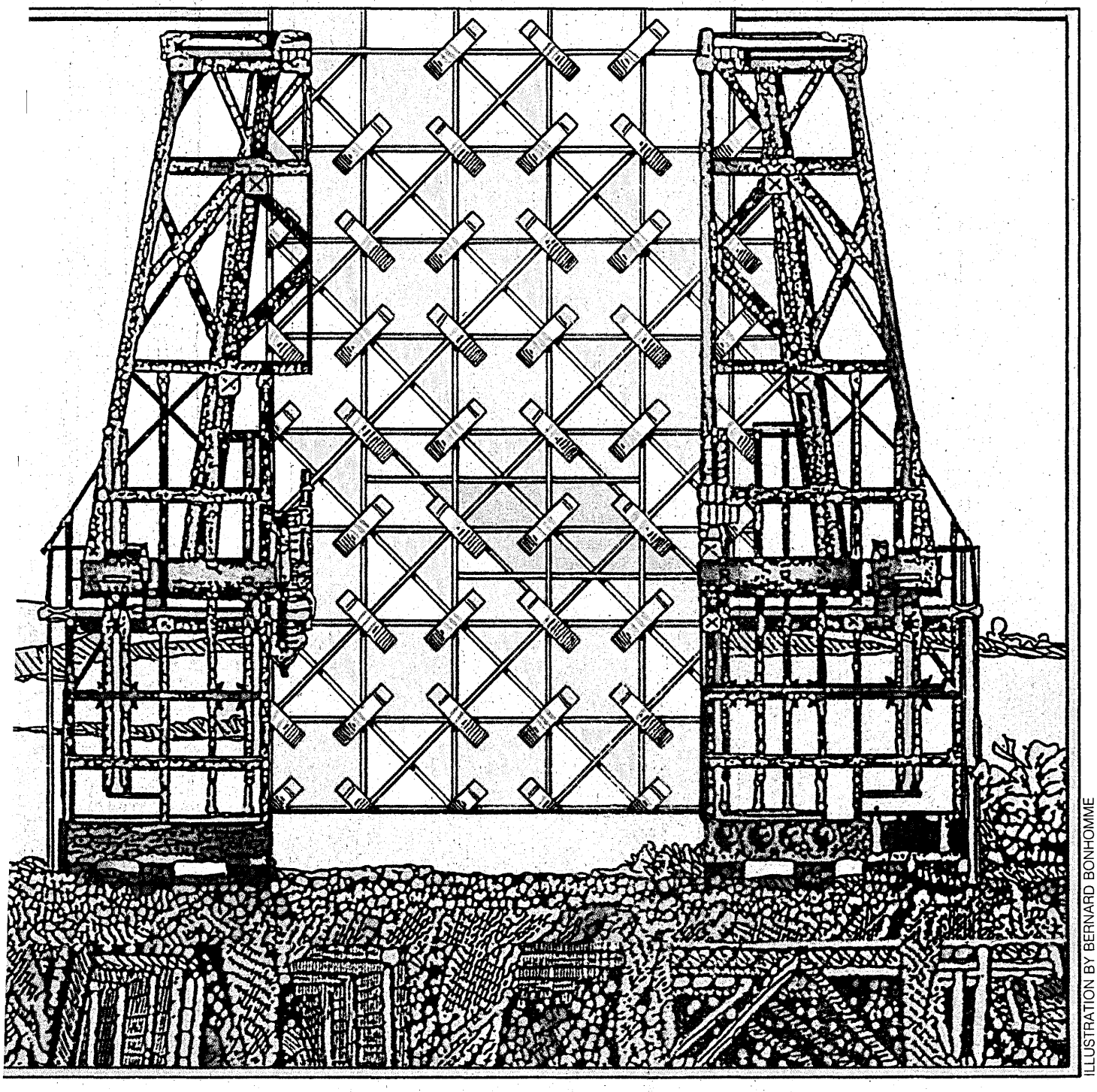


ILLUSTRATION BY BERNARD BONHOMME

Databases store information explicitly, whereas most information in a knowledge base is inferred from a few basic facts.

really the same because knowledge bases can rely on relational databases for their implementation. While this is true, it is also true that the fifth generation machines are just Turing machines and therefore nothing new. To persist in comparing things at such a high level of abstraction is to miss the essential differences between the systems. It is important to understand the strengths and weaknesses of each.

To this end, let us consider a sample knowledge base. For this purpose, I have shown a very simple body of information that happens to be very hard to represent in a traditional structured database but it is very easy to represent in a knowledge base. Consider the problem of representing the family relationships among a group of relatives. We wish to represent relationships such as:

PARENT	MOTHER	FATHER
SPOUSE	HUSBAND	WIFE
SIBLING	SON	DAUGHTER
UNCLE	AUNT	COUSIN

In addition to individual facts about the people such as their sex and age, let us also store whether the person ever held political office and if so, which office. Let us first discuss the knowledge base representation and then consider why this would be hard to represent in a conventional database.

First we have the basic facts stored in the knowledge base. These are stored in predicate form, that is, a function that will evaluate to "true" when invoked. To store the fact that "Joseph is the father of Jack," we write (FATHER JOSEPH JACK). To enter the fact that "Jack is the brother of Bobby," enter (BROTHER JACK BOBBY). We build the knowledge base by simply entering the basic facts. There is no need to be complete. There is no need to store the same amount of information or even the same type of information for each person. The basic facts for our example might be as follows:

```
(FATHER          JOSEPH  JACK)
  (HELD-OFFICE   JACK    PRESIDENT)
(BROTHER         JACK    BOBBY)
(BROTHER         BOBBY   TED)
  (HELD-OFFICE   TED     SENATOR)

(WIFE            JACKIE  JACK)
(MOTHER          JACKIE  CAROLINE)

(MALE            JACK)
(FEMALE          CAROLINE)
```

IF-THEN INFERENCE RULES

The second component of the knowledge base is the inference rules. These are IF-THEN rules that allow new facts to be created from the basic facts. These rules make use of variables such as X, Y, and Z, which will represent specific people when the inference rule is applied. For example, the simple inference rule: IF (HUSBAND X Y) THEN (WIFE Y X) represents the simple fact that if X is the husband of Y, then it is also true that Y is the wife of X. This obvious statement may seem unimportant, but it eliminates the need to enter the basic facts in a uniform way. We need not be concerned whether we have entered all facts regarding spouses with HUSBAND or WIFE. We could do it either way we like, even differently for different people. The inference rules will automatically determine the fact in the form we need it later.

Our sample knowledge base might contain the following inference rules:

```
IF (HUSBAND X Y) THEN (WIFE Y X)
IF (AND (PARENT X Y) (MALE X)) THEN (FATHER
X Y)
(AND IF (BROTHER X Y) (BROTHER Y Z)) THEN
  (BROTHER X Z)
IF (BROTHER X Y) THEN (BROTHER Y X)
IF (PARENT X Y) AND (BROTHER X Z) THEN (UN-
  CLE Z Y)
IF (AND (OR (UNCLE X Y) (AUNT X Y)) (SIBLING
Z X)) THEN (COUSIN Y Z)
```

If we try to represent this information as a database, we must decide in advance exactly what information we want to store and how we want to store it. It's hard to simultaneously represent PARENT, MOTHER, and FATHER, so we might be tempted to actually store only one and always access the data in this way. It would be hard to derive the other two in the classic database paradigm. Also, it will be hard to add new relationships such as NEPHEW and NIECE if they weren't considered in the original design. Thus, databases are considerably more rigid than knowledge bases. Their structure requires a prior uniform definition for each entity and explicit storage of all facts. All of this requires completeness and results in considerable resistance to change. Knowledge bases, on the other hand, represent the data in a much more dynamic fashion. Not only can the facts change, but the structure and interrelationships among the facts can change as the knowledge base is being used.

Knowledge base query. This is the analog of database query. In its simplest format, a database query specifies selection criteria and a list of attributes to be displayed. The database query processor retrieves all records that satisfy the selection criteria and prints the requested attributes of these records. A knowledge base query in its simplest form specifies a selection predicate. The knowledge base query processor determines all the atoms for which the selection predicate is true. A simple example will clarify this analogy. Suppose we wanted to list all the women. A database query might be:

```
PRINT NAME
FROM PEOPLE-FILE
WHERE SEX = 'F'
```

The corresponding knowledge base query would be:

```
(LIST X (FEMALE X))
```

Since these queries involve the retrieval of explicitly stored information, there isn't a significant difference between them. Let's now formulate a simple request for information that is not explicitly stored. Suppose we wanted to know the names of Caroline's uncles:

```
(LIST X (UNCLE X CAROLINE))
```

This request would cause the query interpreter to carry out approximately 100 inferences in a sample knowledge base of 3,500 facts about 1,000 people. A database query for such a request is much more intricate because databases are much less adept at storing relationships between records than they are at explicitly storing attributes about each record. For this reason the concept of "UNCLE" is much harder to represent in a database than sex. Needless to say, if a concept is hard to represent, it is hard to formulate a query to extract it.

It is worth pointing out that relational databases are far more facile at representing relationships between records than hierarchial and network databases. The complexity of such requests, however, increases dramatically compared to requests that select explicit values.

Let's consider a slightly more complex example. Suppose we wanted to list everyone with two brothers:

```
(LIST X (EQ 2 (COUNT (LIST Z (BROTHER X Z)))))
```

This request would require about 2,000 inferences in our sample knowledge base.

A reasonable question for the knowledge base would be to find the men who might soon be ready to seek political office. Let's find the sons and nephews of anyone who has held political office:

```
(LIST X (ALL Y (AND (OR (SON X Y) (NEPHEW X
  Y))(HELD-OFFICE Y))))
```

This last example is particularly interesting because it makes use of a new concept, that of nephew. In a database environment such a query would simply fail. The concept of nephew would have to be defined to the system before such a request could be answered. In a knowledge base environment the system could interrupt processing of the query and ask for an inference rule to define "nephew." This could be done as follows:

```
IF (UNCLE X Y) THEN (NEPHEW Y X)
```

With this inference rule added to the knowledge base, the system can proceed to answer the original question. This illustrates the robustness of knowledge base systems in coping with unanticipated problems.

The inferencing machine. There already exist systems for performing the types of knowledge base queries that we have seen. The Japanese have focused on using the PRO-

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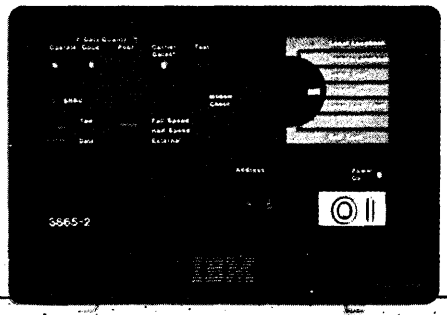

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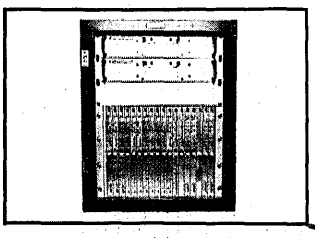

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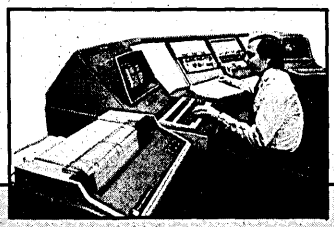

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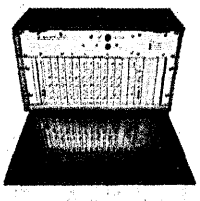

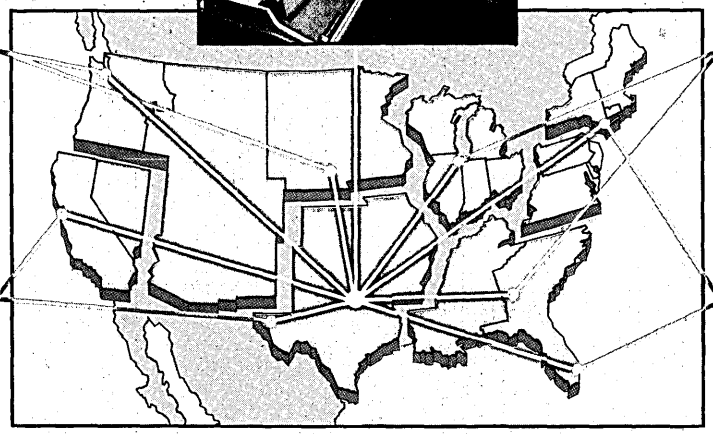

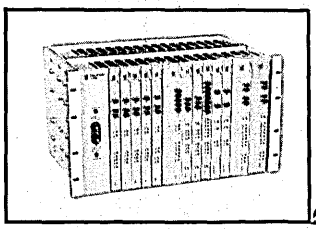

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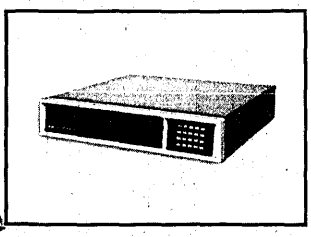

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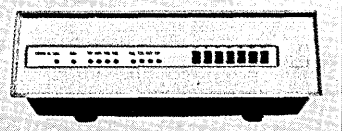

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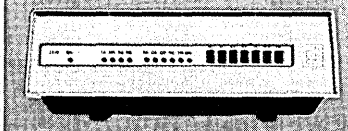

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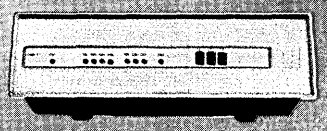

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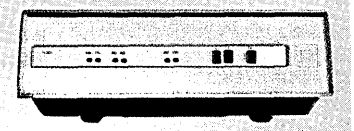

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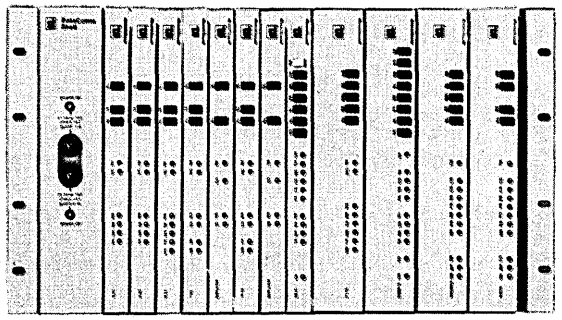

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The Japanese project calls for attaining higher LIPS rates by improving performance in four different ways.

LOG language developed in Europe in 1972 by Colmerauer and Kowalski. A language called LOGLisp has recently been developed in this country by Robinson. It combines the logic programming capabilities of PROLOG with the list processing capabilities of Lisp, the language used almost exclusively by AI researchers in the U.S.

Much like today's fourth generation database languages, PROLOG and LOGLisp act at once as both the knowledge base management system and the formal query processor. In these systems the user can enter facts (in predicate form) into the knowledge base, interspersed with queries or new inference rules.

THEOREM PROVER COSTS CUT

Until recently the computational cost of carrying out the formal mathematical inferences in a "theorem prover" of this type was exorbitant. Mathematical techniques such as unification and resolution have brought this approach into the realm of the feasible on today's mainframes. Roughly speaking, a moderate-speed mainframe today can carry out 1,000 logical inferences in a cpu second. This is the relevant measure of speed for a knowledge base system. The Japanese have introduced the acronym LIPS (logical inferences per second) as the measure of speed for their fifth generation computer, a change from the traditional measure of machine horsepower, MIPS (million instructions per second). The focus of the Japanese inferencing machine is on how high a LIPS rate can be attained. We have already stated that today's machines run at 1,000 or 10^3 LIPS. The Japanese project calls for attaining higher LIPS rates by improving performance in four different ways.

Techniques	Improvements (Order of mag.)
Compiler vs. interpreter	1
Parallel vs. serial	1-2
VLSI	1-2
10 years of tuning	1

The Japanese are aiming for a processor capable of 10^9 LIPS. They plan to achieve this in a reasonably straightforward way: by building a PROLOG compiler instead of an interpreter and by taking advantage of parallelism in the obvious ways. Logic programming is inherently parallel because each reference spawns many new subproblems. Also, there are many candidate items that could potentially satisfy the query predicate. The Japanese plan to embed all of this in hardware making use of the latest VLSI technology to achieve the fastest speed. In light of this approach, significant speedups seem quite feasible.

Imagine for a moment the power of a processor in the 10^9 LIPS range. The types of examples we saw earlier would be child's play. Such a processor would be capable of carrying out subtle analysis of extremely vast knowledge bases. We'll get a feeling for what new applications could be addressed by such hardware in a later section.

Natural language knowledge base query. There is yet another dimension to the fifth generation project that relates to the concept of ease of use as applied to today's database systems. We have seen some logic programming examples. They are clearly not the epitome of ease of use, but I'm quite sure that any vendor selling such a system would claim that it is easy to use, user friendly, and an English language system.

But the Japanese aren't fooled! They want to be able to ask queries in ordinary Japanese. Such a system is called a natural language system. Natural language is a technical term that refers to the languages that people speak: English, French, Japanese, etc. These are clearly distinct from formal computer languages such as FORTRAN, COBOL, etc., or even the fourth generation query languages SQL, FOCUS, etc.

A natural language system must accept and answer requests expressed in the user's natural language (English for us, Japanese for the Japanese), phrased any way the user chooses to express himself. If any ambiguities exist in the request, a natural language system must detect them and ask the user for clarification. This is a fundamentally different mode of interaction with a computer than most of us are familiar with because it shifts the burden of understanding from the user onto the machine. The natural language system must understand the idiosyncrasies of the user and his langage rather than forcing the user to understand the idiosyncrasies of the computer. For may nontechnical users of computers, true ease of use cannot be attained until the computer understands their natural language.

The Japanese recognize this and have included plans to build a natural language interface to their logic programming system. Just how feasible is this? Once again, let us look at the current state of the art in database query. At this point I feel I must give a disclaimer. As the author of the Intellect natural language query system, I am certainly competent to assess this technology but also very much biased. But I think the facts speak for themselves. Natural language database queries—e.g., "How many salesmen are over quota in each district in the eastern and western regions"—are a fact of life in over a hundred commercial sites today.

How far do the Japanese have to go in order to allow natural language knowledge base query? First we must understand that a system such as Intellect translates the natural language request into a formal query to the database system. That is to say that it generates an SQL command when interfaced to the SQL database. For example, the request "List the names and ages of the single and divorced people" would generate:

```
SELECT NAME, AGE
FROM PEOPLE-FILE
WHERE (FAMILY-STATUS = 'S' OR FAMILY-STATUS = 'D')
```

The Japanese are attempting to build a system such as Intellect but with a PROLOG interface rather than an SQL interface. The natural language system must be able to generate the types of logic programming examples we saw earlier from a variety of natural language phrasings of these requests.

Expert Systems. The keystone of the fifth generation project is the building of expert systems. This is the payoff to the four previous steps in the plan. This is the component that provides the leverage in the marketplace so necessary for the Japanese to gain significant market share. But before describing this aspect of the plan, let's first familiarize ourselves with exactly what expert systems are.

Expert systems are also referred to as knowledge-based systems, because they consist of a problem-solving capability on top of a specific knowledge base. They are intended to carry out logical problem solving within a narrow range of expertise. Of course, in some sense any computer application, such as a payroll system, can be thought of as an expert system. I'm sure that in time the term will be abused to the point of becoming meaningless. The technical definition of the term refers to AI systems built on top of knowledge bases. A couple of examples will clarify the point.

MEDICAL EXPERT SYSTEM

The most significant expert system, in my opinion, is the Internist system of Pople. This program performs medical diagnosis for all of internal medicine. The knowledge base consists of the basic facts known to doctors about the relationships between certain symptoms and specific diseases. The inference rules state the connections between diseases, for example, whether one is the cause of another. The problem-solving component starts with the basic facts about the patient and the manifestations experienced by the patient. It then poses queries to the knowledge base to determine a diagnosis. The problem-solving component is responsible for determining what additional tests should be run in order to help clarify the diagnosis process. The Internist system is the product of 10 years of collaborative work by AI researchers and physicians.

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Although it is far from complete, it does better than many human physicians in diagnosing difficult cases.

Other successful expert systems are DEC's R1 system, developed by McDermott at Carnegie-Mellon for configuring minicomputer systems, and the DENDRAL system of Buchanon for spectroscopic analysis.

Expert systems are the cornerstone of the fifth generation project because they will provide a set of application areas where the fifth generation hardware will be required in order to attain the level of performance required. These expert systems, which are intended to outperform systems based on current technology, will presumably run only on the Japanese hardware.

There is another strategy implication of expert systems worth noting. Building the knowledge base and the problem solver also provides a benefit independent of the hardware implications. In a sense the knowledge bases are like storing human knowledge in an "active" form that is not only accessible by the machine, but also can be understood by the machine. This is akin to the difference between putting the *Encyclopedia Britannica* on-line for keyboard searching and having the computer read and understand the material to the point where it could make its own inferences and answer questions not explicitly stored in the text.

This is particularly profound if one thinks of this as the building of a knowledge industry in which modules of expertise are created and sold, perhaps even under brand names. It is hard to imagine the impact of such an industry on society, given the enormous impact that the passive printed media have had. The ability to store and pass information from one generation to the next in an active form would be a significant achievement. The creation of the knowledge industry plays a major role in the fifth generation project.

By comparing the various components of the fifth generation project to the existing state of the art in database, I hope I have removed some of the mystique of the project. It is without doubt an ambitious effort, but one in which each step is based on existing capabilities. While it is almost certain that the Japanese will not attain all of their goals for this project, it is also virtually certain that they will fulfill some of them. Recent experience with commercially successful AI systems indicates that certain problems are indeed solvable using well-engineered AI techniques.

There are two important caveats in that remark: *certain* problems and *well-engineered* techniques. No one can deny the Japanese mastery of the engineering discipline. There can be no doubt that they will do a superb job in engineering anything they come up with. The issue of problem selection is one that is most significant in the area of expert systems. This technology is in its incipient stages and must be applied with great selectivity.

This is the part of the fifth generation project least likely to succeed. Many of the problems they speak of addressing are not likely to be solved using the expert systems approach in the time frame of the project. It is, of course, hard to assess the real problem-solving value of the improved hardware. But some of these problems are likely to remain outside the limits of this technology, even with the hardware performance boost.

The interesting question is determining the class of problems that the new hardware will bring into the window of the expert systems technology. To the degree that these are interesting and valuable applications, the Japanese will have established a market niche for their hardware. We can only hope that AI research, and more importantly AI development projects within the U.S., will allow us to not only keep pace, but to extend our technological lead. The only other strategy is to wait and buy it from the Japanese. ✱

"I now pronounce you nerd and nebbish!"

CARTOON BY HENRY MARTIN

Dr. Larry R. Harris is founder and president of Artificial Intelligence Corp. and author of Intellect, the natural language query system. He was previously a professor at MIT. He has a PhD in computer science from Cornell University.

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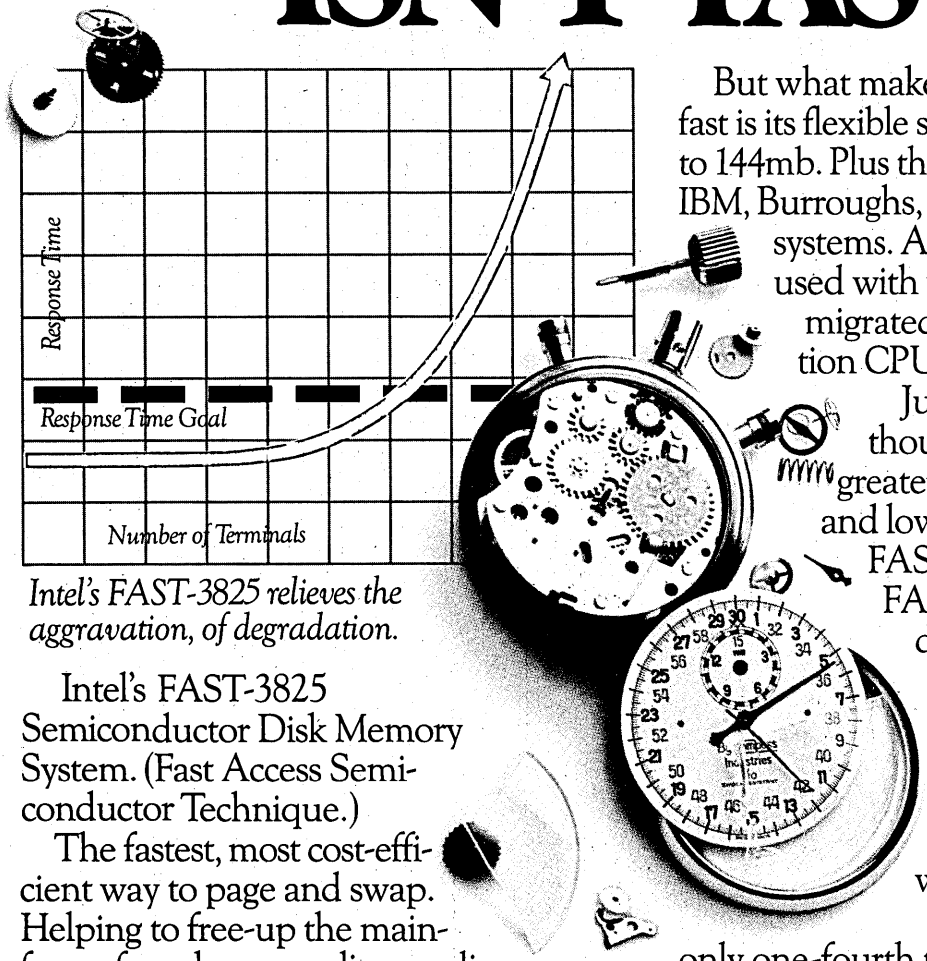

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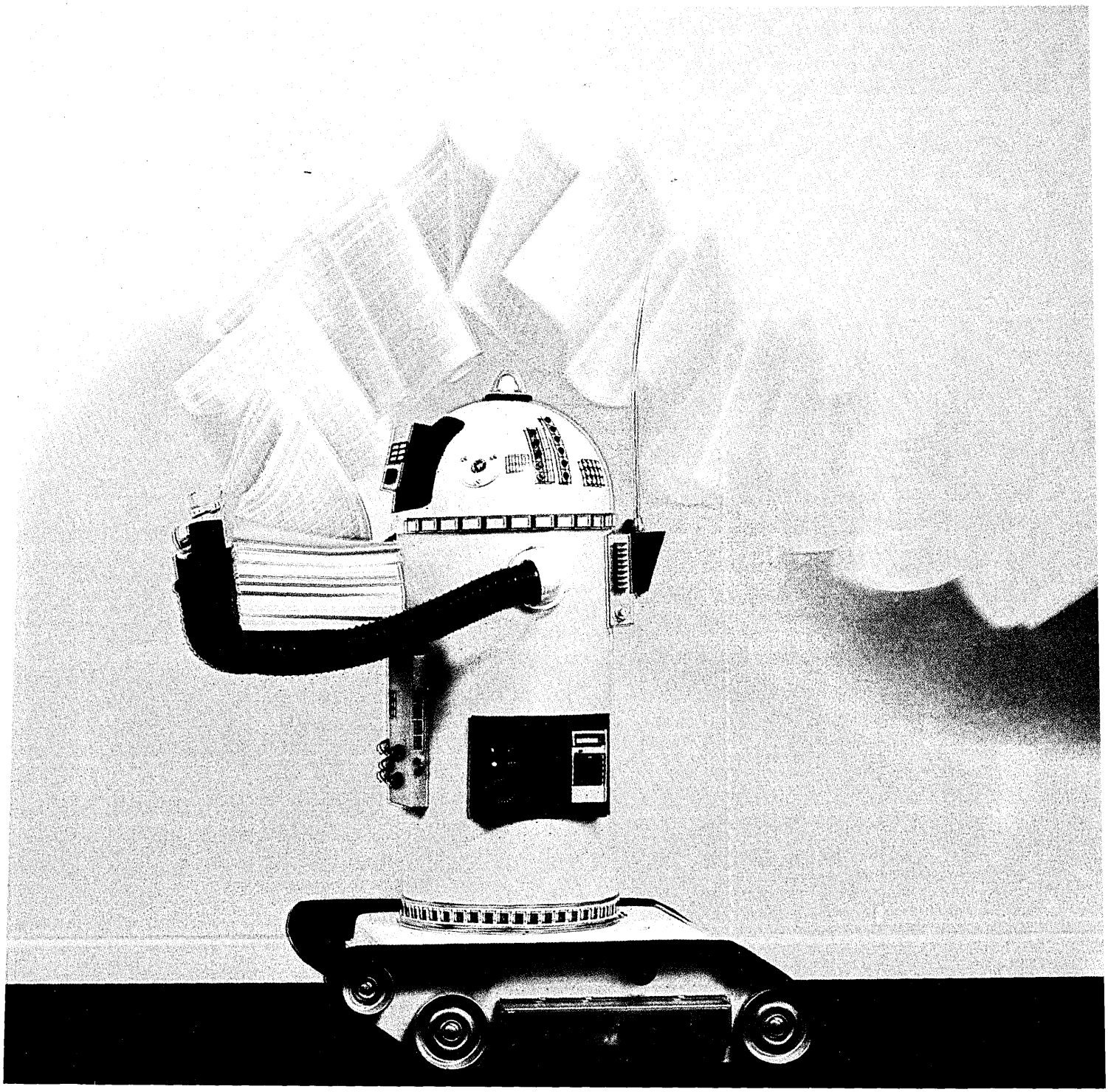

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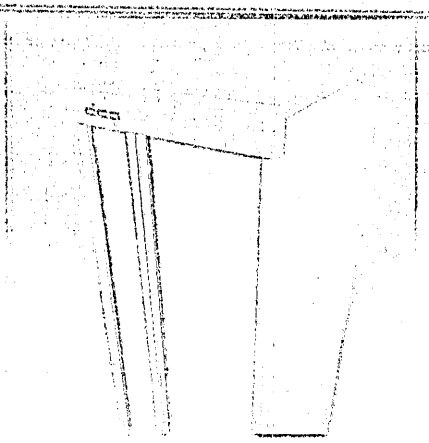

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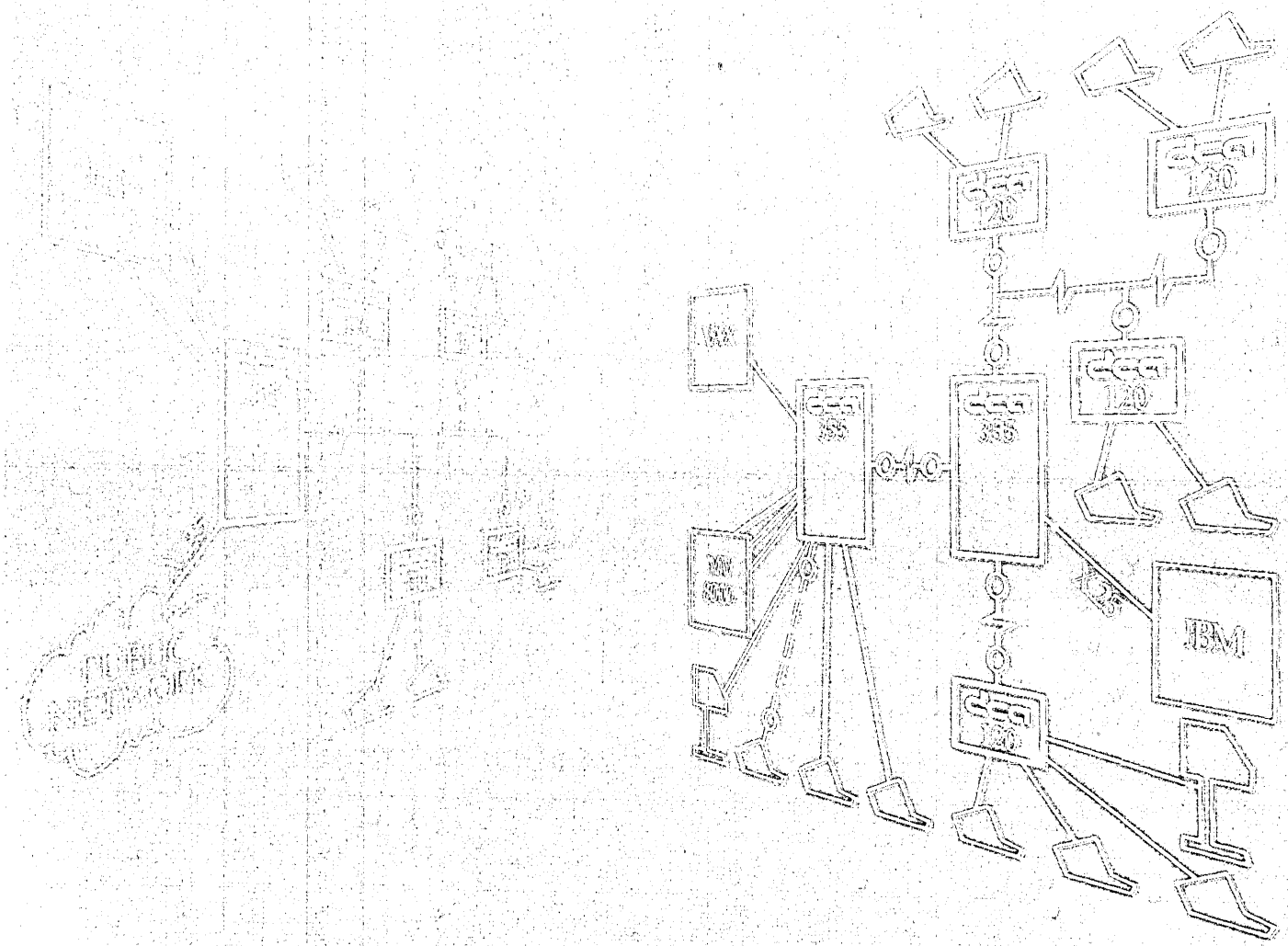


A hardware vendor, an industry analyst, a software vendor, and an academic assess Japan's fifth generation computers project.

CAN THEY DO IT?

by Jan Johnson

America has seen what the Japanese can do in automobiles, consumer electronics, and integrated circuits—but those are products made with current technology. In 1981 Japan put forth a new challenge, a project rife with technology that resides on the misty edges of information processing. The so-called fifth generation effort embraces things like artificial intelligence and knowledge-based processing.

Can they do it? Is the project a genuine threat to U.S. preeminence in information processing? Opinions run the gamut, and too often seem based on emotion. To give this highly charged issue the careful consideration it deserves, DATAMATION sat down with four people from four different segments of the computer industry. Each brings a different perspective to the discussion of the Japanese fifth generation project.

Jonathan Allen, professor of electrical engineering and computer science and director of the research laboratory of electronics at MIT, brings a wealth of experience to the discussion. He spent 12 years researching speech synthesis and speech-to-text problems, and more recently has delved into speech recognition, integrated circuit design, and design methodology. He had spent three weeks at NTT (Nippon Telephone & Telegraph) in Japan just prior to the fifth generation announcement.

Peter Gregory, vice president for planning and corporate development at Cray Research, has a personal as well as a professional interest in the Japanese computer industry.

Marty Goetz, senior vice president and director of the software products division at Applied Data Research, was invited to represent the software industry.

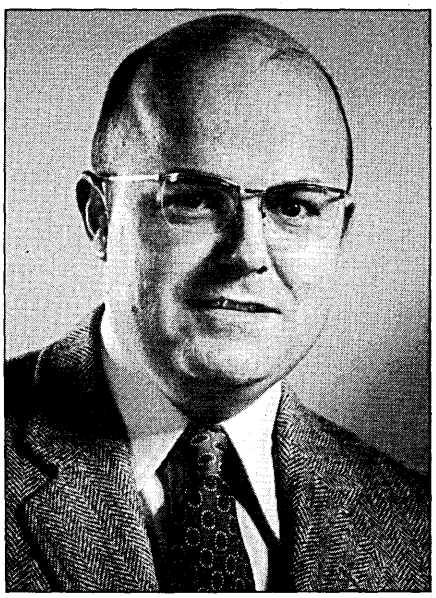
And Ted Withington, vice president, information systems at Arthur D. Little, has had an opportunity to observe as well as consult with Japanese computer vendors.

We held separate interviews with each participant and asked each the same set of questions.

***DATAMATION*: How do you view the Japanese fifth generation proposal? Do you see it as a collection of goals, or as a product design project?**

Gregory: My initial reaction was that the Japanese government, anxious to establish a strong position in the world computing community, has been sold a bill of goods by an ambitious research lab working in AI [artificial intelligence], claiming things that were extremely optimistic. What I have seen of AI has been very rudimentary when compared to the claims made for this project. You can write AI applications—oil analysis, medical diagnosis—but these are very specific. To say that generalized AI will be here in eight years is exceedingly optimistic.

At the same time, it is a highly desirable objective, and I think putting a stake in the ground is excellent. Even if they only go 30% of the way by 1990 they will have achieved something that no other computer manufacturer is even contemplating. Most others are struggling with the problem of ease of use, worrying about command languages, interactivity, worrying about how to get the systems programmer out of the computing shop. All of those things are aimed at taking a vast body of software written in the last 20 years and simplifying it. The Japanese are attempting to break out of that, throw everything away, and start again by asking what would enable the computer to be humanized. That I think is the real impressive stuff.


JONATHAN ALLEN

I expect them to achieve a very attractive von Neumann machine. With all the participation they are soliciting they will get some very interesting ideas on what the Fujitsu 380 follow-on will look like in 1990. Even if they don't make it with an entirely different architecture, some of the ideas from the fifth generation project will probably be built into the von Neumann machine on an evolutionary basis.

Ultimately it is hard to draw a distinction between goals and product design projects. I don't think the Japanese would set a goal that wasn't going to result in a product design at some point. They have been fairly specific in terms of the design objectives; they have categorized the performance objectives of the system and there is a deadline on it of 1990.

If you look at the structure of the proposal it has all the familiar pieces of a product development project—a technology program, a software development program, a machine architecture program, and an end-user interface program in terms of input/output. Supercomputer development is a special box, not part of the fifth generation program as such, but off to the side. It appears to make the diagram comprehensive. There is no real proposal to make the supercomputer into an AI machine, but it is logical to expect an access port from the AI system to the supercomputer.

Allen: I think there are a number of motivations behind the project, but the major thing is that it serves as a focus for Japan's computing effort. It's a declaration of intent to the world, and to some extent a media event.

They have been very strong on the hardware side, largely in the plug-compatible machines. But they have not been very strong in software. If you go through the NTT lab

Goetz: My level of confidence that the Japanese will accomplish their goals is close to zero.

almost all the machines used for software development are American-made. Japan wants to improve its software standing. Yes, their goals are very ambitious, but that's okay. If their goals were seen to be doable by people sitting in their offices today, then they wouldn't be very good goals for a 10-year project.

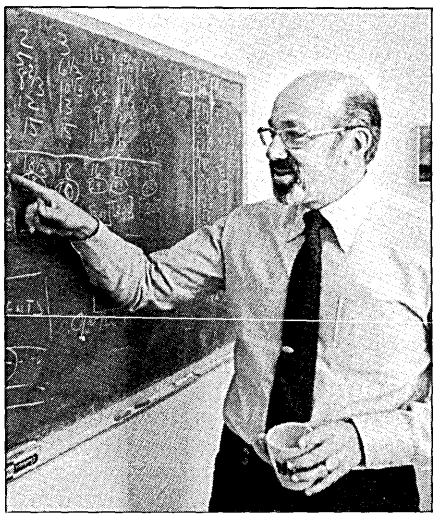
I don't have much sympathy for those who attack the Japanese. My feeling is that the Japanese are pragmatic people and if they find something useful, they will continue to investigate in that direction; if not, they will stop. In order to attract MITI funding they needed specific, new ideas. They needed evidence of new thinking. They have taken some current and some controversial ideas, such as using the logic language Prolog and dataflow processing, and melded them into the proposal. If the new ideas turn out, they may develop new leadership in those areas.

But they will not stick with Prolog or dataflow processing just because they made statements about them at a conference. It is a mistake to think they will. The thing to remember about the Japanese is that they investigate a lot of things in parallel. That's why I can't get excited or critical about their choice of Prolog or dataflow processing or anything else.

Goetz: I've been in the field for 20 years and I think the proposal is pie in the sky. For example, an important aspect of the fifth generation machine is that it be a "thinking" machine, one that mimics the human recognition system. Humans, though, have certain characteristics that are mind and body. There are a lot of problems in creating a thinking machine that aren't solvable simply because you're working with machines. If the Japanese are talking about this as being a product definition, a commercial product by 1995 that can recognize natural speech, I'm skeptical. But it's not really a product design; it doesn't have any specifications. It's more a wish list. I don't find anything of real substance in their proposal. They are ideal goals, far beyond what can be accomplished in a 15-year period.

A true fifth generation machine would not be a quantum leap, but an evolutionary step. This proposal, however, is such a leap it boggles the mind of a practitioner. A futurist might call what they are proposing an eighth generation machine.

Withington: If the fifth generation proposal is interpreted as some kind of product design, it is both deficient and probably unattainable. If it is taken as a directional objective, it is undoubtedly interesting and worthwhile. If you look at the wording in which the concept was presented I think you will find that the Japanese said as much—that it is a directional



MARTIN GOETZ

objective. Certainly one of the objectives in conducting the initial conference was to be cooperative and to indicate that they wanted to improve the lot of humanity.

***DTM*: How realistic are the fifth generation goals?**

Withington: The fifth generation goals are almost certainly not attainable in full form. I would guess that the Japanese who conceived the proposal would agree. In a few specific areas, however, I am more optimistic than I first was. For instance, in the past year I've seen examples of some knowledge-based systems that show real promise. Among the widely known ones are a drug prescription system, a diagnostic system, and a chemical properties system. Natural language recognition is moving along too. Furthermore, it appears that the Japanese language is more tractable than almost any other language in the world. It may indeed be in Japan that the most progress in natural language speech recognition systems is made. Also, there is a greater need there for this capability because their written language is so difficult to put onto a keyboard.

Goetz: My level of confidence that they will accomplish their goals is close to zero, for two reasons: because they are talking about a "thinking" machine and about the recognition of natural speech. In the first area they haven't even defined the problem. No one knows how the mind works. Even if they knew a lot more, the next question focuses on the programming effort. How do you program a thinking machine?

The problem with natural language input is knowing the intent of the speaker. Recognizing the words is just the beginning; you also have to interpret them. Natural languages are the wrong languages for computer input. They're just too imprecise. And whether they use natural language or not, they still have the problem of deductive reasoning in a machine.

My feeling is that the fifth generation is simply a beautiful wish. I am not aware of anything that exists that is close to what they have announced. There is no reason to think these goals can be achieved in the time frame they have laid down. Nothing exists in universities or the labs that would indicate it is just a matter of time.

Gregory: I don't see how the generalized AI system is going to be constructed, so my present belief is that it is not possible to make a machine entirely driven by AI concepts in that time frame. But just stating that they intend to do this has produced a sudden awareness throughout the industry. It has also produced a focus on the desirability of trying to construct major applications with an expert system interface.

I think what will come out of the program is the capability to produce AI-oriented products. But I would be very surprised if Japan dropped its IBM-compatible plans and changed the machine architectures. I think they will do it in parallel. If the AI product is successful, then at some stage in the 1990s they may stop making IBM compatibles. But I don't believe they will give up on a very strong horse in order to back something completely revolutionary and unproven. I also believe that some of the ideas they are developing will be adapted to other product lines. The idea is that if you could take speech recognition today and plug it into a von Neumann machine you would have a very useful machine. With the fast storage system, the peripherals, and those kinds of things augmenting their IBM compatible program, I see it as becoming evolutionary. Then at some stage the AI machine will take over, probably not before the year 2000.

***DTM*: How do U.S. AI research efforts compare to Japan's?**

Withington: All of the objectives and technologies listed in the Japanese papers are ones that are being investigated by various parties in the U.S. Most of the terms that are used are familiar to us, such as dataflow processing. I don't know whether the level of accomplishment is any greater here than in Japan. What the Japanese have done, though, is tie together a variety of AI services and techniques into a single package. I think that is an innovative approach in itself, one that I've never seen taken by American companies. But all of the pieces are already familiar to American researchers.

Gregory: I don't work in the AI field, so I won't comment.

Gregory: I don't think the Japanese would set a goal that wasn't going to result in a product design at some point.

Allen: In the U.S. AI research is very strong, probably stronger than in Japan. What is interesting is that American industry regarded a lot of AI ideas as wild, while the Japanese embraced these ideas more seriously. In the U.S., AI had been pretty much a university endeavor—MIT, Stanford, Carnegie-Mellon—until recently. It's only been in the last couple of years that a love affair has developed between AI and American industry. Fairchild, Atari, TI, HP—they never thought about it, but now they are hiring. AI has gone commercial in the U.S. now. I wouldn't be surprised if HP started selling Lisp machines pretty soon. They are certainly using them internally. Japan just came around earlier.

Goetz: I don't know, but I suspect that the U.S. is doing as much as the Japanese in terms of basic research in the area of AI, particularly at places like Stanford, MIT, and IBM.

***DTM*: Is there any indication that the Japanese can make more rapid progress than the U.S.?**

Goetz: No. I think what the Japanese have proved is that they can build reliable, very-high-quality systems that are less expensive than U.S. products. They have not been in the forefront of new technology, at least not in the computer industry. In software they have demonstrated no state-of-the-art capability. But what is needed most in the fifth generation proposal is software. They don't have a software industry; they basically use U.S. technology.

Withington: My answer is maybe so. They can afford, if they wish, to make long-term commitments of research funds for 10 years out or more. Also the Japanese may be more likely to make more rapid progress because research here is more fragmented. Among universities, communication is pretty good through the technical journals. But industrial research is more secretive and most of it is rather short term in orientation. So the Japanese plan may enable them to focus research people and money and make better progress than we can. Of course, that's not a certainty; we have seen a great deal accomplished through the profit motive.

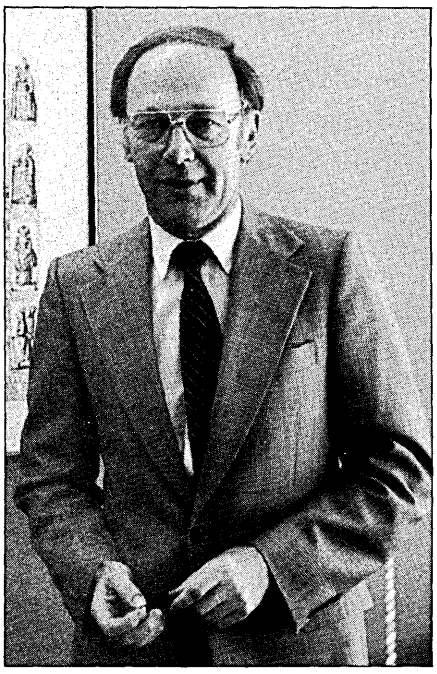
There is one other obvious thing: Japanese software does trail behind the U.S. Most of what is needed in the fifth generation project is software related. If Japan gets there before us, they will have to remedy their lack of software and pull ahead of the U.S. I don't know what the likelihood of that is.

Allen: It's hard to isolate any one thing, but I think there are a lot of things—many of them cultural—that indicate the Japanese may move faster than the U.S. They travel like mad, talking to everyone worth talking to. They read everything. They are very dedicated and work long and hard. My colleague at NTT is always in the office by 8 in the morning and doesn't go home before 8 at night, and does this six days a week. In Japan, ideas move more quickly from the university to industry. Japanese industry takes on riskier projects and is willing to wait for them to come to fruition, whereas in this country, people only want to take on those things that will generate a profit in a short period of time. That's a big difference.

Gregory: The answer to that is yes. Look at the way they have structured other projects in the computer field. They set up joint research efforts and cooperate at the basic technology level. When a technology has emerged that is capable of being manufactured, the results of that research are made available to each of the systems companies and then they compete. When they turn that technology into computer products, the computers look slightly different but they all have the same basic roots. That suggests in the AI field as well they will cooperate on the basic research and will make the research available to the systems houses. In that sense they are different from the U.S. because in the U.S. it is not easy to coordinate research between competing companies.

***DTM*: What are the U.S.'s weaknesses in the face of this Japanese challenge? What are our strengths?**

Gregory: It all really comes down to whether you are prepared to commit to a long-range investment program or not. One of our weaknesses is shortness of vision, our inability to take a long-range approach. It's a helluva sell to get a nation to commit to a national research program of that magnitude, particularly one based on something that is as much in its infancy as AI is today.


PETER GREGORY

But then you have to ask why IBM hasn't come forward with a proposal like this since they have the resources and dominate the customer base. They've been grappling with the problem of making systems easier to use for many years. You have to assume it is the focus on short- and medium-term profitability that frustrates the longer-range investments.

Creating a machine that is able to dialog with the man on the street—that's a whole new ball game and that's exactly what the Japanese are proposing. The only thing that can defeat it is that the man on the street may have learned BASIC before the AI machine gets on the market. Then the question becomes, do you really need a computer that can talk? Do you teach the man on the street a programming language or make a computer that can talk? We in the U.S. may be achieving the former.

The fundamental U.S. strength is innovation. I really have only seen the Japanese in the role of being superb adapters of a product, not as creators of something that is radically new. I think the U.S. is still a better environment for new ideas. They are generated under the pressures of the competitive system and I would hate to see that capability sucked into a Japanese national product program.

That really is the fear I have. The fifth generation project may look very appealing as an opportunity for sharing in research, but I believe the end product is a master plan to try to dominate the computer world with a capability nobody else will be able to come within miles of. If they have extracted the ideas of our people in the meantime, just as they have emulated IBM's machine designs, just as they have emulated Cray and CDC machine designs, they will pick up the idea, turn it into a product, and market it as successfully as we all know they can. If anyone is going to do that kind of thing in the U.S. it will be a small company—maybe three or four guys who broke away from a large company or university—that comes out with an AI program.

Allen: Our government provides zero leadership; there is no feeling of central government expertise. The long and short of it is that we end up with a more fragmented approach. That is not the case in Japan. We don't have anything corresponding to what they have, but then, I don't know that we want it. There is good and bad in it.

We don't get as uniform an attack on a problem, but then we may get more ideas. It is important in academia to have a wide vari-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Withington: One of the U.S.'s strengths is in software and the armies of programmers who think they can get rich by founding another VisiCorp.

ety of approaches. But at some point, people look at that diversity and label it fragmentation. Those at a university are the last people to worry about standardization. We should be the big risk takers. That's why I have some concern about AI being pulled too close to industry and standards. Academics aren't doing their jobs if they aren't way out on the edge taking risks. The problem is that in the U.S., society, through government and industry, should demand that [of universities] and support it.

Also, in the U.S., we have lost some of our confidence. In one respect, we've been on top and that's bad because if you're on top there is only one way to go. I think after the automobile industry downfall the U.S. suffered a psychological shock. We have to tighten up and get discipline. I don't think we are out of it; we are simply facing a group of highly motivated, well-trained people who know where they are going.

We still lead in the microprocessor area and we are very strong in software. The dataflow processing idea was generated in this country. AI is an American phenomenon. We are still very much alive in the IC area, CAD area. We don't have to lie down and play dead.

Goetz: I don't think of the U.S. as fragmented; it is a free enterprise system. The U.S. has done well in lots of high-tech areas by having a free enterprise environment with lots of innovation. Look at the space program. Rockets that were sent to the moon required lots of sophisticated components supplied from different organizations and from a competitive environment. Japan doesn't have this. When it is something that comes from a production line, however, Japan will do well.

Withington: I think the U.S. is weakest in management. The management of most U.S. corporations is oriented too much toward short-term profits. Often they are not patient enough to invest in long-term projects. At the same time, they don't subsidize work in universitites where long-term research can take place. So research at universities is small and fragmented and nobody puts in patient labor.

American's virtue is its willingness to take risks, risks in research and in innovative products, both in the venture capital market and in terms of personal risks. That matters most. Another of our strengths is in software and the armies of programmers who think they can get rich by founding another VisiCorp.

***DTM*: How do you think the U.S. computer community should view the Japanese proposal—as a challenge, a catalyst, or a blueprint?**

Goetz: I don't want to say it is a joke, because

F.G. WITHINGTON

there are probably a lot of very bright people involved. But it's certainly not a challenge. Perhaps one could view it as a catalyst. I think it is taking one direction to solve one set of problems—to reduce the cost of labor. It has a lot to do with robotics. But it does not address traditional uses of computers. There is great disillusionment with computers among business organizations. Computers have not come at all close to working satisfactorily, and that challenge is not addressed in the Japanese fifth generation. I think U.S. companies are addressing the problem of more effective use of computers within the business environment. In terms of other problems—reducing the cost of labor, developing new robots, providing more leisure time—the Japanese proposal may be a noble goal. It certainly isn't in the mainstream of the way computers are used today, though.

Allen: I would say as a catalyst—certainly not as a blueprint. What is right for the Japanese is not necessarily right for us. But they are on the move.

Gregory: As a threat. They're very consistent. They declare what they intend to do eight or 10 years ahead of time, then they spend the next eight or 10 years doing it. What the Japanese have attempted has always sounded outlandish at first. No one believed they were serious in the camera industry, in the auto industry, in shipbuilding. They were not believed to be serious as a major systems supplier and yet today they make an IBM-compatible machine that is twice as fast as the fastest machine that IBM makes. The Fujitsu 380 is as fast as an IBM 3081, but the 3081 has two engines, the Fujitsu doesn't.

I can remember in 1974 or 1975 when they laid down the very large scale integrated circuit program that was due to come to maturity in 1980. That was the program that resulted in the current generation of highly integrated logic components and the 64K RAM chips. I can't remember an instance when they said they were going to achieve a dominant position and didn't do it.

Even if the AI machine isn't made, you still have all that development and you can bolt it on the latest IBM compatible and get some of the functions. The spin-off from the program is going to be very substantial, even if AI is very slow, even if it can only be applied to a limited number of industries, even if you have to maintain parallel development in the von Neumann machines for another 10 years. They will capitalize on the starting point and get there in the end. I don't think you call it a challenge; it's a threat.

The success of earlier Japanese programs may be attributable to the U.S. business system. Any company that takes its sights off building the most advanced, innovative product feasible with current technology asks to be overtaken by its competition. Most major U.S. corporations' decisions are dominated by business planners whose motivation is conservative. In the computer industry today the major innovations are coming from small companies. In a *Fortune* article, quotes from two prominent people in the computer industry indicated that this is something not to be taken seriously. Essentially, they said the technology isn't proven and we shouldn't lose any sleep over it. The major concern I feel is that the major U.S. computer companies have become complacent.

Withington: With all due respect, I don't feel there will be a great deal of impact. Many U.S. companies already are supporting research in many of the areas the Japanese have singled out. And for another thing, the directions they have taken are not new.

One thing that did seem sparked by this was William Norris's idea to pool research effort among American companies. The idea certainly received a push forward from the fifth generation announcement.

***DTM*: What is the U.S. doing to protect its industry position?**

Goetz: Not enough. They should make sure there is an independent software industry through antitrust laws, so that one or two companies don't dominate the software or hardware business. IBM is gaining too much dominance. The free enterprise system is different from Japan Inc. In Japan, they have large companies under government control. I believe the free enterprise system is how innovation is best developed. We can stay ahead through a free enterprise system.

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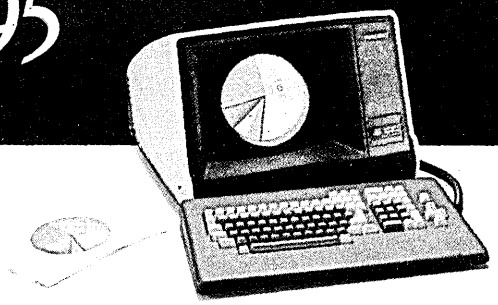

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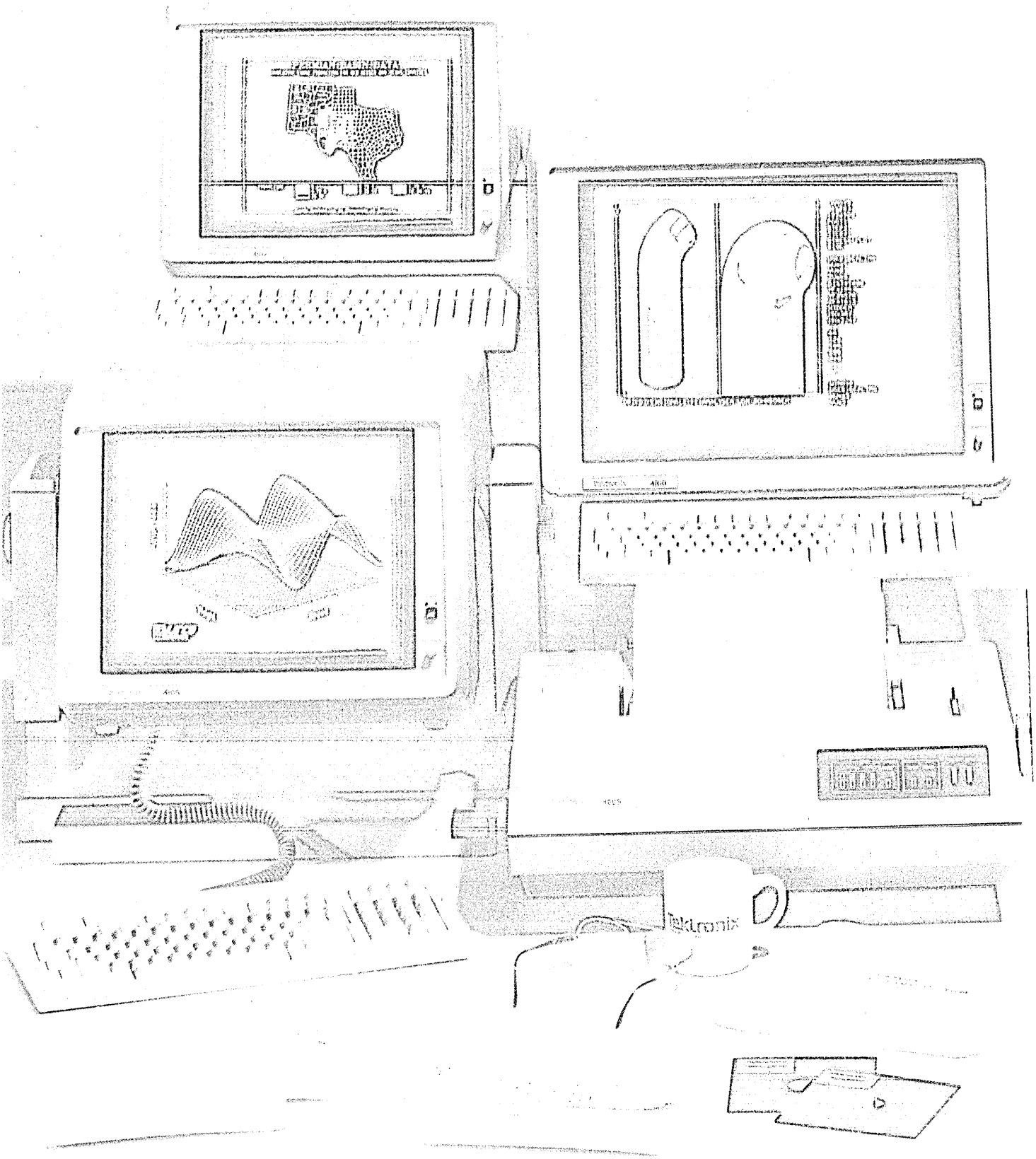

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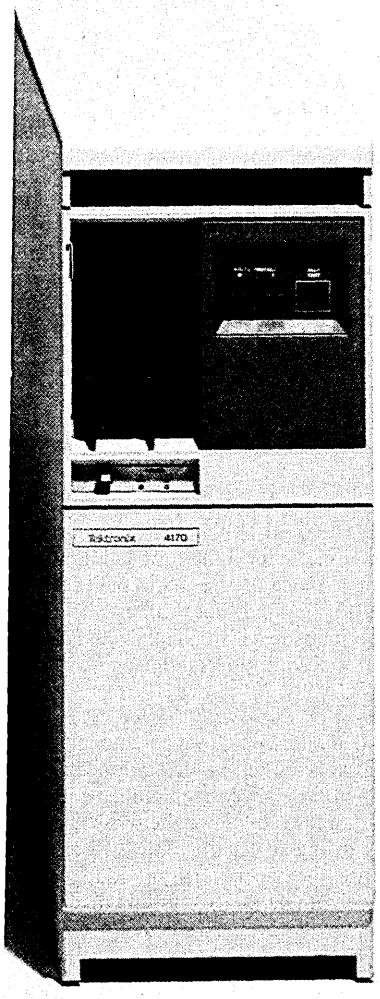

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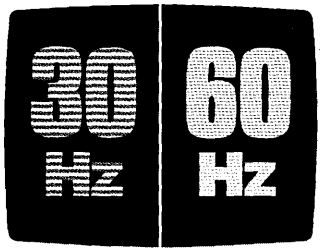

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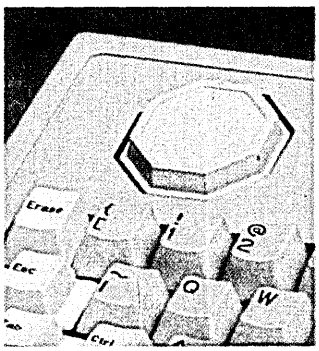

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Allen: They won't stick with Prolog or dataflow processing just because they made statements about them at a conference.

Withington: Nothing in an organized way. The government is taking action, for instance, by subsidizing the VHSIC project, entirely for selfish reasons. The Navy is funding some significant goal-directed research through DARPA. Also, the government is putting constraints on technology transfer; they are not permitting computers to be shipped to Communist countries. They are using protectionist mechanisms, with two objectives—national security in a military sense and to protect manufacturing jobs in America. I'm not sure they are exactly protecting American industry, though.

Allen: There are some efforts, such as the semiconductor group research being organized by CDC. But one company can't do everything. There needs to be more cooperation. There needs to be more willingness on the part of industry to fund more research at universities. We need money, they need our students. The trick is to arrange it in a way so that the research can be appropriate to the university.

Basically, though, if you want to protect your position, be the best. It would be very dangerous for us to get into a defensive posture. If we just sit around and react, then that means they are taking all the initiative.

Gregory: I'm not sure that Norris's cooperative research effort had anything to with the fifth generation. I think the pressure behind that was exposure to the problems in the component industry. I think what he is trying to do is organize cooperation among the electronics companies so that we can all build computers using a better family of electronics rather than wait until our electronics industry gets eaten up by the Japanese.

As for what is being done, the DOD has a program on very-high-speed integrated circuits, which should cover one of the boxes on the universal Japanese building block diagram. In software, there are several groups I see springing up now that are going to be expanding on the pioneering work in the AI area.

***DTM*: Has the fifth generation announcement influenced what you are doing or what your company is doing?**

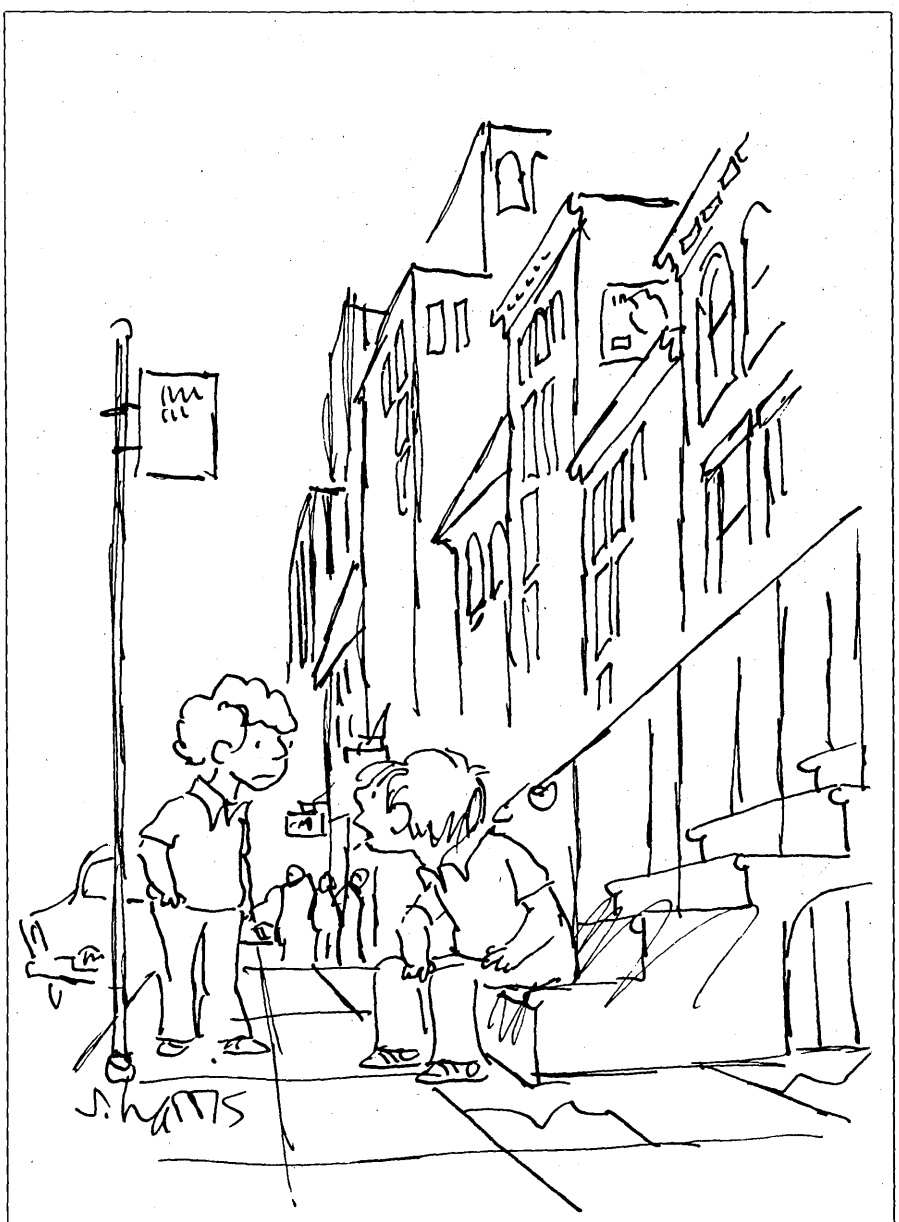
Goetz: No.

Withington: Not that I know of.

Allen: No, not me, but I think it has spurred industry, not so much to respond to the fifth generation effort in kind, but to think about how they can retain leadership and about cooperative efforts with other companies and universities.

Gregory: We are tracking the supercomputer program that appears on the diagram of the fifth generation program in a little box of its own. It's part of the program in the sense that it underpins it, but it's not a critical piece. They will use the technology program to drive the supercomputer program, but that is not to say they will develop a supercomputer that can talk. The fifth generation machine will be high performance, yes, but one that will be optimized toward a different kind of computation than high-speed arithmetic. It will have different architectures. We are looking at number-crunching machines; they are looking at machines that will handle those knowledge bases.

As far as Cray Research is concerned, we are going to continue to focus on our objective, which is to offer the highest performance supercomputers in the business. So, when the Japanese can offer an intelligent, conversational front-end computer, there will be a Cray supercomputer in the background.



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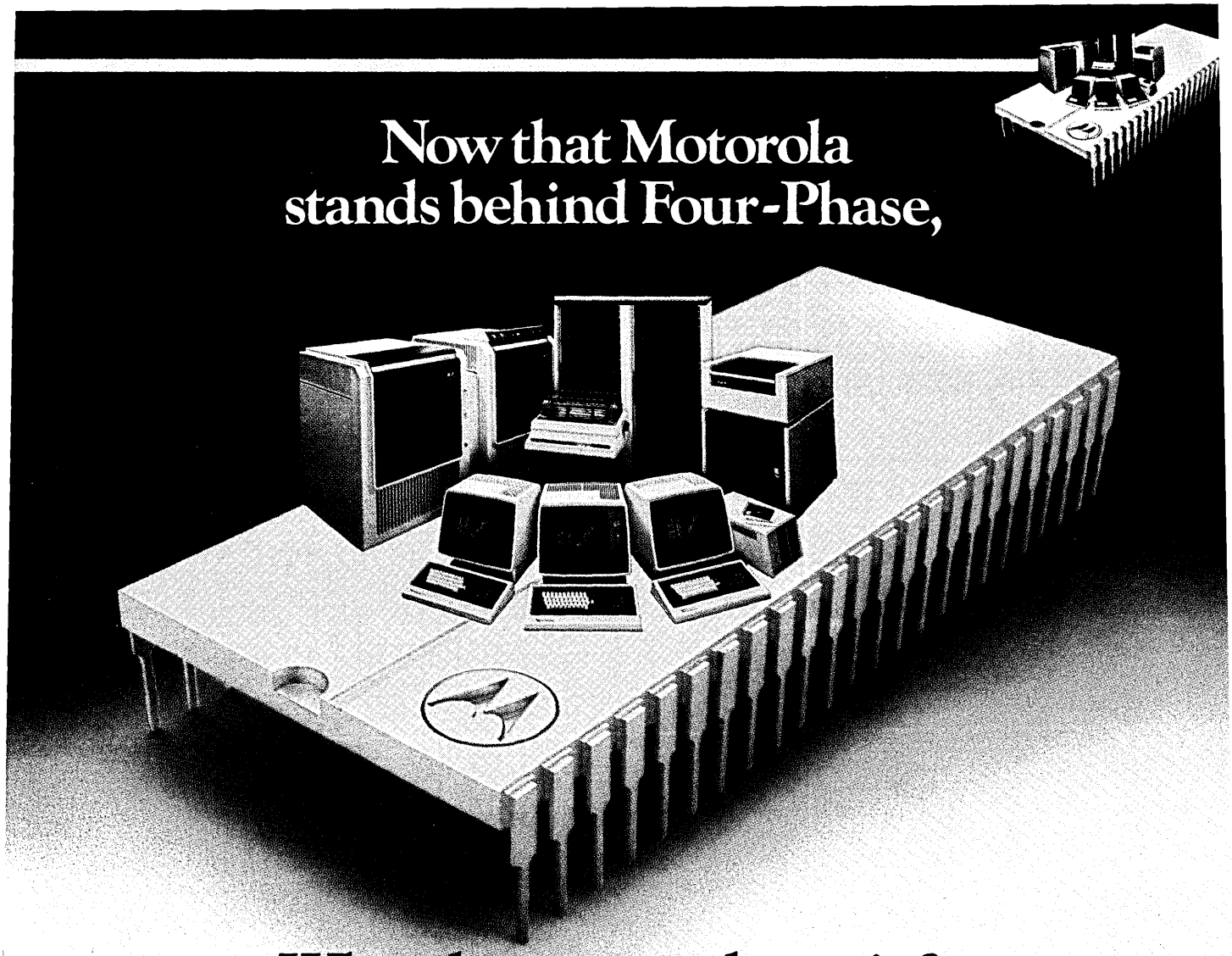

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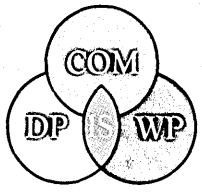

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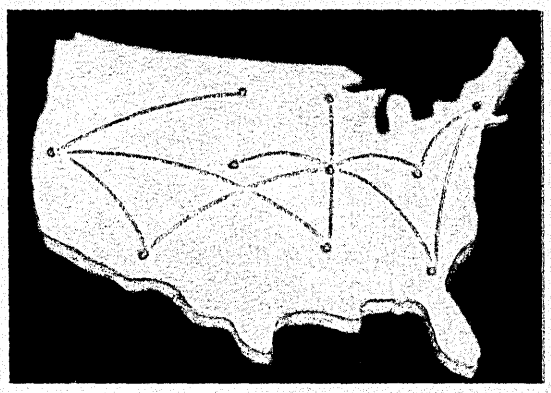

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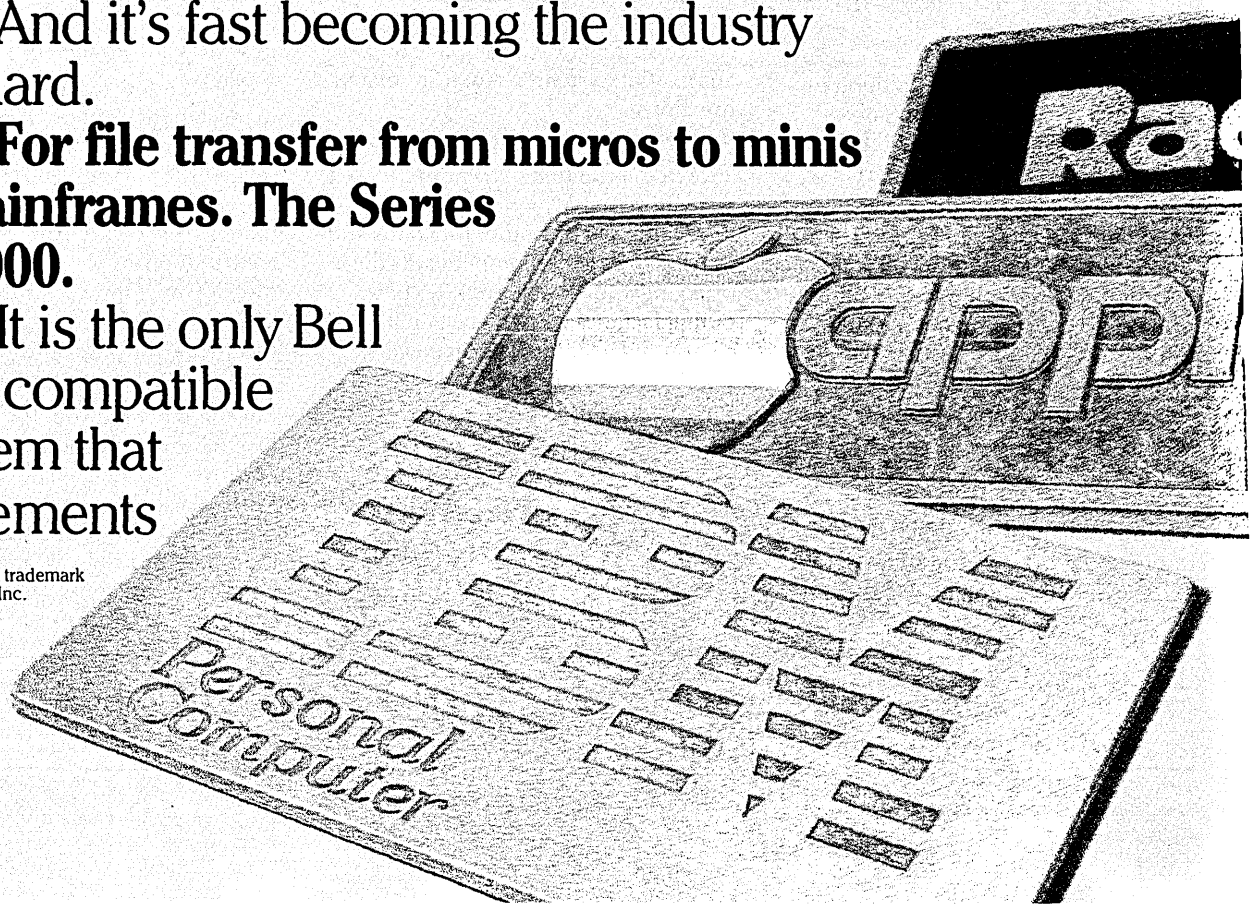

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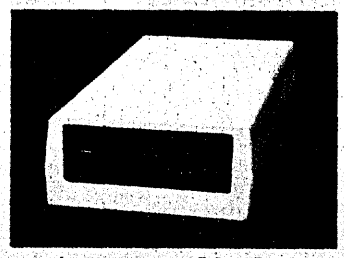

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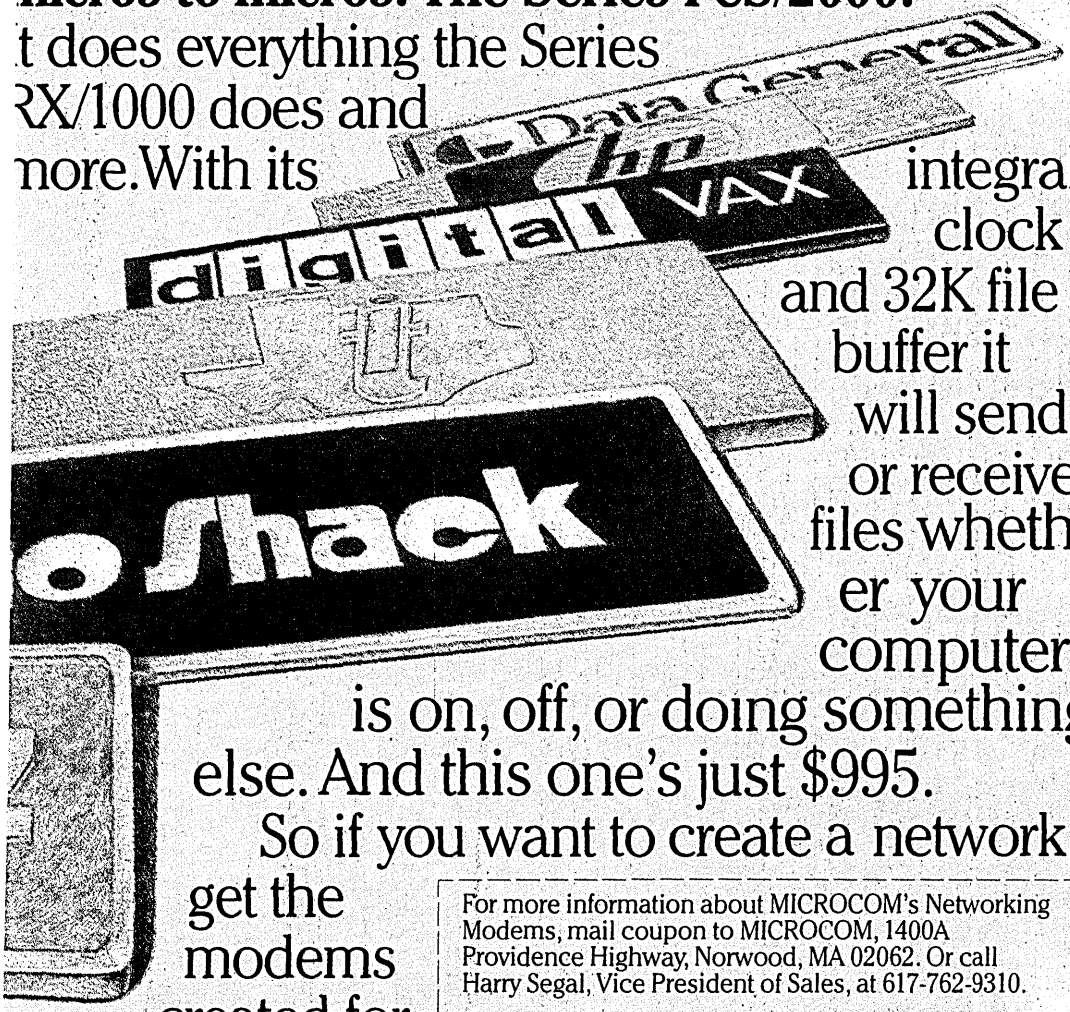

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Once we learn to listen to our users, teaching them will be easier.

USER TRAINING: LESS IS MORE

by Laura L. Scharer

For at least a decade dp people have emphasized long, thorough, formal user guides in their in-house training methods. But are these guides helpful to users? Let's look at a real training exercise to establish what users want and need from their training.

This particular case took place during implementation of an order processing system. Several dozen users had to be trained on over 20 on-line inquiry and update functions. The most important element of the training was a very thorough user's manual produced at a cost of over 100 analyst hours, plus word processing, copying, collating, and binding costs. In the manual, each on-line function was described in four to 20 pages of outline-style text. Small groups of users were given cursory verbal explanations of each function as they gathered around a crt. The users were then referred to the written manual for more detailed information. Questions were answered during these meetings and for several weeks thereafter. Telephone calls to the analyst were frequent.

This may appear to be a very successful training procedure, but here's what really happened.

Phase 1—the intensive training period:

Only 10% to 15% of the user trainees read the manual. Instead, they listened carefully during demonstrations, and many took notes. These notes were referenced continually, and users discussed the new functions among themselves. Within each group were one or two users who quickly understood the functions and became local heroes by helping everyone else in their department. Most of the teaching and learning was "show and tell" mode, not "write and read." During the initial training period, every question asked of the analyst was answered in the user manual. The manual was indispensable to the analyst. But for the users, the most frequently consulted reference during this period was a little sheet of paper with the name and telephone extension of the analyst-instructor. Every terminal had one of these taped on it.

Phase 2—six months after intensive user training:

Half a year later, no one else had read the user manual. Update pages to the manual generally had not been filed; in fact, several users could no longer find their copies. Questions regarding a function were, again, pursued first (and usually answered) within the user group. Few questions were posed to the analyst, and those that were could have been answered by referencing the manual. New users were trained by the more experienced users, again exploiting show and tell rather than reading.

The most-referenced paper during this period was a list translating old system transaction codes to new system transaction codes. The list had originally been jotted down for a user during one of the initial training sessions and had been xeroxed and passed along to other users. No one ever bothered to type this list or improve the quality of the xeroxed copies.

An important observation: users who didn't understand a field on a screen or the operation of a function did not pursue an explanation unless it blocked their jobs.

Phase 3—three years after user training:

Nothing new happened concerning the manual or the user's understanding of the system. Training was still by word of mouth. At this point, even the analyst was no longer informed of changes made to each function by the technical group, so the manual was decidedly out-of-date. Rare questions about a certain function could only be answered by consulting the manual or by examining program code. The analyst's recall was fading.

For those users who originally used the full-version manual, "cheat sheets" now proliferated. These were typically one-page summaries of the difficult-to-remember codes appearing on each screen. The cheat sheet grew as questions were answered verbally and the user jotted down notes. (Few users had studied the manual to extract their notes.) When these cheat sheets became too dog-eared and coffee-stained, users stuck them into glassine folders. Only a few typed or organized their cheat sheets.

Postscript:

As a group, the users quickly became proficient, the on-line functions were quite effective, and the system ran smoothly. The user training was successful, even if the formal user manual was not.

Throughout this story and countless other variations on it, the user's message is consistent: "I won't [or don't like to, or don't have time to] sit down and read a big, thick manual. But I like to have someone show me a system. I already know a lot of what you're telling me, so I'll just take notes on the new things. I'd be happy to help the other people who are having trouble. Let me practice. Let me discover some things for myself."

OPTIMIZE NATURAL PROCESS

Users have said this to analysts for years; why not give them what they want? The analyst should optimize, not disrupt, the user's natural learning process.

There are several elements in this process. First, users won't read a manual but they will learn from demonstration and verbal explanation. Users are also natural teachers. Virtually every user group has its official or unofficial leader who enjoys having the rest of the group rely upon him. In real situations, they follow the medical school maxim: see one, do one, teach one. For many users, training is supported by only a very small amount of writing, most of it informal.

Undeniably, some writing is required to support user training. Our challenge is to provide documentation that users will read and reference over and over. This usually means that if we write much less, our documentation will be used much more.

The most important document an analyst can give his users is the simple cheat sheet. It should be one page long and have wide margins and wide spacing so the user can add his handwritten notes. The cheat sheet must tell the user how to start each function. It should then expand the meaning of difficult-to-remember field headings and code values. (If this threatens to exceed the one-page rule, perhaps your efforts should be directed toward clarifying your displays.)

A cheat sheet should contain very few words, and only the facts. It should not have long sentences that bury the information you are trying to convey. For example, don't write:

There are four functions. Their transaction codes are:

ORDR—the purpose of ORDR is to provide order inquiry.

The analyst should optimize, not disrupt, the user's natural learning process.

COIN—the purpose of COIN is to cross-reference customers and orders.

CUIN—the purpose of CUIN is to provide customer information.

CCHG—the purpose of CCHG is to update customer information.

Do write:

ORDR—order inquiry.

COIN—customer-order ref.

CUIN—customer inquiry.

CCHG—customer update.

Finally, the sheet should include the name and telephone number of the user's trainer.

Any other written documentation you provide to the users should be guided by their requests. As you demonstrate a system and answer questions on the telephone, you can detect the areas that puzzle them and respond directly to these needs. Such explanations can usually be distributed quite adequately in memo form.

So, our traditional manual has been reduced to a cheat sheet with some memos stapled to the back of it. We can even provide the glassine folder. In most cases, this documentation works very well for three reasons. In the first place, traditional user guides address a good deal of information that is already common knowledge (i.e., keyboard operation, explanations such as QTY is the quantity field and it must be numeric).

Secondly, users of the 1980s have an excellent background working with the systems. They know standard dialogs and other basics. They've done it before.

Lastly, today's systems are more self-documenting and user friendly than ever before. If the user can get into a function, he can generally execute it.

There are, of course, individuals who may want or need to know more about a system than could possibly be presented in the cheat sheet format. The obvious example is the analyst, who must respond to questions in the years following system implementation. Another person who may wish more detailed system understanding is the line manager or supervisor who is responsible for system operation. For these people, the general design document is an excellent reference. Very often, if that document has been well prepared, there is little reason to translate its contents for reference after system installation.

TRAINING DEMONSTRATION

Live system demonstrations and personal interaction are considered the most useful elements of the user's training period. This is backed by some of the basic principles of teaching and learning. Most importantly, demonstrations offer the user a multimedia barrage of new information. Psychologists tell us that if a new concept can be experienced in many ways (see it, hear it, say it, write it), the learning process is more rapid and permanent. Generally, more information can be conveyed verbally than through reading in a given time. Additionally, a well-presented demonstration can grab and hold attention longer than a written document.

During a training demonstration, the user receives a degree of personal his attention and encouragement that makes him want to perform well. The user is more comfortable in the presence of a sympathetic and expert advisor—the analyst. Watching the successes, hearing the questions, and even witnessing the small and correctable mistakes made by his peers will also help alleviate the user's anxieties that could interfere with learning. Interaction with the users allows the analyst to detect areas of confusion, thereby giving her an opportunity to target written explanations properly.

Demonstration is not an easy or natural skill. Doing it right requires expert knowledge of system, preparation, organization, practice, and careful engineering of the training environment. The primary rule is to know your subject. Bring reference materials with you. If you must say, "That's a good question; let me research the answer and get back to you," you are not adequately prepared.

Limit the scope of any single presentation. Don't dump so many ideas on the users that they are inundated. Keep the sessions short and have more of them. Avoid fatigue, confusion, and frustration. Give each member of the training class a chance to try what you have just demonstrated. Let the users walk away with the satisfaction that they have grasped something. Control the presentation and stick to your subject.

Select your audience carefully. Depending upon how much training time is available, try to train in small groups rather than large ones. Make sure that the groups are homogeneous. If some of your users need basic keyboard training and others have been using the system for years, separate them. Be aware of each group's orientation so that your demonstration is within the context of familiar, everyday procedures. Emphasize normal cases in initial sessions, and progress to the exception situations (low-volume transactions) as familiarity with the system grows. (Incidentally, error correction is not usually an exception.)

Try to provide a physical environment conducive to the demonstration, and remember that on-the-spot training is not always best. Each member of the audience should be able to see, hear, and sit comfortably. Large monitors or screen-projected images from a crt are invaluable when training larger groups.

Finally, a demonstration must convey the critical information about each function but should allow some room for self-discovery. At the end of each training session, give an inviting and very short preview of what will be covered in the next session. For example: "Next time, we will talk about the product inquiry. You enter that inquiry by keying PRDT and the product number." By the next class, some of the users will, out of curiosity, already have learned PRDT.

THE LOCAL USER EXPERT

The third element of this new user training methodology is the local user expert, the person who emerges as the natural leader and teacher within each functional group of trainees. This user can normally be identified during the informal discussions and question-and-answer sessions that take place when the analyst is not present. The analyst can exploit this phenomenon by seeking the local expert before general training, giving him extra attention and training, and requesting his advice and support during the training period.

It is better to have one of the real hands-on users in the user expert position, rather than the trainee group's actual manager. A "working supervisor" (the "player-coach" often found in clerical groups) is an excellent choice for the user expert if he is indeed respected and proficient in his work. If he is also excited about the new system and committed to it, you have a winner.

The manager of the trainee group must be aware that you are selecting a local expert and must offer unfailing support to the technique. After all, he'll be investing his best person's time on the system, although he will receive many benefits in return.

Most importantly, once a user expert is trained, a person highly knowledgeable in the new system will always be present in the user area. The analyst is present only rarely during training, and even less frequently after training is completed.

In addition, training will be more effective and relevant. The user expert can relate much better to his group, speak its language, and make the instruction vivid with examples, such as, "Remember last week we had this particular problem? Well, now with this system, we can . . . ."

Training is more rapid. The user expert facilitates the informal learning that occurs in the analyst's absence, when users are independently trying new functions. And the faster training takes place, the faster the user area becomes independent of the systems group. Operations return to normal, and dp charges stop rolling in.

To the analyst, the local expert becomes an indispensible ally and lieutenant. Once he understands the system, he can ad-

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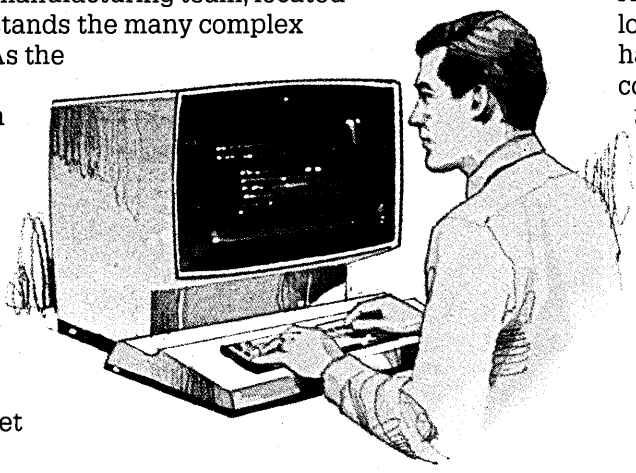

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CIRCLE 128 ON READER CARD

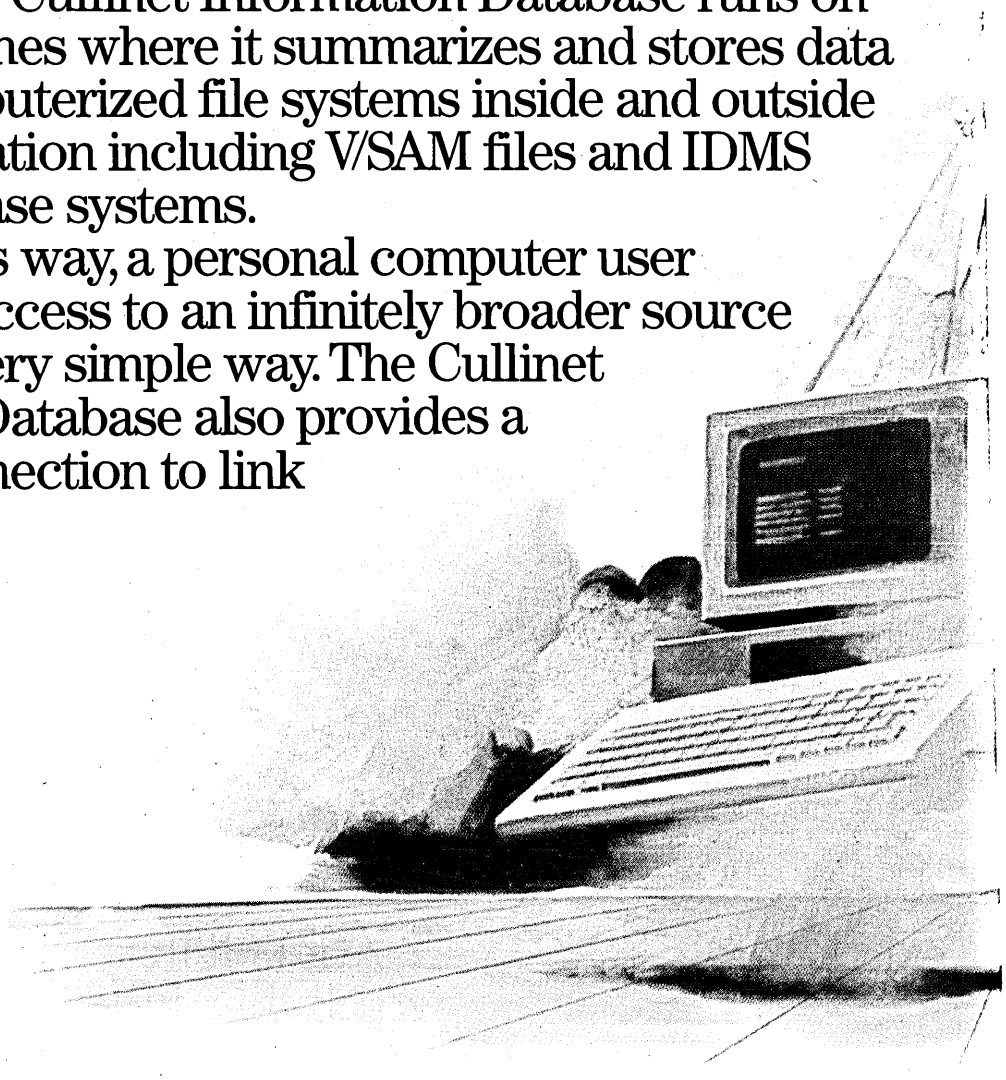
Taming the renegade p.c.

It starts with one personal computer. Then another. Then several. And over time it grows clear that personal computers are here to stay and that you, in data processing, will have to manage them.

Enter a relational-based information center for IBM and Apple's Lisa personal computers called the Cullinet Information Database.

The Cullinet Information Database runs on IBM mainframes where it summarizes and stores data from all computerized file systems inside and outside of the corporation including V/SAM files and IDMS or IMS database systems.

This way, a personal computer user gains direct access to an infinitely broader source of data in a very simple way. The Cullinet Information Database also provides a software connection to link



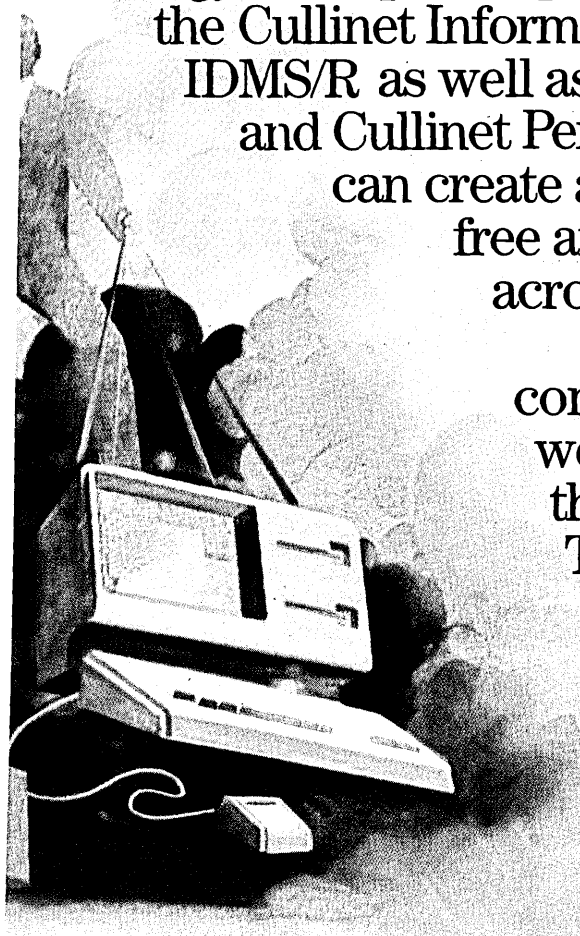
personal computers in a network. Thus, giving the people who use personal computers a way to share their information with others.

Now you can bring a workable and defined strategy to corporate personal computing. And because the Cullinet Information Database integrates with IDMS/R as well as Cullinet's Applications Software and Cullinet Personal Computer Software, you can create a system, from one supplier, for a free and fluid exchange of information across the whole corporation.

You can, in short, turn personal computers into the useful tools they were always meant to be. Instead of the renegades they've become.

The answer is software.

And software is Cullinet.



Cullinet

Is your most productive asset all washed-out?

Look at it this way.

If you had to squint to focus on washed-out screen characters. Hour after hour. Just how efficient would you be?

The fact is, poor CRT contrast takes its toll. On your terminal users. And on department productivity.

But now there's a sensible solution.

Introducing Glare/Guard® anti-glare panels.

Glare/Guard instantly eliminates up to 94 percent of all CRT glare. Resolution is always sharp. And image brightness and clarity are dramatically enhanced—even under bright, fluorescent lighting.

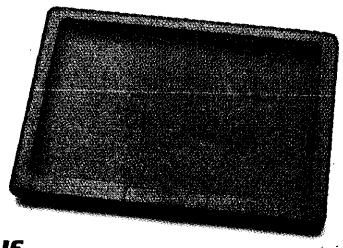
Without anti-glare panel | Etched panel | Glare/ Guard

The result? No screen washout.

Glare/Guard's secret is HEA®—a special High-Efficiency Antireflection coating we applied to the windows of NASA's Space Shuttle. And only Glare/Guard has it.

Glare/Guard's durable, laminated-glass design lasts indefinitely. It quickly retrofits to virtually every leading display terminal—no tools required. Its smooth surface is easily cleaned. And Glare/Guard sells for $99, regardless of display size.

Of course, there are less expensive anti-glare products available. But the nylon strands of mesh screens cause fuzzy images. While etched panels merely spread glare around and blur resolution.



Only Glare/Guard does exactly what an anti-glare panel is supposed to do. And that's getting your terminal user's attention out of the glare, and back onto the screen.

Try one. And see for yourself.

Place a trial order from your dealer and install Glare/Guard on your busiest terminals.

Then sit back and watch.

You'll see the difference. On the CRT screen. And in your terminal user's performance.

For your free brochure, talk to your authorized Glare/Guard dealer. Or call 800-447-4700. Glare/Guard, OCLI, Dept. 109D/TO, 2789 Northpoint Pkwy., Santa Rosa, CA 95401. Syntopican Booths 722 & 723. NCGA Booths 2141 & 2142.

Glare/Guard®

A difference you can see.

CIRCLE 130 ON READER CARD

Live demonstrations and personal interaction are considered the most useful elements of the training period.

vise the analyst on all aspects of training—what time to hold sessions, who should be grouped together, what needs to be written down, what subjects should be stressed, and what confuses the users as they practice. Best of all is when the local expert stands with the analyst during training sessions to teach. Sometimes the expert takes over—Ms. Analyst, sit down and let him. You have succeeded brilliantly.

The user expert can be a calculated part of training because today he is out there. In this way, we are exploiting the growing sophistication of the user community to the advantage of both parties.

The user expert is so important to training that if he isn't born (or doesn't identify himself) make one. And have his manager commit to an unending line of experts. If the original one leaves the group, another should be trained.

FORMAL USER MANUALS

So far, our training scenario hasn't mentioned formal user manuals. But, there are times when a formal manual must be prepared. There are other times when a user manual is totally discretionary. We must decide, in each case, whether one is needed. Don't prepare a manual reflexively because you think it is one of the service requirements of your job. Prepare one only if it will serve the users.

A thorough user manual is necessary in several instances. For example, prepare one whenever the end users are geographically removed from the systems group, or when a teacher will be available for only a short period or not at all. Of course, if user management requests one, you should comply. In this case, management should be aware of the costs involved in preparing a manual and should encourage its use by trainees to offset the expense. Probably the best reason for preparing a formal manual is the recommendation of the user expert. The assumption is that he knows his group and has a feeling for the manual's usefulness in his specific environment.

Certainly, if it will be used, write a manual. But, as always, look for efficiencies when you prepare it. Cut out the dead weight, and present succinctly the information users need to have. Always include:

1. A list of the functions available to the user and the purpose of each one. Confronted by a problem or question, the user should be able to go to the manual and decide which function to execute.
2. Instructions for initiating execution of each function. Get the user started.
3. The meaning of messages.
4. An interpretation of all field descriptors and field values that may appear.

To make all this worthwhile, organize the manual so that information is easy to find. More manuals fail because the user can't find information than because the information isn't there. Provide an index and separate sections with plastic tabs and type obvious headings on every page of the manual.

Convey as much information in pictures as possible. Avoid illustrating a function on one page and explaining it on succeeding pages. Let the picture speak for itself. For example, a facsimile of a screen can be supported by marginal notes (in the analyst's handwriting) explaining the fields on the screen. The technique is certainly not artistic but it is very easy to prepare and reference.

There are also some things that don't belong in a formal user manual. Do not try to sell or justify the system through the manual. Forget the flowery language and excessive words altogether. Don't make it difficult for users to find what they need. Do not explain system internals or even very complicated error-correction procedures, especially those where the systems group must assist in recovery. Instead, be certain that the user can detect when such a situation has occurred, and instruct him to "call the data processing department for assistance."

IN-LINE TRAINING AIDS

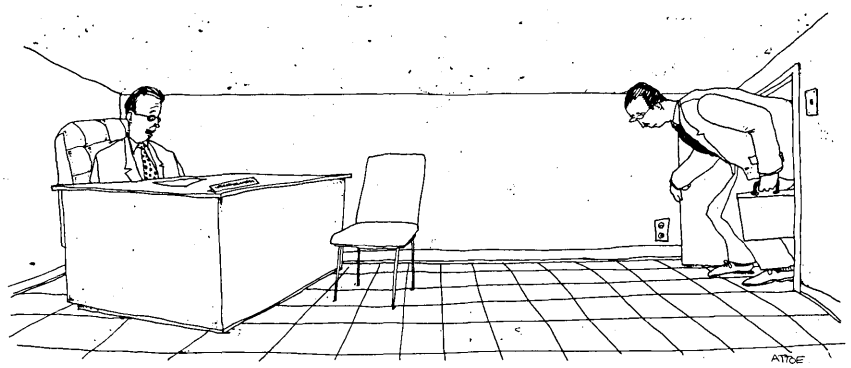
Training and subsequent recall can be assisted by integrating instructional aids with the on-line functions and reports that comprise the user interface. Some in-line aids available to the analyst and user are:

1. Obvious field descriptors and values. Unintelligible abbreviations and codes are replaced by complete words or good mnemonics.
2. Keys or legends translating the meaning of encoded or abbreviated fields. These are useful in cases where shortened forms are necessary to fit columns to the width of a report or screen, but some space can be spared for special messages or footnotes.
3. "Next step" operational cues that guide the user in executing each function. These, too, can be included on each screen or page.
4. HELP screens that are functionally connected to on-line tasks. These screens offer the advantage of virtually unlimited space and selective use. Additionally, because they are physically separate from the primary function, they do not interface with normal-case operations.
5. Data dictionary access from an on-line system. Data dictionary entries can provide a separate and universal source for data element descriptions.

Essentially, in-line aids can be thought of as electronically connected cheat sheets. In-line instruction is an added cost, however, because in most cases potentially active function space is replaced with passive space.

This cost can be balanced by a number of potential benefits. Two such benefits: in-line aids are always available to the user to help assure that a function will be executed properly and interpreted correctly; and the constant presence of in-line aids contributes to the effortless incidental learning that is possible through frequent and comfortable exposure to new information.

Prototyping is a system development technique that can be distinguished by user interaction with a working system model. When prototyping has been used to define a system, the analyst must consider some additional opportunities and problems during user training. First, on the positive side, the users—or at least those users selected to participate in requirements definition—begin their training very early in the project. In fact, if the end users all participate in requirements definition and a full working model is prepared, user training can virtually be complet-



"Please, sit down."

CARTOON BY STEVE ATTOE

To the analyst, the local expert becomes an indispensable ally and lieutenant.

ed as a by-product of definition activities. At the very least, the user expert can be identified and trained during the prototyping iterations. If a larger user audience must be addressed, the prototype can be used as a training tool long before the finished system is available, thus expending training time.

These advantages are offset by some potential problems, most of which arise from a common source—the possibility of boredom with a system after oh-so-many demonstrations. Users may lose their eagerness to see and try the new system by the time their real training begins. Likewise, the analyst may feel she can deemphasize the training period because so much time has already been spent with the users. Unless the system was fully prototyped and all users participated in requirements definition, user training must take place to be certain that the full user audience is addressed; that all system features, especially those not originally prototyped, are covered; and that the slight differences between the model and the working system can be pointed out.

A special caution is in order when the implemented version of a system and the prototype do in fact contain operational differences. In this case, the analyst and users may have to unlearn the model to learn the new system correctly. Psychologists have written that task interference—the knowledge of similar but different tasks—will often block new learning.

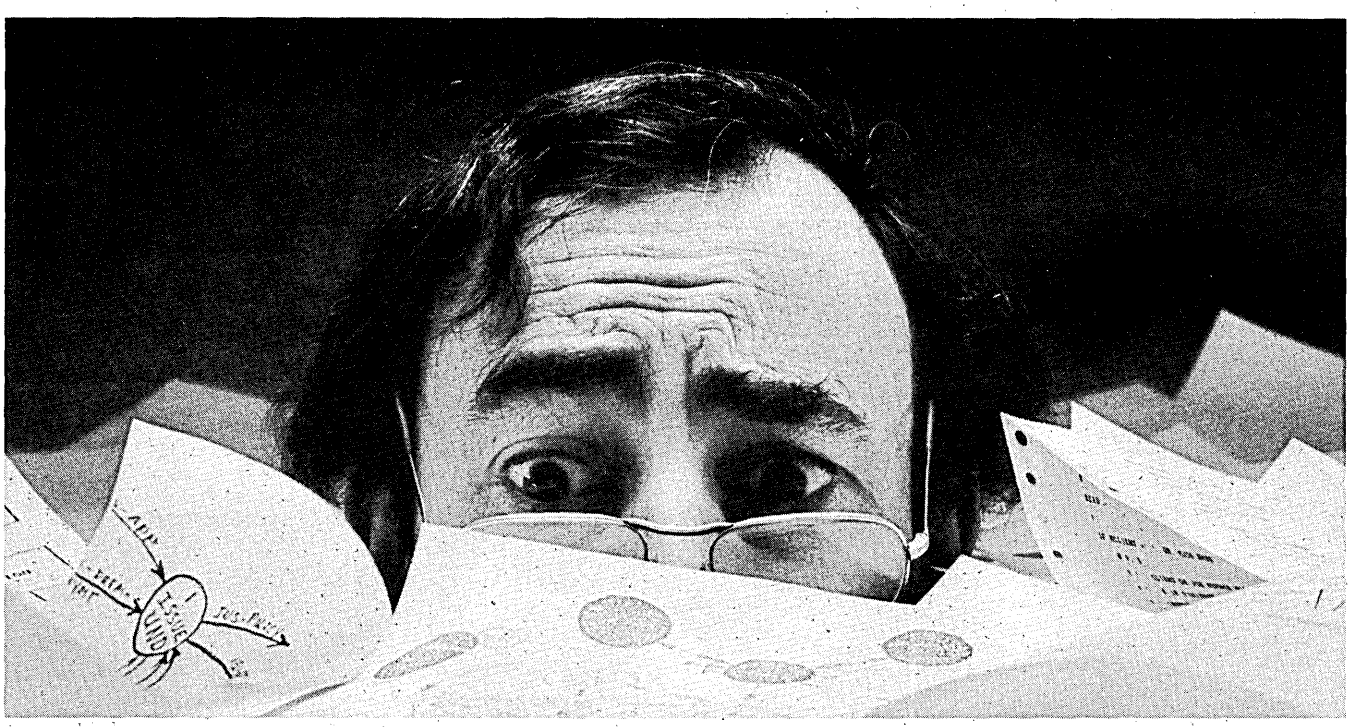
This approach to user training has some potential for economic payback, especially the cost-avoidance of developing large, expensive, throwaway user manuals. For example, cost to produce the user manual described at the beginning of this article was over $3,000 and it was rarely user-referenced. The cost savings that might be achieved, however, are much less important than two other things: the increased effectiveness of the training, and the increased productivity of the analyst or trainer. In fact, the productivity measure for user training can be stated as the output (how much useful training occurs) as a result of the input (the trainer's efforts).

An important warning is in order. Payback in effectiveness and productivity will be realized only if this approach is used when appropriate. This is an alternative, not a shortcut intended to cheapen the training effort. In fact, when user training is very critical, the best approach might be to provide more, not less—to combine a very thorough manual with the demonstrations, cheat sheets, and user experts.

User training can be an exercise in futility. Successful training is rarely congratulated or noticed, while unsuccessful attempts can almost singlehandedly invalidate man-months and man-years of investment into system design and construction. Even when training is apparently successful, the investment in formal training materials often cannot be justified by their real use.

But there are three powerful informal elements to user training that can be exploited: the cheat sheet, training demonstrations, and the user-expert. Introducing these elements into the training regimen by strategic choice rather than by accident can improve the productivity of the analyst and provide the user with the training tools that he really wants and needs. *

Laura L. Scharer is project manager, systems analysis, with O.M. Scott & Sons, Marysville, Ohio. Before joining Scott ("The Lawn People") in 1977, Ms. Scharer was on the staff of a small consulting group based in Columbus, Ohio.



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D7/83

CIRCLE 93 ON READER CARD

Newcomers TeleVideo and Altos made inroads as oem suppliers, but IBM may dominate another market.

THE SYSTEMS HOUSE SHUFFLE— MICROS IN, MINIS OUT

In California, or in a California state of mind, people say that less is more. In systems houses and oems, people say that smaller is bigger, for during 1982, sales of personal computers jumped nearly 70% from the prior year, according to a survey by Sentry Database Publishing, Hudson, Mass. In addition to selling all those micros, the value-added remarketers did a gold-rush business in peripherals and applications programs. At a time when unit sales of minicomputers to these same companies declined slightly, the small systems boom enabled the 2,002 organizations surveyed by Sentry to increase their aggregate revenues to a record $3.7 billion.

The survey for the *Directory of Systems Houses and Computer Oems* included 70% of America's systems houses and oems, representing the market as a whole. The survey respondents sold more than 171,000 computers last year, nearly 122,000 printers, more than 104,000 crts, 83,000 disk drives, and thousands of other products. This mountain of hardware was accompanied by hundreds of thousands of software programs covering every conceivable business use.

Software houses got a noticeably bigger slice of a growing pie during 1982, while the aggregate of dealers, distributors, and commercial oems lost market share even as they achieved larger volume as measured by the number of systems sold. The year saw some big and surprising changes in market penetration by makers of processors and peripherals, many of them owing to superior products and effective distribution.

Not all the survey results are consistent with a single trend, nor should they be. The companies surveyed range from tiny shops with a few employees and sales of less than $50,000 to organizations with more than 1,000 people on the payroll and revenues in excess of $100 million. But there are discernable directions, particularly as feature-packed small machines gain acceptance among the end users served by our survey base.

For one thing, personal computers are not, for many users, simple appliances that can be plugged in and put right to work. To

FIG. 1

PERCENT SHARE OF MINICOMPUTERS SOLD VIA SYSTEMS HOUSES/OEMS

MANUFACTURER	1978	1979	1980	1981	1982
Data General	20.7	20.2	21.6	21.5	11.5
Datapoint	1.4	1.4	2.0	4.2	4.1
Digital Equipment	40.7	46.2	43.5	48.4	42.8
Hewlett-Packard	4.9	3.7	5.2	6.0	7.2
Honeywell	1.4	1.9	1.8	2.5	1.4
IBM	1.3	2.4	5.4	3.2	4.7
Prime	0.7	1.3	1.5	1.5	11.0
Texas Instruments	5.3	2.0	2.1	1.8	5.5
All others	23.6	20.9	16.9	10.9	11.8
Total Sample (units shipped)	**10,546**	**11,089**	**14,066**	**14,463**	**13,440**

FIG. 2

PERCENTAGE OF PERSONAL COMPUTERS SOLD VIA SYSTEMS HOUSES/OEMS

MANUFACTURER	1978	1979	1980	1981	1982
Alpha Micro	—	—	—	1.5	1.0
Altos Computer	—	—	—	—	4.9
Apple	22.4	19.0	48.7	37.9	20.3
Cado	—	—	—	—	1.3
Commodore	0.3	13.0	5.9	6.5	5.4
Cromemco	4.6	4.6	1.7	2.1	2.4
Digital Equipment	—	—	—	—	1.0
IBM	2.3	2.2	1.5	3.7	11.3
Intelligent Systems	—	—	—	—	1.2
Intertec Data	—	—	—	—	2.0
Northstar	9.3	5.0	2.1	4.3	6.1
Osborne	—	—	—	—	1.9
Radio Shack	—	—	—	1.9	1.2
TeleVideo	—	—	—	—	3.5
Texas Instruments	—	—	—	—	3.3
Vector Graphic	1.4	3.7	4.8	1.2	1.6
Wang	14.0	9.6	5.4	4.8	2.5
Xerox	—	—	—	1.2	3.4
All Others	45.7	42.9	29.9	34.9	25.7
Total Sample (units shipped)	**4,639**	**9,344**	**18,188**	**21,750**	**36,792**

ILLUSTRATION BY RICHARD EGIELSKI


SYSTEMS
HOUSE
52

Floppies remain the most popular type of disk, but they are not the fastest-growing kind.

take advantage of the available technology, many users must hire systems houses and oems to assemble, configure, and program personal computer systems. The availability of inexpensive computers has opened up new opportunities to value-added remarketers in fields that were not automated in prior years and for smaller companies in business sectors where, until recently, automation has been unaffordable. In particular, more and more software applications are being sold to users in agriculture, food service, finance, publishing, and travel. At the same time, oems and systems houses are witnessing a slump in sales of applications for systems in certain manufacturing-related areas.

The biggest changes in the way systems houses and oems do business seem to be reflected in the 7% decline in minicomputer shipments (by number of machines) from 1981 to 1982. It appears that some of the applications that formerly used minis now run on micros, and this change may help explain the market penetration shift.

FIVE INDUSTRY CLUSTERS

Industry participants were grouped into five clusters. Hardware/product oems sold the most systems, 33% of all those accounted for by our survey. In this scheme, companies in the group design, manufacture, and market standard, off-the-shelf products built around minis or micros. They generally have unique offerings protected by patents or trademarks and usually make their gear on assembly lines. Organizations in this sector grossed 24% of the $3.7 billion in systems sales the survey base logged in 1982. Yet in terms of the number of firms in our survey sample, they make up only 17%. Their share of market, by number of systems, dropped from 1981, but their share of aggregate revenue increased. In short, these companies represent a diminishing share with growing revenues.

The next largest sector of the business, selling 25% of all systems logged, was the category called systems houses and integrators. Companies in this group make customized systems to order. They comprise 42% of the organizations surveyed and take in 40% of the revenue in the business. Compared to 1981, the situation for 1982 for these organizations shows they remain in about the same place relative to other kinds of oems and systems houses.

The next smallest sector includes dealers, distributors, and commercial oems who, all told, sold 23% of the systems reported to us while accounting for 16% of the aggregate revenue. They make up 19% of the firms in our survey base. Their ranks include independent dealers, or distributors that buy whole systems for single vendors. In many cases, they add value by supplying applications software.

Software houses and software oems represent a growing part of the business. These are companies that do not make hardware but do provide software and support to end users. They sold 15% of the systems and generated 17% of the revenue in our survey base. This is an uptake from 1981, when they sold 13% of the systems but generated only 12% of reported revenues. Their population totals 19% of all systems houses /oems.

The last group in the survey is retail stores. They sold 5% of the systems and brought in 3% of the revenue. Only 3% of the companies we polled are in this group, and,

FIG. 3

1982 GAIN IN SYSTEMS SOLD VIA OEMS

Agricultural accounting	+596%
Estate planning, portfolio analysis	+533
Restaurant accounting	+485
Mail list processing	+458
Travel agency accounting	+304

1982 DECLINE IN SYSTEMS SOLD VIA OEMS

Numerical control tape preparation	−84%
Master production scheduling	−69
Bill of material processing	−69
Industrial robot control	−65
Machine tool control	−64

FIG. 4

PERIPHERAL SALES VIA OEMS

	QUANTITY SOLD VIA OEMS				
TYPE OF PERIPHERAL	1979	1980	1981	1982	% CHANGE
PRINTERS					
Dot matrix	11,149	15,920	51,156	68,994	+ 35%
Letter-quality (daisy-wheel, thimble)*	—	—	—	20,524	N.A.
Line printers (under 300 lpm)	9,869	3,116	8,710	6,494	− 25%
Line printers (300 lpm & up)	1,149	3,266	6,833	6,581	− 4%
Teleprinter terminals (with keyboard)	9,751	5,263	27,633	19,403	− 30%
Group Total	**31,918**	**27,565**	**94,362**	**121,996**	**+ 29%**
DISK DRIVES					
Diskette (floppy) drives	7,072	24,187	41,236	44,553	+ 8%
5¼-inch Winchester drives*	—	—	—	14,250	N.A.
8-inch Winchester drives	134	1,170	4,558	8,423	+ 85%
14-inch Winchester drives*	—	—	—	3,690	N.A.
Fixed disk drives	245	336	682	3,675	+439%
Removable disk drives	4,371	8,376	11,197	8,958	+ 20%
Group Total	**11,822**	**34,069**	**57,673**	**83,549**	**+ 45%**
TAPE DRIVES					
Cassette/cartidge drives	2,208	2,082	4,444	6,708	+ 51%
Reel-to-reel drives	834	3,264	4,323	4,296	− 1%
Group Total	**3,402**	**5,346**	**8,767**	**11,004**	**+ 26%**
CRT TERMINALS/ MONITORS					
Alphanumeric	28,275	37,425	89,008	96,007	+ 8%
Graphic	2,486	1,591	5,578	8,006	+ 44%
Group Total	**30,761**	**39,016**	**94,586**	**104,013**	**+ 10%**
OTHER					
Memory expansion boards	7,183	2,833	13,034	14,643	+ 12%
Digital plotters	748	152	773	1,205	+ 56%
Group Total	**7,931**	**2,985**	**13,807**	**15,848**	**+ 15%**

*New category this year

FIG. 5

DOT MATRIX PRINTER MARKET SHARE

MANUFACTURER	1981 Oem Market Share	1982 Oem Market Share
Anadex	0.3%	2.4%
Centronics	4.3	2.4
Dataproducts	0.9	1.2
Datasouth	0.6	2.4
DEC	10.2	17.5
Epson America	12.1	25.3
Facit	—	1.4
IBM	0.3	1.6
Mannesman Tally	0.5	1.1
NCR	0.1	1.0
Okidata	0.6	9.0
Texas Instruments	22.0	17.6
Wang	1.6	1.2
All others	46.5	15.7
TOTAL UNITS	51,156	68,994

FIG. 6

LETTER QUALITY PRINTER MARKET SHARE

MANUFACTURER	1981 Oem Market Share	1982 Oem Market Share
C. Itoh		1.2%
Dataproducts		1.1
DEC		2.0
Fortune Computer	New category	1.2
NEC	in this	38.2
Qume	year's	15.3
Wang	directory	1.9
Xerox/Diablo		17.4
All others		21.7
TOTAL UNITS		20,524

FIG. 7

FLOPPY DISK DRIVE MARKET

MANUFACTURER	1981 Oem Market Share	1982 Oem Market Share
Apple Computer	3.1%	6.6%
Commodore	1.0	2.4
IBM	0.4	7.2
Mitsubishi	—	1.7
Remex	0.3	1.8
Shugart	45.2	12.6
Tandon Magnetics	1.3	24.3
Wang	1.4	1.3
All others	47.4	42.1
TOTAL UNITS	41,236	44,553

like systems houses, they hung in there at about the same overall share of market during 1982 as in 1981.

All told, participants in these various aspects of the systems house or oem trade sold 171,236 minis and micros last year. They identified 50,232 of the computers by maker, and of those so identified, 13,440 were minicomputers, while the remaining 36,792 machines were micro based.

Digital Equipment is the leading minicomputer vendor, with a 42.8% share of market. This is a drop from 1981's 48.4%, but clearly the biggest piece of the pie anyway. Data General is number two, just as it was the year before, but the company did suffer a loss of market share from 21.5% in 1981 to 11.5% in 1982.

Coming up even faster than Data General is sliding is Prime Computer, number three in '82 with an even 11% of the market, versus 1.5% of the mini market in 1981. The Natick, Mass., company last year offered huge discounts to oems, up to 50% off list to some remarketers that wrote new applications software. Hewlett-Packard is fourth in the mini business among our respondents, with 7.2% of the market, while Texas Instruments runs fifth, with a 5.5% market share.

Among makers of micros, Apple ranks number one in 1982 (as it did in 1981), but a big piece of the company's market share is being lost to IBM. Apple sold to systems houses and oems 20.3% of the microprocessors bought in 1982, compared to 37.9% in 1981. IBM, with 11.3% of the 1982 micro market, rose from a 3.7% share in 1981.

After Apple and IBM in our survey comes North Star, with a 6.1% market share, up from 1981's 4.3%. Commodore got 5.4% of the market in 1982, down from the prior year's 6.5%, while Altos, which didn't show up in the 1981 survey—it was one of the so-called others—sold 4.9% of the micros identified by survey respondents.

DISK DRIVES A HIT

Among the various peripheral devices sold by oems and systems houses in 1982, disk drives were the biggest hits. Some 83,549 were moved during the year, a 45% jump from 1981's 57,673. Floppies remain the most popular type of disk, but they are not the fastest-growing kind. The 44,553 floppy drives sold in 1982 made for only an 8% increase over the prior year's shipments. Systems houses and oems bought 14,250 Winchesters (5¼ inch) in 1982. This type of disk was not in the 1981 survery, but suddenly the mini-Winnie is big business. Larger Winchesters were popular, too, and the 8-inch type hit sales of 8,959, an 85% increase over the prior year's 4,558. In addition, some 3,690 14-inch Winnies were bought by our survey group along with 3,675 units of unclassified fixed disks and 8,958 units of removable-media hard disk.

Tandon is the biggest factor in the floppy disk market, accounting for 24.3% of the purchases by oems and systems houses. A year earlier, Tandon's drives were named by only 1.3% of our survey respondents. Shugart, number one in 1981, is number two in 1982. With 12.6% of the market in the most recent poll, it accounted for 45.2% of the floppy business in 1981.

Tandon is also the winner in the 5¼-inch Winchester market, with a 23.2% share. Right behind Tandon is Caelus Memories, with 21.1% of the market.

Quantum Corp., with a 38.2% share of market, wins 1982's 8-inch Winchester sweepstakes; the company had only a fraction of a percent of the market in 1981. Shugart is number two here, with 16.5% of the market, up from 7.5% a year earlier. In the 14-inch race, Priam comes out on top with a 13.4% market share, while Control Data, with 11.6%, is number two.

Oems and systems houses purchased 121,996 printers in 1982, 25% more than the 94,362 they bought in 1981. The fastest growth was in the dot matrix business, which accounted for 68,994 machines. Survey respondents bought 20,524 letter-quality printers, the second most popular category, followed by telepinter terminals (19,403 units) and, running neck and neck, the two groups of line printers. Systems houses and oems bought 6,494 line printers running at under 300 lines per minute in 1982 and 6,581 printers running at 300 lines per minute or faster.

Epson is the favored vendor of dot matrix printers, with 25.3% of the market, up from its 12.1% share in 1981. Texas Instruments, with a 17.6% market share and DEC, with 17.5%, tie for second place. DEC's 1982 share is an increase from its 10.2% showing in 1981, while TI's share is smaller than the 22% the company racked up a year earlier.

Japanese designs also win in letter-quality printers. NEC sold 38.2% of the machines counted in 1982, followed by Xerox/Diablo, with a 17.4% market share, and Qume, with a 15.3% share. In the low-end line printer group, Digital Equipment, with 19.4% of the market, edged out Dataproducts, with its 18.9% share. DEC had less than 12% of the market in 1981, while Dataproducts had 10.5% Both companies are picking up business at the expense of TI and Centronics, which fared better in 1981. That year, TI grabbed 21.8% of the relevant market, while Centronics had a 10.1% share, which dropped to 3.1% by the time the 1982 survey results came in.

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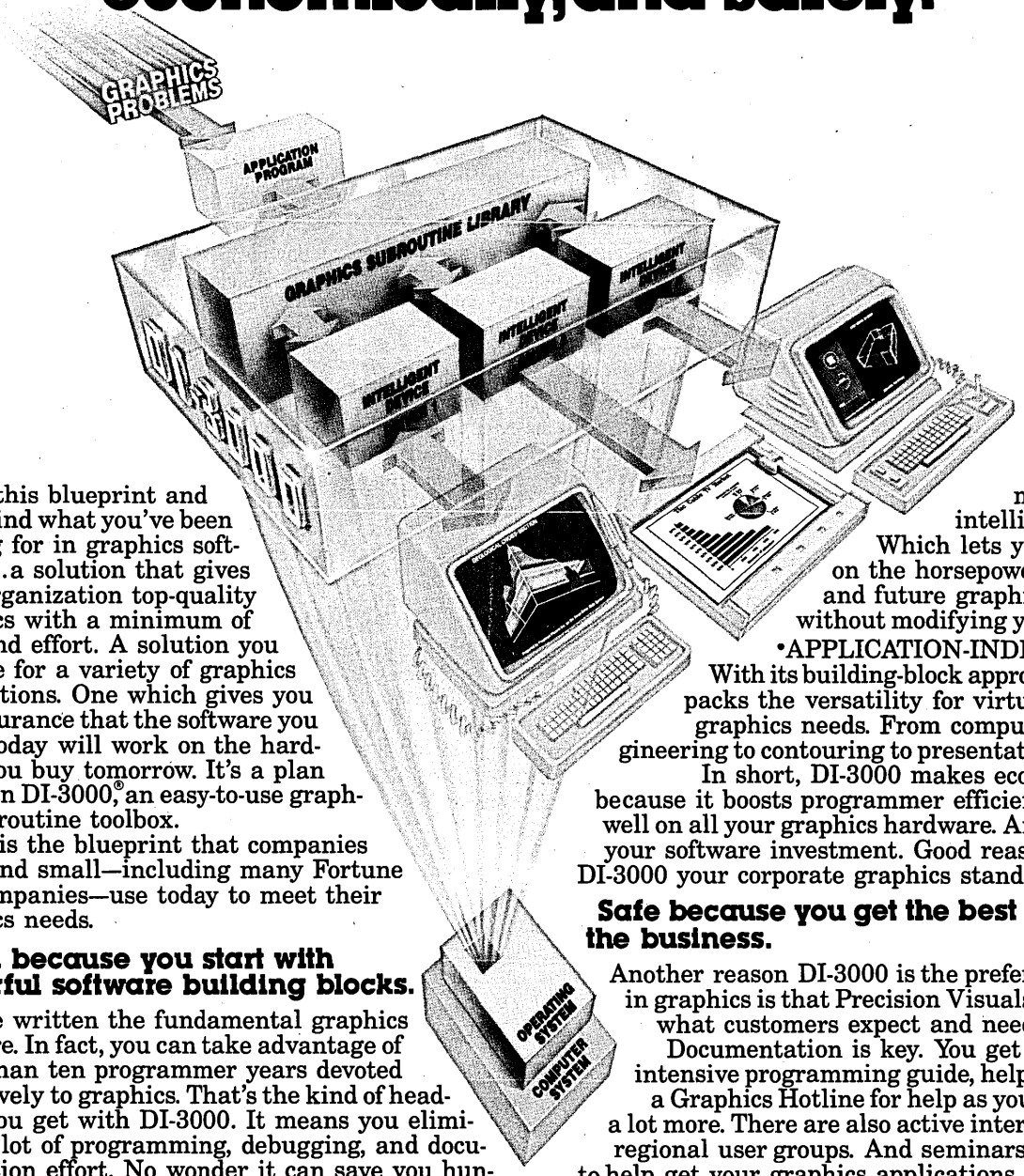

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CIRCLE 141 ON READER CARD

Agricultural applications were up 569% in 1982; estate planning and portfolio analysis applications rose 533%.

When it comes to faster line printers in the oem marketplace, Dataproducts is the leader, as it was in 1981, but the company's market share, which was 31% in 1981, dropped to 19% in 1982. Number two in 1982 is Printronix, with 16.7% of the market, off a bit from its 19.7% share in 1981. DEC is coming up fast here, with 11.6% of the market in 1982 versus only 3.4% in 1981.

Magnetic tape, to systems houses, generally means cassettes and cartridges these days, not reel-to-reel units. Some 6,708 packaged-media units were bought by survey respondents in 1982, a 51% increase over 1981's purchases, while the 4,296 reel-to-reel transports they acquired in 1982 came to pretty much the same number they bought during 1981. All told, the tape market rose 26% to 11,004 units from 1981's 8,767.

Crt terminals are a big business for the survey respondents, but not a business that is growing as fast as some other component areas. The growth from 1981 to 1982 translated into sales of 104,013 units in the latter year, compared to 94,586 in the former. At the same time, graphics display terminals were popping, jumping 44% to 8,006 units in 1982.

DEC CRTS LEAD MARKET

The most popular crt terminals are those made by DEC, which took 16.5% of the market in 1982. Teletype is number two, with a 13% market share. Both vendors picked up relative market penetration from 1981. The company losing the most ground was Lear Siegler, which went from 17.2% of the market down to 1.7%. Furthermore, intense price competition among competing terminal markers TeleVideo, ADDS, and others led to much red ink.

Among makers of graphics terminals, Intelligent Systems is the leader with a 13.8% market share, followed closely by Digital Engineering with 12.8% of the market, and DEC with 12.7%.

Digital plotters were up sharply from a small base, accounting for sales to oems and systems houses of 1,205 machines in 1982, a 56% jump from 1981's 773 tally.

Systems sold by the applications they support were also ranked. Because many systems handle several different applications, the totals far exceed the number of actual machines delivered by oems and systems houses. The data reflect areas of growing demand and, unfortunately, areas of diminished importance during 1982. Applications were tallied by number of systems, not by dollar value.

Here are the most dynamic applications areas: agricultural accounting applications were up 569% in 1982 to 14,179 units, proving that computerized farming is the wave of the future. Estate planning and portfolio analysis applications rose 533% during 1982 to 8,791. Restaurant accounting applications jumped 485% to 17,024 systems. Mail-list processing systems deliveries were up 458% to 73,295, and travel agency accounting applications took off by 304%.

On the down side, industrial applications were struck. Numerical control tape preparation systems missed 1981's mark by 84%. Master production scheduling systems lagged by 84%, and bill of material processing applications were down by 69%. Industrial robot control was off 65%.Machine tool control systems programs were ground down by 64%. ✱

The 1983 directory of systems houses is available from Sentry Database Publishing, 5 Kane Industrial Drive, Hudson, MA 01749.

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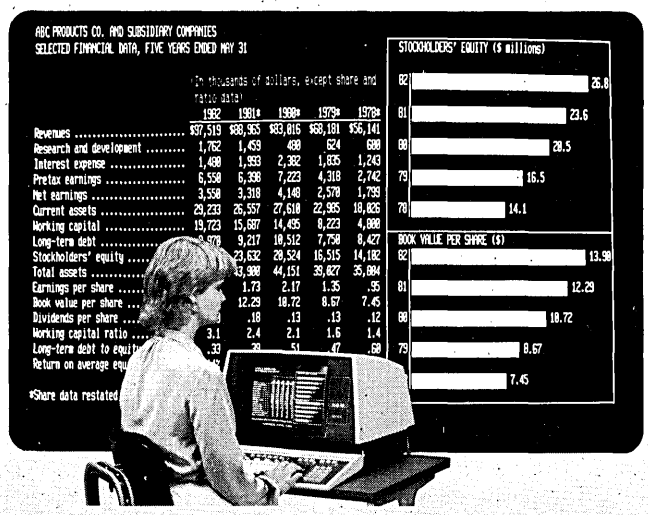

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CIRCLE 135 ON READER CARD

Don't despise that man looking over your shoulder; he's just doing his job.

CONFESSIONS OF AN EDP AUDITOR

by Dale F. Farmer

I am an edp auditor. It is what I do eight hours a day, five days a week. Edp auditing is my profession, my career, my life. Unfortunately, many of the people I work with, even some in the auditing department, have almost no idea what my job entails. This article will define the edp auditor (EDPA), list his many job functions, explain some of the terminology used by auditing, and show how the EDPA goes about gathering information. We will also examine the problems facing this relatively new job, and why the EDPA is not the most popular person in the corporation. Perhaps equally important, we'll take a look at what the EDPA is not. And, lastly, we will answer the often-asked question, "You watch us, but who watches the watcher?"

People generally see the EDPA as a computer room busybody, a sort of electronic Mary Worth, who searches diligently for even the most minor infraction. They don't realize that EDPAs must have programming knowledge, an understanding of computer operations, the ability to report uncomfortable truths to upper management, and the ability to provide computerized support and advice to financial auditors. The EDPA has to keep abreast of federal regulations and be aware of innovations in hardware and software technology within the industry. Fig. 1 shows a list of edp audit tasks. Although it was compiled under a grant from the Bank Administration Institute, the items are typical for an EDPA in almost any industry.

Since the edp audit function is fairly new, it is rare to find detailed job descriptions for it. But in one form or another, all of the descriptions I have seen usually come down to two items—verifying controls and identifying exposures. Those two words, exposure and control, seem to cause the greatest misunderstanding. There is, however, a very simple way of remembering what these two words mean to a business: when you think of the word exposure, think about a person standing naked in the snow. If that person were to stand in the snow for long, he could catch a cold. We are not 100% certain that this person will become ill, but is a reasonable possibility. That is the heart of the word exposure—a reasonable chance that something bad may occur. To the person outside with high-rise gooseflesh, that something is illness or death. To a corporation, losses or bankruptcy are the possibilities.

Now think of the word control and picture layers of clothing on that shivering, blue person. The more layers of clothing you add, the less likely it is that he will catch cold. No amount of clothing can guarantee that this person won't get sick. That risk can only be reduced. If you try to eliminate the risk by piling on the clothes, the person would be unable to move, and might even die from suffocation. The effects of exposure and control work the same way with a business.

So what the EDPA does, essentially, is look for the possibility of loss and the degree of risk involved. If the risk is low and the chance of loss is low, odds are that management will elect to accept the risk. Most of the time, the EDPA will find low-loss and low-risk exposures, but will still report them to management. Many people find this practice annoying. It is the EDPA's duty, however, to report all significant findings to management, and this includes any and all exposures. It is up to management, not the EDPA, to decide what action will be taken. In addition, if an EDPA did not report his complete findings and a loss occurred from some nonreported exposure, you can rest assured there would be hell to pay.

Reporting exposures and recommendations to management is relatively easy for the EDPA. Finding the exposures is another matter. Around 70% of an EDPA's time is spent gathering information. In order to get this information, he uses a variety of tools. Some of the more common ways to gather data include the use of questionnaires, checking documentation, checking the source code, and testing the master files.

Interviewing personnel is the most basic tool an EDPA has because it permits greater insight into the area being examined. Although structured questionnaires are used as guidelines, the EDPA also relies on the experience of department personnel to find the necessary information. Although interviews are useful, they do have drawbacks. Most people are nervous when questioned by a member of the auditing department. They believe the EDPA is trying to find fault with them or their jobs. EDPAs are far more concerned with finding fact than fault.

Examining documentation is another way the EDPA learns about a particular operation. This is not as effective as many other tools, because documentation is usually out of date or nonexistent. Up-to-date system information is actually much more valuable to the programmers, operators, and users than to the EDPA. That's why he informs management of the lack of documentation for the benefit of the operation as a whole. (Besides, you don't think we really like to read manuals all day, do you?)

Checking the source code is an excellent tool for EDPAs who understand a particular language, and an aggravation to the programmer who wrote it. Many programmers believe that the EDPA is criticizing their coding ability or attempting to find some code

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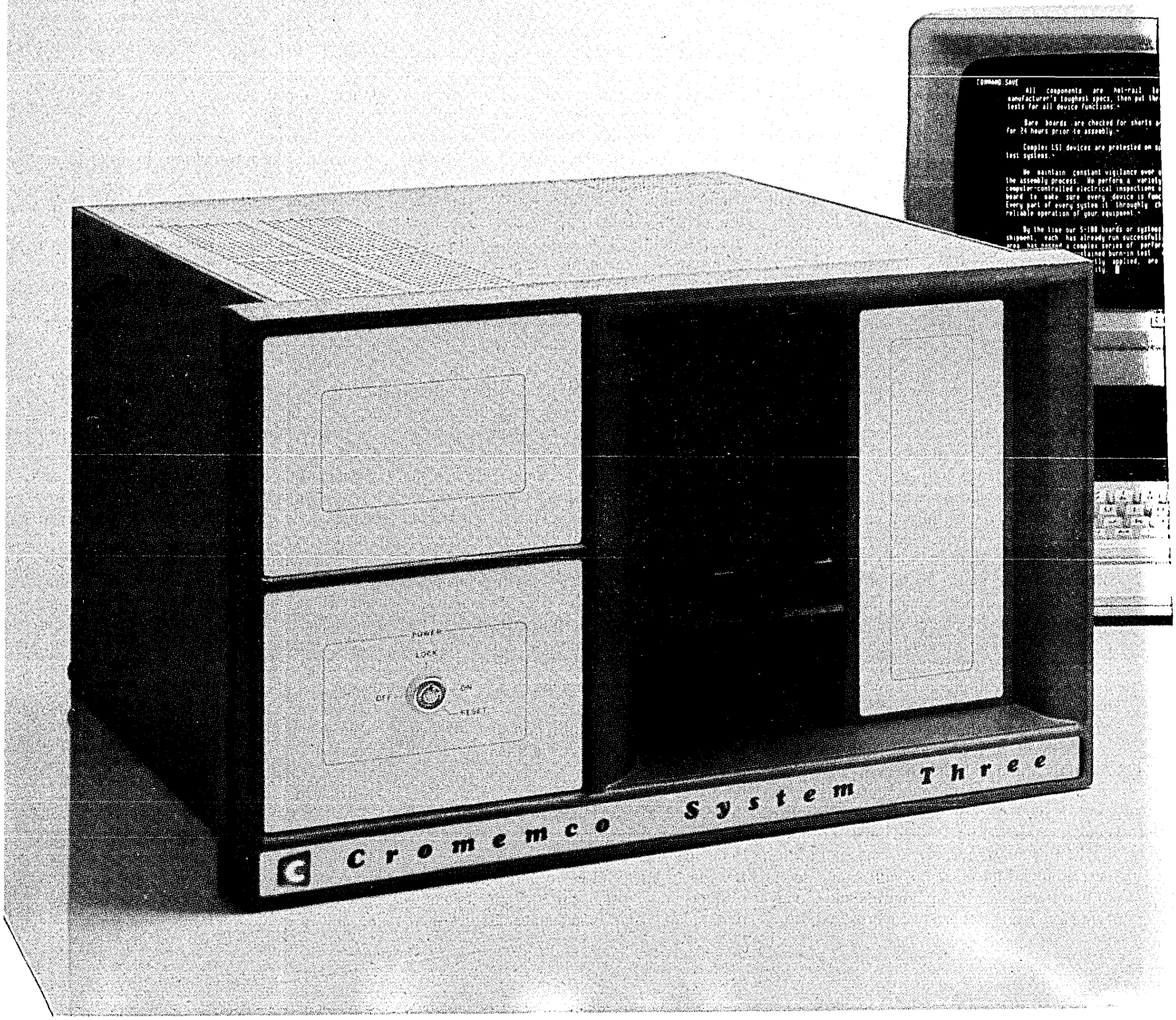

range of applications. And, of course, high-quality terminals, floppy disks and hard disks, tape drives, printers, and monitors.

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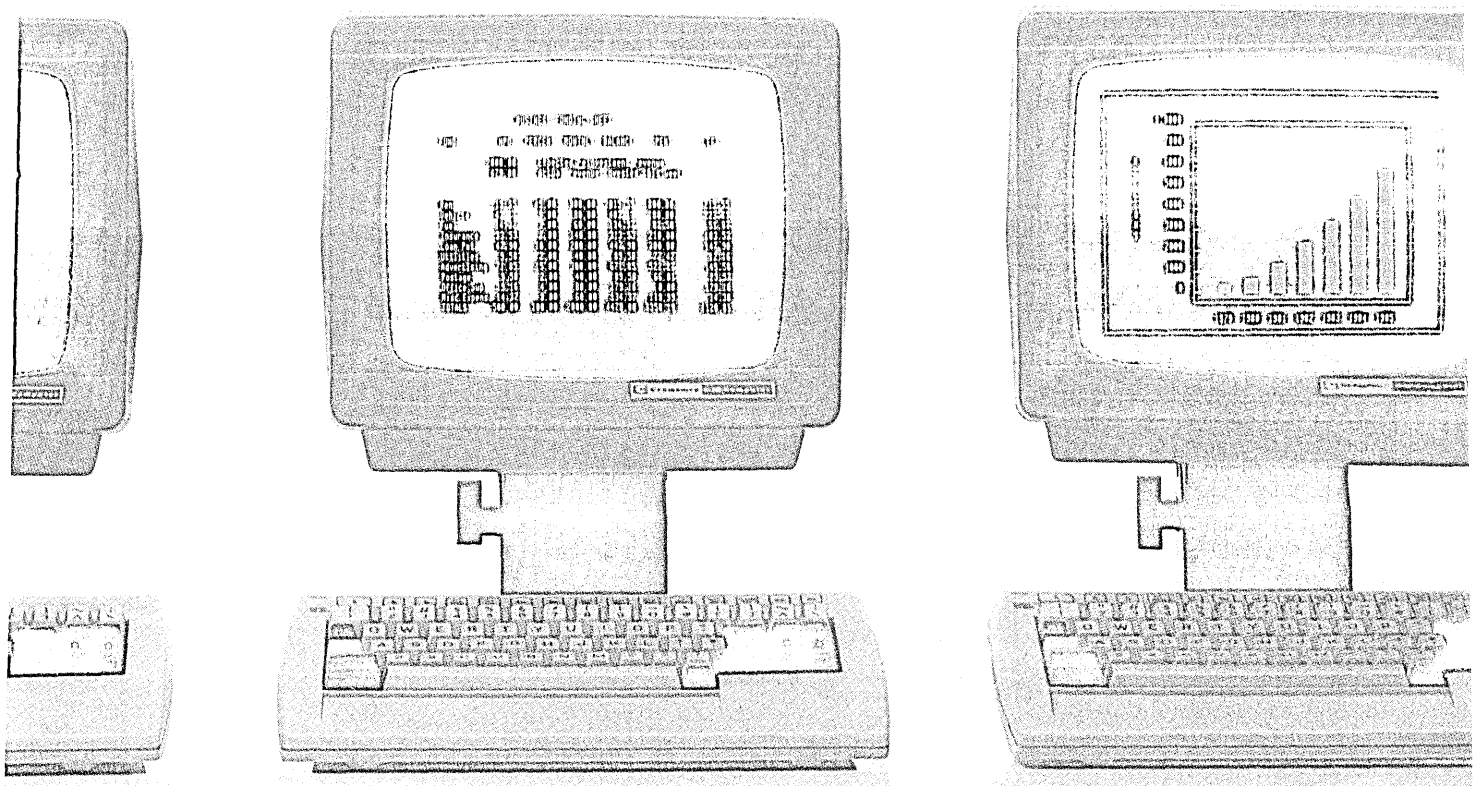

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CIRCLE 136 ON READER CARD

The EDPA's greatest concern is not finding fraud, but finding exposures.

that has been defrauding the company for years.

In reality, EDPAs use source code to try and follow the flow of data in the system to understand how the computer is used in a particular application. And yes, on occasion an EDPA will look at a section of code to see if interest is being skimmed or if accounts that should be charged are not. But this does not automatically convey suspicion upon the programmer. Rather, it is a general scan that is used "just in case."

An EDPA needs the knowledge to write a program, but not the ability to compile or run that program in the system. The EDPA should have a programming tool available, but it must be more controllable than COBOL or BASIC.

Finally, EDPAs can verify information in the master files themselves to see if it is complete and accurate, that no invalid codes are present, and to verify balance information when necessary. File information is usually checked against the output from the system or from general ledger balances.

USING AUDIT SOFTWARE

By now you are probably wondering how the EDPA can check this information without writing programs. Yet he m ist write his own programs to ensure they can be done in a timely manner and also allow for audit independence. The answer to this problem is audit software.

Audit software can be used by the EDPA to perform all of the functions I mentioned earlier, plus some specialized ones, without causing any damage, updates, or modifications to the master files. And, audit software has more controls built into it to help prevent errors. Even a generalized report writer could be used effectively by auditing without damage to the system. More controls are usually provided by the programming department as to what files you can access, use for output, etc. It is really a cooperative effort—the EDPA receives the necessary information, and the programmers don't have to worry about a larger workload from auditing requests.

A comment I hear quite often is that the EDPA's greatest concern is finding fraud. That is only partially true. The greatest concern of an EDPA is finding exposures. Fraud is only one exposure. There are many other exposures that are common to most businesses. These include business interruptions, competitive disadvantage, erroneous management decisions, erroneous record keeping, excessive costs, loss or destruction of assets, and unacceptable accounting.

These are not listed in order of importance. That order is determined by management. The EDPA then concentrates on the areas that management feels deserve high priority. For example, if you have an on-line real-time system, you will be more concerned about business interruption than a company that updates its files by batch processing once a week. Priorities depend on the type of business you have.

Most of the time, however, the focus seems to return to fraud. One reason is that fraud is rather spectacular and receives a great deal of press. Most everyone in the computer industry has heard of Stanley Rifkin or Equity Funding. The press focuses on these cases because of the amounts of money involved. Luckily, frauds such as these are few and far between. In the real world, companies lose more money than those two frauds combined because of errors, accidents, and disgruntled employees. The reason you don't read about those problems is because the losses occur slowly and quietly, but they quickly add up to large sums. Some potential problems include keypunch errors, mounting the wrong input, eating or drinking near the computer, taking tapes or master file printouts home, and firing an employee but not restricting access to the computer.

FIG. 1

TYPICAL EDP AUDIT TASKS

1. Normal financial audits (i.e., without significant edp aspects).
2. Traditional postinstallation reviews, e.g., of controls in an installed application.
3. Computer installation review (simple review of security and operating procedures; nonpolicy, nonmanagement review).
4. Operational audit of edp department (review of efficiency, effectiveness, adherence to policy, etc., of edp departments; may include edp management).
5. System feasibility studies (participation in or review of hardware-software purchase or make decisions).
6. System design control: reviews (review of controls in a proposed edp system).
7. Project control review of timeliness, cost, etc., in an ongoing edp project.
8. User of an audit software package.
9. Consultant to other auditors on use of audit software.
10. Writing computer programs for auditor usage.
11. Edp consultant or team member responsible for edp for non-edp audit staff.
12. Designer of generalized audit software.
13. Traditional test decking of installed system.
14. Acceptance testing of new edp system, i.e., before installation of system.
15. Supervise or sign-off on edp system, work of non-edp auditors.
16. Supervise other edp auditors.
17. Conduct training of auditors in edp topics.
18. Use of ITF (integrated test facility) approach.
19. Use of COMBI (COBOL missed branch indicator) or other analyzer of tests.
20. Use of DBMS (database management system) as audit tool.
21. Review of edp adherence to recent legislation, e.g., privacy legislation.

From "Job Definitions of Bank EDP Auditors" by Charles R. Litecky and John E. McEnroe, the *Magazine of Bank Administration* (Vol. LIV, No. 4, April 1980).

I have tried to explain what an EDPA is and what he does. Perhaps it would answer more questions if I explained what an EDPA is not.

First of all, an EDPA is not a policeman. He does not look for errors and fraud strictly to fire or convict an employee. Instead, the EDPA is attempting to help the company reduce current losses and prevent future losses.

The EDPA is not the answer to all of management's fears, nor is he an insurance policy against loss or fraud. Some managers believe that when an EDPA comes in, all of the problems should disappear. Fraud and loss might lay low, but they never disappear. Management must realize that EDPAs cannot find and solve 100% of their company's problems, but they can help to reduce the possibility of loss.

Since the EDPA profession is still young, it has met with some resistance from different corporate areas. Department heads see the EDPA as another person adding to their paperwork. Programmers feel that the recommendations made by the EDPA will reduce efficiency by adding controls, and therefore

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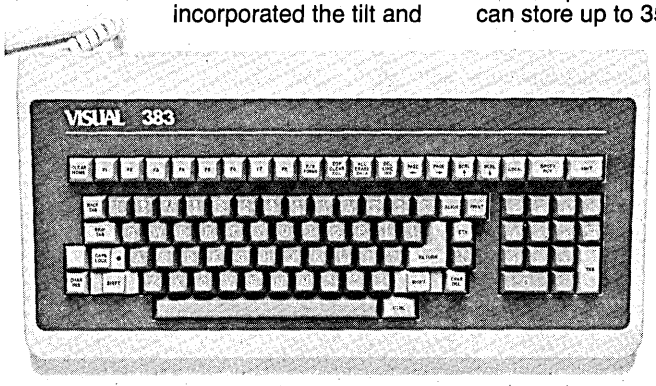

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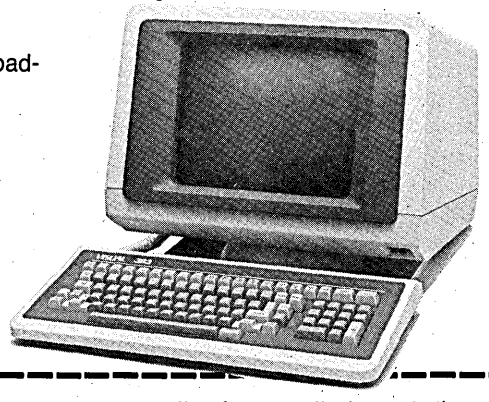

FEATURES	VISUAL VS 383	DATAMAXX MAXXIMA 983	DELTA DATA 2830II	BURROUGHS SR110	BEEHIVE DM83
Screen Type	14" Green P-31	12" Green P-31	12" Green P-31	12" White P-4	12" Green P-42
No. of Pages Standard	6*	2	2	5*	4*
Password Protected Set-Up Functions	6	3	None	None	1
XON/XOFF Printer Support	STD	NO	NO	NO	STD
Host Accessible Local Forms Storage Buffer	STD	NO	NO	NO	NO
Function Key Storage	Non-Volatile RAM with Battery Back-up	Non-Volatile RAM with Battery Back-up	—	Non-Volatile RAM	Non-Volatile RAM
Completely Reconfigurable Keyboard	STD	NO	NO	STD	NO
User Configurable Page, Data Comm, Softkey Buffers	STD	NO	NO	STD	STD
Time of Day Clock	STD	STD	NO	NO	STD

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The EDPA is not a policeman; he does not look for errors and fraud strictly to fire an employee.

more lines of code, into their programs. They also fear that EDPAs may destroy or alter a master file they have been given access to.

The problem is that EDPAs are actually trying to help businesses increase efficiency while reducing the potential for loss. Adding to a program may increase its run-time by five minutes, but at the same time prevent someone from adding or deleting information without proper authorization.

Oddly enough, the EDPA even encounters resistance from members of the financial auditing staff. This is partly due to the fact that the EDPA function is such a new breed. Also, many financial auditors are a little intimidated by the complexity of computers and computer jargon. Resistance usually fades after the auditing staff becomes familiar with computers and what they can do to increase accuracy and reduce work loads.

A lot of problems face EDPAs, but the greatest problem by far is the lack of communication. The EDPA needs to know what is going on in the data center to audit effectively and report accurate findings to management. He must be aware of changes in management concerns to target the audit accordingly. And the EDPA must know what projects are being considered or developed to assure that the development is directed to the users' needs, and also to the cultivation of security and error controls within the system.

The EDPA must also stay abreast of changes and improvements in the dp auditing field. With changes in the computer industry occurring almost daily, it is vital that the EDPA keep up with technology as well as new auditing techniques. This can be done through meeting with fellow EDPAs and discussing problems in an open forum. Other aids include continuing education programs offered by colleges and professional groups, and subscriptions to a few computer and auditing trade journals.

WATCHING THE WATCHERS

Finally, we come to a question mentioned at the beginning of this article—"Who watches the watcher?" Well, just about everyone does. Internal auditors keep a close watch on the EDPAs to assure that they are going about their duties properly and checking the areas that most concern management. External auditors (both financial and edp) examine the reports and working papers filled out by the EDPA, and also check that the EDPA is following the guidelines set forth in the EDPA manual. Regulatory agencies double-check the work done by the EDPA to see if their guidelines for auditing are being followed. Management makes sure the EDPA is adequately addressing its concerns. Dp programmers and operators should be certain that the EDPA is following their department guidelines. This is very important, because the EDPA has access to a great deal of information. It is dp's duty to implement and monitor the controls it places on EDPAs.

So, as you can see, edp auditing is much more involved that it appears. And the demand for EDPAs has been growing in recent years, so chances are you will have a greater degree of involvement with them in the near future. I hope this article has contributed to a greater understanding of edp auditing. Writing it has helped me solve one major problem; when people ask what I do for a living, I now have a simple answer for them—I look for naked people in the snow. ✻

Dale F. Farmer is currently the edp auditor at People's Trust Bank, Fort Wayne, Ind.

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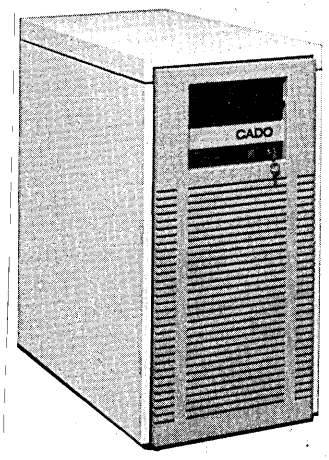

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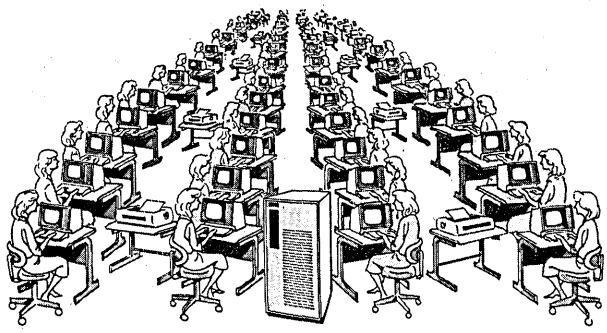

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D-7

How past failures and present opportunities are transforming the art of managing information systems.

MIS-STEPS TO SUCCESS

by James C. Wetherbe

MIS executives have the greatest management challenges and opportunities in modern organizations. Everything is coming their way. The costs of operating organizations are going up at an alarming rate. Labor, management, physical plants, raw materials, energy, transportation all cost more. The only exception to this phenomenon is computer technology. Computer technology continues to offer performance increases that are nearly incomprehensible, and far exceed implementation in organizations. In an era when productivity and cost control can affect organizations' futures, computer technology and those who know how to manage it hold the key to the future.

With challenge and opportunity there is usually risk, and MIS is no exception. Many a well-intended aspiring MIS executive has had the warm personal experience of involuntary termination. In a 1976 *Harvard Business Review* article, R.L. Nolan reported that turnover rates for MIS executives were as high as 50% in 1972 and had run as high as 25% to 35% in other years. In interviews of 20 MIS executives conducted in 1973, Nolan discovered seven had been dismissed, 11 had changed jobs in the past three years, and only two had held the same job for five years.

Why such a dismal track record for what should be an excellent stepping-stone position into greater management responsibility and position? Perhaps it can best be explained by two factors—organizational expectations and MIS management inexperience. In this article we will discuss both of these factors and review the evolution of this key management position. Next we will review the advice of four former MIS executives who not only survived MIS management but were promoted into higher management.

"Expectations gap" is a term often associated with the advent of MIS in organizations. The expectations gap is the difference between what is expected and what occurs. The term was not coined for MIS, but the field has done much to popularize it.

Organizations had high, often unrealistic, expectations for what computer systems would do for them. Envisioned were systems that would place massive amounts of information at management's immediate disposal. All organizational information would be integrated into a single database. Managers would have terminals on their desks that would allow them to easily monitor organizational operations and forecast future operations by the mere entering of commands into the terminals.

The application of computer technology to business problems hit full stride in the 1960s. This was an era when technology was almost considered an end in itself. If something could be done, it should be done. This was the decade when a man would be put on the moon. Technical feasibility was the primary consideration. Economic and operational feasibility were secondary.

At the end of the 1960s, organizations were disappointed. They found that technical feasibility was not enough to warrant multimillion dollar computer expenditures. They found that often these systems were not worth the expenditure or that they would not work in the context of their organizations.

Even as organizations began to impose economic feasibility assessments by requiring justification of systems, they found estimates were often several hundred percent off the target. And operational feasibility continues to elude organizations today. To illustrate how something can be technically and economically feasible but not operationally feasible, consider dieting. It is technically feasible and can be cost justified. Operationally, however, there are often problems (to the chagrin of millions of people).

The combined effect of technical, economic, and operational problems set MIS back. A survey conducted by McKinsey & Co. in 1968 revealed most organizations considered their MIS efforts less than successful. They had been both naive and oversold. Most information systems failed to deliver what was promised.

For example, Weyerhauser Co., the far-flung forest products complex, had probably made as effective use of computer technology as any other U.S. corporation of that time. They had experienced their disappointments, however. When they began to develop a new on-line inventory system, they were led to believe they could develop the system in one year with 10 people. Instead, the project took three years and 50 people.

The all-time low for MIS came in 1972 and was marked by John Dearden's "MIS is a Mirage" article in the *Harvard Business Review*. He argued that MIS was a grandiose, unrealistic concept, and that a profession that possessed a set of "system skills" that could be used in different functional areas of the organization was nonsense. The year of "MIS is a Mirage" was also the year of the worst turnover of MIS executives.

As evidenced by the turnover rate, the history of MIS executives has not been glorious. The phenomenal demand for implementing computer technology into organizations resulted in an accompanying demand for MIS professionals—a demand that could not be met. Even today, MIS ranks as one of the professions with the greatest shortage of qualified people.

This shortage has often resulted in undertrained and inexperienced people being hired into MIS technical positions. The better of these technicians were often catapulted in MIS management positions at a pace that exceeded their technical and managerial training and their organizational and political maturity. MIS executives were usually 10 years younger than their counterpart managers in other functional areas in their organization. This leads to a situation where ill-prepared managers are put in charge of a complex technology that will dramatically change the organization and encounter a great deal of resistance as it does so. And, the organizational expectations for the results of change are unrealistic. Therefore, the mortality rate of MIS executives is not so surprising after all.

A review of articles written about MIS in the last 10 years conveys a sense of how the field has evolved:

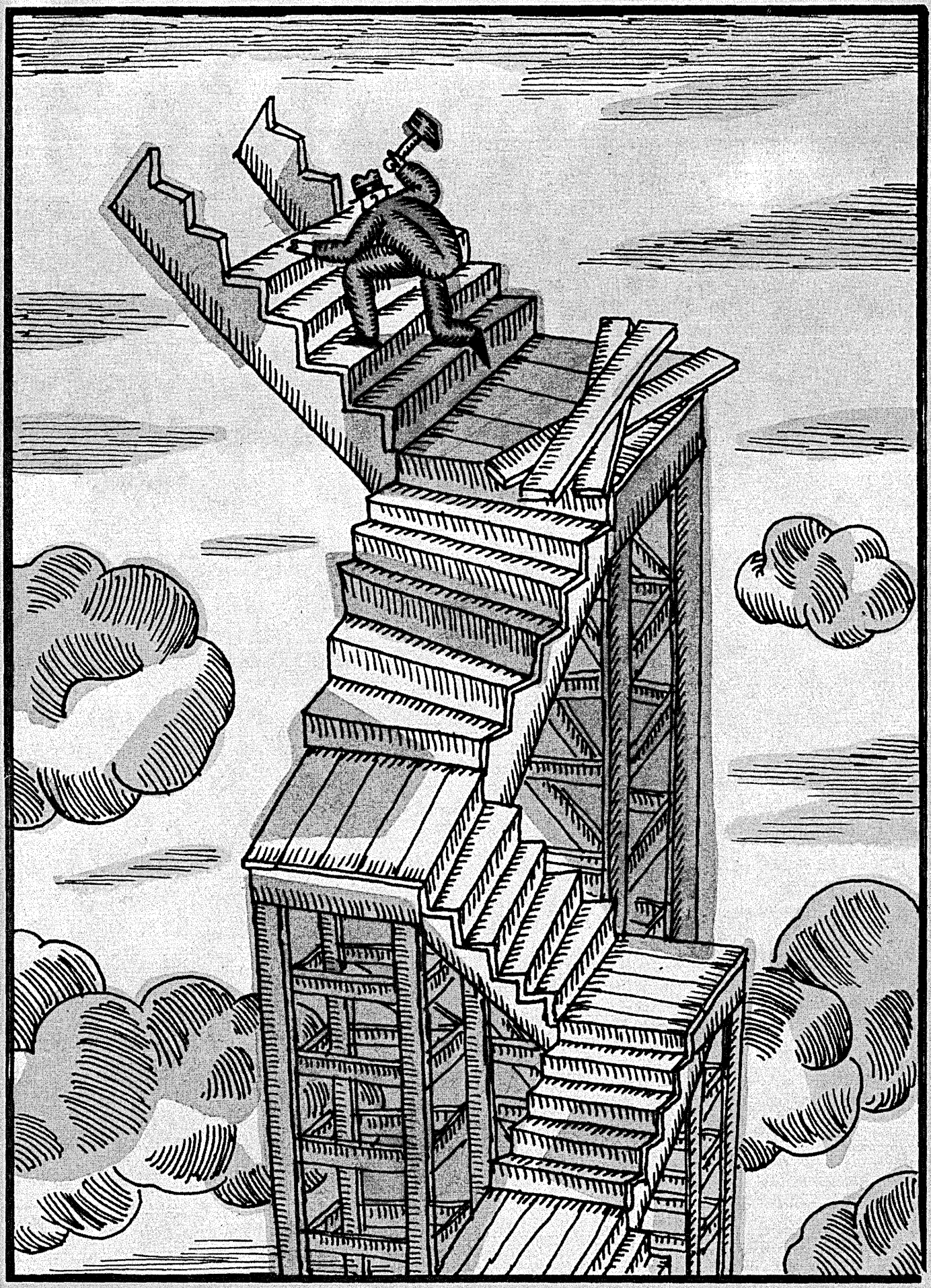
"Plight of the Edp Manager," Richard Nolan, *Harvard Business Review*, 1973.

"Where Do Dp Managers Go From Here," M. Blee, *Infosystems*, 1974.

"Business Needs a New Breed of Edp Manager," Richard Nolan, *Harvard Business Review*, 1976.

"Dp Needs Managers Not Technicians," R.

ILLUSTRATION BY PHILIPPE WEISBECKER



J. August, *Infosystems*, 1976.

"Edp Managers Put on Business Suits," Gene Bylinsky, *Fortune*, 1976.

"Dp Management Comes of Age," W. A. Sommerfield, *Infosystems*, 1976.

"Power, Politics, and Dp," J. Rue, *Datamation*, 1976.

"Dp Managers Still in Adolescence: Withington," *Computerworld*, 1977.

"Can Today's MIS Manager Make the Transition?" J. C. Gilbert, *Datamation*, 1978.

"A Balanced Orientation for the Information Systems Manager," W. M. Taggart and V. Sibley, *MIS Quarterly*, 1979.

"The Changing Role of the MIS Executive," J. Ferreira and J. F. Collins, Jr., *Datamation*, 1979.

"Solving a Mismatch in Computer Management," *Business Week*, 1979.

"Manager or Technician?" The Nature of the Information Systems Manager's Job," Blake Ives and Margrethe Olson, *MIS Quarterly*, 1981.

"Information Systems Management—A Hybrid Blossoms," W. Rhodes, *Infosystems*, 1981.

"IS There Life After Information Systems Management?" James Wetherbe, *Corporate Report*, 1981.

"MIS: A Starring Role at Last?" Janet Crane, *Datamation*, 1982.

"Future Role of the Information Systems Executive," J. F. Rockart, L. Ball, And C. V. Bullen, *MIS Quarterly*, 1982.

MIS executives have had to evolve from technicians to managers with little preparation and few role models. They have had to realign their loyalties and commit themselves to their organizations rather than to their technology. They have had to focus more on interpersonal and administrative skills and delegate more technical activity.

The figure on p. 206 portrays this evolution of MIS management, starting with the 1950s and progressing through the 1980s.

PROFILE FOR SUCCESS

They say hindsight is 20-20. Therefore, to gain perspective on the role of the MIS executive, I interviewed four former MIS executives who not only survived the trials and tribulations of MIS management, but were promoted into higher-level management positions—still an unusual achievement for occupants of what is often considered a technical management position.

Rajiv Tandon has been corporate vice president and general manager of the car rental division of National Car Rental System Inc. since 1980. He joined National Car in 1971 as operations research analyst, was named director of financial analysis in 1975,

THE DP MANAGER: WHAT MAKES HIM TICK?

by Rod Wilson

Is there such a person as a typical dp manager? I believe there is, and that most people in that position are far more similar to each other than they realize. They are individuals, to be sure, but after more than 20 years in the industry, I've learned to identify several traits they have in common. If you're a dp manager you'll probably be surprised to find how many of them apply to you, and if you're in an IBM shop, you'll find an especially strong correlation. The size of the installation doesn't make much difference, unless it's very small.

I hope you'll forgive me if I refer to the manager as male, but it will save tedious repetitions of "he or she." Except where I've indicated, the remarks apply to male and female equally. Let's start with the most obvious aspect.

Physical Appearance. A male manager will tend to be slightly above average height, with females closer to the average. They'll both have a slim build. At an age of 35 to 40, he'll be slightly more conservative in dress than his subordinates, partly because he's a little older than they are but also because he's more exposed to top management. Perhaps we're moving away from the old IBM dark suit and white shirt, but not too far away. Long hair and beads are definitely out. He'll almost certainly be neatly dressed, whatever his style.

Personality. The manager is a complex character. He usually has a low opinion of users, based on many years of blowing their noses for them. Ergo, he must be smarter than they are and this feeling is often manifested in a flash of arrogance or even anger when the users tell him, as they love to, how to run the department. He suffers fools very badly, and he loathes long-winded self-defenses. He's usually a fair-minded person, however. Since the users are not always as good as they might be, he expects his department to be better. High standards are the order of the day, and he must have the highest standards of all. He judges his own performance against tougher criteria than he would ever dare to apply to his own staff. Not surprisingly, he often fails to reach these levels. To the rest of the world he appears to be doing a pretty fair job but, in his mind, his work could often be better. The result is low self-esteem. Since he is aware of his role as a leader, he conceals this fact with an air of self-confidence.

The manager also suffers from a feeling of inadequacy, and this is caused by what I can only term the disadvantage of his experience. Junior staff can afford to be sure of themselves—they don't even know that there used to be different ways of doing things. The manager can still remember archaic languages that he mastered with considerable effort and many late-night debugging sessions. This knowledge is of absolutely no use to him now, a fact that depresses him. Since he is removed from the daily whirl of monitors and databases, he is tortured by the feeling that he is dropping further behind each day, and can never catch up. His juniors know more about current techniques than he does, yet he has to appear to be wise and powerful. While in most other professions experience is of great importance, he finds that the most experienced person in the department is perhaps the least knowledgeable. How can he get around this? Only by writing code; yet, if he does, he knows that he will not be filling his function as a manager.

His self-doubt and poor opinion of his own performance are exacerbated by his determination, inculcated by his job, to see both sides of any question. He's so determined to be fair-minded that, on issues outside his work (where he's usually fairly sure of himself) he rarely has strong feelings. The list of topics about which he doesn't greatly care is long, with politics near the top.

Still, the dp manager has to appear strong and sure of himself if he is to be accepted by his staff and users alike. He therefore develops an air of omniscience and can be called upon to make presentations on any subject. Our man has a taste for amateur dramatics and loves to parade on a stage. Given half a chance, he'll ham it up like an old-time burlesque comedian.

There's a strong analogy here. Just as the two faces of the theater are comedy and tragedy, so a manager is both an introvert and a mock extrovert. But, as we said before, he's a professional, and, although he may like to appear casual during a presentation, chances are he was up all night cramming facts and figures into his mind and rehearsing his act.

More so than other managers, he is forced by the nature of his work to be brutally realistic. If a user's complaint is justified, the dp manager must recognize this even though the consequences are contrary to his own interests—he may be forced to accept a great deal of extra work or to cancel a special project that his department is well into. On occasion, his brooding view of the world may be grim indeed. Yet he must also be a supreme optimist. "Every bug is the last one" is not just an empty slogan to him. He really believes it, because if he didn't, he'd collapse from the sheer dread of what's coming next. This isn't an act but a faith in his own department's ability to crack any problem. This attitude carries him through many dark valleys.

Self-image. How does he see himself? As master of his trade. While he acknowledges that he never knew everything, and that each day the mountain of information grows while the percentage that he knows shrinks accordingly, he believes that he has learned the facts of dp life. As mentioned earlier, he does not like dilettantes (which is how he sees most users) telling him how to run his department. A glance at their methods of operation usually fills him

with scorn. Within dp, his high standards prevail and to him the worst insult is "unprofessional."

He perceives himself to be in a cruelly exposed position in an often hostile world—if he weren't professional, he'd never survive. He knows that his back is broad, that he'll never break whatever the strain, that he's a rock of sanity in a sea of undisciplined users, and that no matter who caused the trouble, he'll be expected to get everyone out of it.

He also sees himself as erudite and, in fact, his thirst for self-education, coupled with his absorbent memory, often make him a well-rounded and privately conceited person. He's proud of the fact that his mind can rise above the mundane level.

Education. He didn't do too well at high school: he got through but his performance was no better than average. It wasn't that he found the work hard so much as uninteresting, and he quickly learned how to do just enough to keep himself out of trouble. Contrary to popular belief, he did not excel at math. If anything, he did well at English and other languages. In college he performed rather better, but he was never a star. If he wanted to, he could do well, but he was easily distracted by other pursuits. It's interesting to note that a fair percentage of dp managers dropped out of college, and some never attended. Lack of formal qualifications has never held back a born dp manager, technical expertise and aptitude being rated far more highly than in other professions. Is this why our man gravitated to dp? Be this as it may, many managers obtained their degrees in later life, often through night school.

Choice of career. Of course, it's also possible that his moderate educational performance is linked to his bemusement when it came to choosing a career. Mostly, he just didn't know what he wanted to do in life. Many managers started in other lines of work and drifted, almost by accident, into computers. I have known former geologists, navigators, lawyers, and especially, teachers—but pride of place must surely go to an archeologist with whom I once worked.

For several years now, many persons have spent their entire career in data processing. But there must be very few managers in this happy position, and they must be very young.

Marriage. Sadly, the dp manager is likely to have problems with his family life. It's not that he doesn't like being married; on the contrary, he probably likes it almost too much. It's simply that his job—especially his willingness to put in extra hours—is very hard on his marriage. Still, he's almost invariably fond of home and spouse, loves his children though he may have difficulty relating to them.

What does he do when, as is too often the case, the pressures lead to divorce? He gets married again, and often surprisingly quickly. He *likes* to be married, because he spends a large portion of his business day resolving problems under considerable pressure, with ungrateful users pouring the blame over his hapless head. As a counterbalance, in his private life he has a very real need to love and to be loved.

Work habits. His workday isn't all conflict, of course, but he does have heavy demands made on his time. Every manager is accustomed to a couple of urgent memos on his desk, an irate user standing before him, his operations manager lurking in the background, and an incessant flow of telephone calls—all at the same time. He learns two things very quickly—first, to retain several problems in his head simultaneously, enabling him to switch from one topic to another at a moment's notice. Secondly, he learns to attack his old enemy, paperwork, at great speed, and to move it from his desk so he can concentrate on the real needs of the department.

He then, however, shows another side of his character. Although ostensibly he's working with a broad brush, he often shows a near obsession with minutiae. If something really captures his attention, no detail is too trivial for him to pursue. Time ceases to exist for him until he has resolved every aspect of whatever took his fancy. Like a child, he can be fascinated by puzzles and tests, whether they are in or out of the work for which he is paid. Give him a logic problem, and any work short of a catastrophe is pushed to one side. He doesn't mind staying late to complete the work, but the puzzle is a challenge to his intellect and he is unable to resist proving himself. Again, he is the victim of his own ego.

If real problems arise, he is highly conscientious. There is no complaint when his phone rings at midnight. Rather, there is a glow of self-satisfaction that a desperate programmer has had to call him for advice. He'll rush to work dressing in the car, and be happy to emerge bleary-eyed at dawn's early light—if he's been successful.

This is an area where women are often even more determined than men, showing astonishing fortitude if necessary. But, male or female, if there's one single characteristic that a person *must* have to be a manager, it's an unwillingness to be beaten in a professional situation.

Social behavior. What's he like off duty? First, we must realize that, like a police officer, he never really goes off duty. Day or night, he always has one ear alert for a phone call, he's always sensitive to a problem situation. Perhaps for this reason, he dislikes confrontations in his private life—they're too close to his business environment. Generally, he perceives himself as a peacemaker. He's an abysmal failure, of course, because of his determination that, at all costs, whether it concerns him or not, he must get to what he believes to be the heart of a matter. He sometimes appears to lose all sense of proportion in a domestic argument, yet often he genuinely doesn't know how the fight began. His only defense is to avoid a conflict before it begins, and he frequently gives in before an argument can escalate simply because he knows that given half a chance, he'll behave badly. He's not a coward; he's being a realist.

One thing is a near certainty: our man possesses an above-average sense of humor. He has a quick, dry wit, which he frequently directs at himself. Sometimes he's too quick with the funnies and will dig at his superior when it might be a lot smarter to keep quiet. His humor is generally of the gallows variety and he is likely to stay calm and make jokes in the most dreadful situations. This is another part of his peculiar personality: he may lose his temper over quite minor issues yet remain cheerful and relaxed as the building burns around him.

A very small number of dp managers smoke, although our man may have smoked fairly heavily in earlier life. He probably gave it up in response to warnings that it was bad for his health. Like many others who converted to a cause, he may now have stronger feelings against smoking than someone who never smoked.

The drug scene? Practically never. But he often likes a drink—or two or three—at the end of the day. Although he may be something of a loner, this does not apply to his drinking. He will not drink alone and, if there's no company, he may well do without. But put him in a crowd, preferably with his peers, and he'll drink as if it's the last chance he's going to get on earth.

Why does he drink? Certainly not to get drunk. It helps him to step aside from his ever-present problems, at least for a while. But, make no mistake, he hates to be drunk or even tipsy, since this gives him a feeling of not being wholly in control of himself.

Health. From this, one might be forgiven for believing that our man is in poor health, a prime breeding ground for ulcers. Yet, to show how contrary he can be, he's usually blessed with excellent health. His general fitness is far better than he deserves, especially considering how he abuses his body with drinking, late nights, and work pressure. Perhaps he thrives on the adrenalin that pumps into his system each day. The only halfway sensible explanation for this paradox is that the type of person who is drawn into dp is also the type of person who can stand its pressures. He has to be—he'd be dead otherwise. ❋

Rod Wilson drifted accidentally into data processing in 1959. A chartered secretary, he was a systems engineer and marketing representative with IBM. He now lives in Johannesburg, South Africa, where he has been the data processing manager of Nestlé for the last 10 years. The profile fits him fairly well.

FIG. 1

EVOLUTION OF THE MIS EXECUTIVE

	1950s	1960s	1970s	1980s
1. Kinds of Experience	Programming	Programming systems analysis	Programming systems analysis, project management	Systems analysis, project management, systems development
2. Leadership Skills	Small teams	Project management	Large project management	Large project management
3. Education and Training	Good H.S. math	Programmer, technical degree	MBA	MBA
4. Technical Ability	Card files, batch	High-volume batch on-line	Enough not to be snowed	Enough not to be snowed
5. Business Acumen	Accounting rationales	Accounting/business operations	General management/business	General management/business
6. Company Business Expertise	None	Low	High	High
7. Communication Skills	Low	Low	Medium	High
8. Systems Analysis Skills	Independent sequential processing	Integrate department & technology	MIS/database orientation	MIS/database decision support systems orientation
9. Planning Skills	None	Short term	Strategic and short term	Strategic and short term
10. Organizing Skills	Minimal	Medium	High	High
11. Reporting Hierarchy	Low in accounting area	Middle in accounting area	High in administrative area	Ceo
12. Organizational Skills	Superclerk/ bookkeeper	Report generator accountant, recordkeeper	Change agent	Change agent leader
13. Loyalties	To computer	To computer department	To organization as a whole	To organization/ society

Source: Dickson, Gary W., and Wetherbe, James C., *MIS Management*, McGraw-Hill, New York, 1983.

and was promoted to corporate vice president of management information services in 1977.

"The most important thing," Tandon says, "is to have a strong business perspective. The information systems function tends to have too technical an orientation. A good information systems executive must make every effort to learn, and have his staff learn, about the business they work in and become committed to making information systems technology improve business operations." One step Tandon took was to recruit systems analysts from user departments.

Steve Platt, senior vice president of business development for Fingerhut Corp., joined the company in 1973 after holding technical and managerial positions with Pacific Intermountain Express, Mattel, Fairchild, and Levi Strauss. Platt's views echo Tandon's: "Top management takes technical skills for granted. What they are interested in is what computer technology can do for the business. You have to solve business problems and create business opportunities using the computer in order to be effective."

Tom McKeown, senior vice president of St. Paul Fire & Marine Insurance Co., was vice president of information systems at The St. Paul Cos. from 1977 to 1980. Before that he held positions in information systems management with Honeywell, was director of public relations and placement for St. John's University, and was a sales representative for Burroughs Corp. McKeown agrees with Tandon and Platt, and adds: "The information systems manager must view the users as customers. In that light, information systems must be customer-driven. The customer may not always be right, but he is always the customer. Also, the information systems manager needs to eliminate the mystique generally associated with computer technology and have information systems become an integral part of the organization."

Jim Nermyr, vice president/controller of B. Dalton Bookseller, held technical and management positions with EMR, Super Valu, and Red Owl before becoming vice president of information systems of B. Dalton. Agreeing with the preceding comments, he adds: "An information systems executive needs to be able to react well in high-stress situations. He must be able to implement short-term solutions in critical situations while still making progress on long-range information systems requirements."

What advice do these four gentlemen offer to new information systems executives?

Tandon: "Know the mainstream business, manage expectations, and don't attempt huge, multiyear projects. Break big projects into small projects with short-term deliverables."

Platt: "Establish your own credibility, define key support points in the organization to give you feedback on how you are doing, pay close attention to your staffing. That is, good people are the key to success. And never forget that information systems are user systems. Give users credit for good systems. Keep the information systems people quiet; they will get their credit."

McKeown: "You have to be marketing oriented. Too often information systems executives say that management doesn't understand them. That is the wrong way to look at it. It is the information systems executive's responsibility to explain information systems technology to management."

Nermyr: "Seek exposure to top management through presentations, outside activities, company programs, and other activities, in order to develop strong informal communication with top management. Don't stop learning—continue to learn about what's happening in the industry, as well as your own company." ✱

Dr. James C. Wetherbe is director of the Management Information System (MIS) Research Center and professor of MIS in the School of Management at the University of Minnesota.

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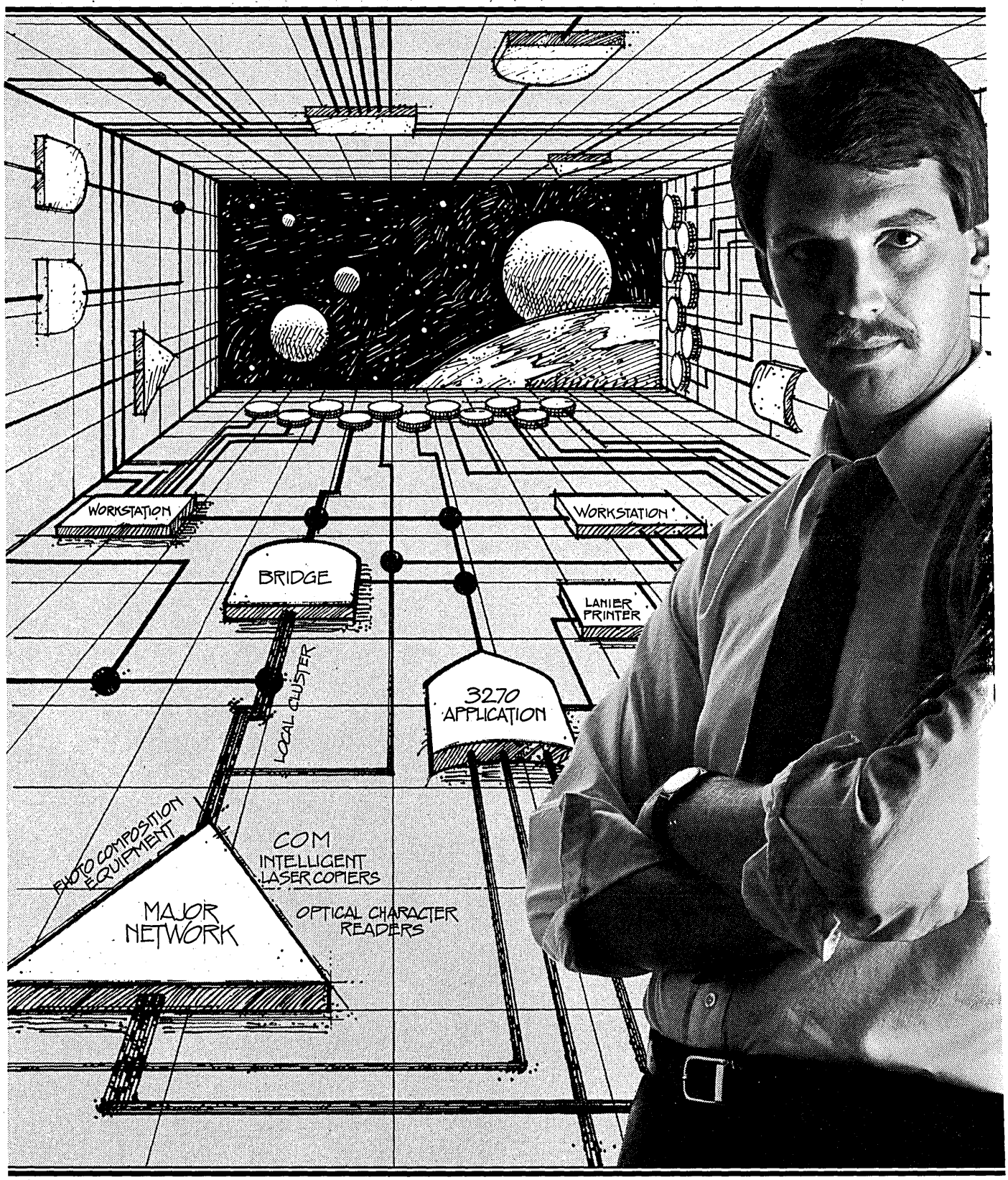
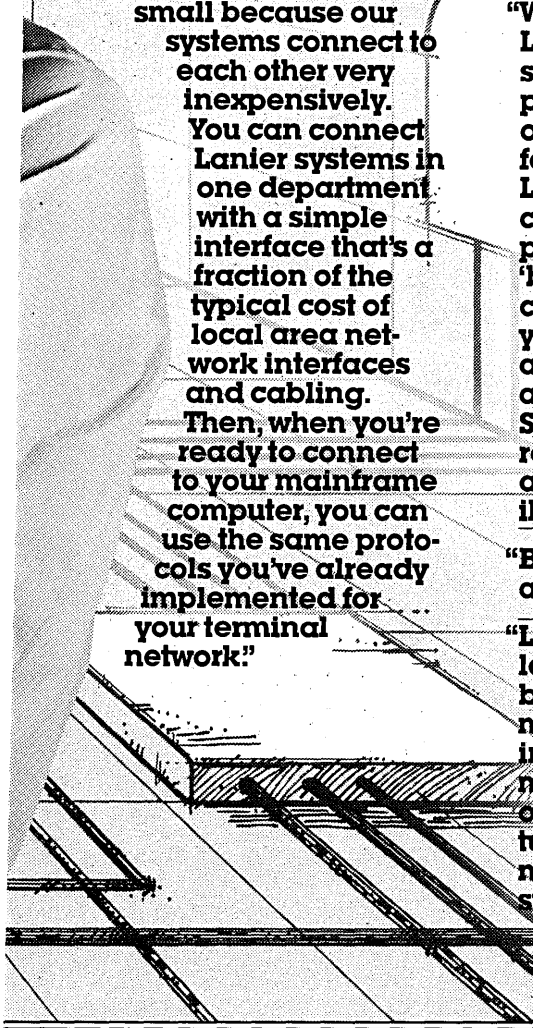
CIRCLE 134 ON READER CARD

"What major local area networks will Lanier fit into?"



"You name it."

Leo Cortjens, Director, Networking Development, Electronic Office Systems Division



With all the different networking alternatives available, the last thing anyone needs is one more. So Lanier is proud to announce that we're not introducing another new standard. Instead, we're going to support the industry's major local area network schemes. By doing this, Lanier will give you compatibility.

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"Can I connect Lanier equipment to my IBM mainframe?"

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"How do Lanier office automation systems communicate with my IBM computers?"

"With special 'bridges.' Lanier system elements such as terminals and printers connect to each other by inexpensive interfaces. Then the entire Lanier system communicates with your IBM computer through a Lanier 'bridge.' The Lanier bridge can talk to SNA systems: your IBM mainframe, another Lanier bridge via a telephone line, or any SNA subsystem you can reach through data lines, all without any compatibility problems."

"But what about other local area networks?"

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I WONDER HOW ACTUAL SALES FOR LAST MONTH
COMPARED TO THE FORECASTS FOR PEOPLE UNDER QUOTA
IN NEW ENGLAND.

NAME	1982 SEPTEMBER SALES	1982 SEPTEMBER ESTIMATED SALES	CHANGE	% CHANGE
SMITH	$52,570	$55,064	2,494-	4.53-
JONES	$83,596	$85,360	1,764-	2.07-
ALEXANDER	$52,546	$55,483	2,937-	5.29-
ADAMS	$53,837	$56,357	2,520-	4.47-
McNEIL	$95,760	$96,929	1,169-	1.21-
McKAY	$36,448	$39,694	3,246-	8.18-
BERGER	$85,691	$90,515	4,824-	5.33-
COLONDER	$75,762	$77,448	1,686-	2.18-

With Intellect, all you do is type a simple question—any way you want

```
PRINT  LNAME, 82-SEP-ACT-SALES, 82-SEP-EST-SALES,
       82-SEP-ACT-SALES - 82-SEP-EST-SALES,
       (82-SEP-ACT-SALES - 82-SEP-EST-SALES) / 82-SEP-ACT-SALES

IF     REGION = 'NEW ENGLAND' AND
       82-YTD-ACT-SALES < 82-QUOTA
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Before Intellect, you had to use a complicated query language like this

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Eighteen months ago true English-language data retrieval was not even possible in everyday commercial applications. Although Intellect is a recent and dramatic development, it is already hard at work at over 100 installations in major Fortune 500 companies. It has been hailed by publications such as *Business Week* and *Fortune* as the first product to put Artificial Intelligence to practical commercial use. Intellect is used in a wide variety of businesses, such as manufacturing, banking, insurance and retailing—because the system incorporates a lexicon tailored to the way your company does business.

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Fleet Financial Group is a four billion dollar diversified financial services company headquartered in Providence, R.I. which has created one of the most advanced Information Centers in the U.S. Here, Sandra R. Hirsh, Information Center Analyst for Fleet Information, Inc.,* shows Thomas G. Dunn III, Assistant Vice President of Fleet Credit Corporation** how easy it is for an executive to use Intellect to work with the information center database.

*Fleet Information, Inc. is a subsidiary of Fleet Financial Group
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CIRCLE 142 ON READER CARD

Some on-line information services may sell like hotcakes, but others will be about as popular as horseburgers.

IS VIDEOTEXT VENDIBLE?

by Efrem Sigel

Now that videotext ventures like Time's teletext service and Knight-Ridder's Viewtron are moving from labs and research centers into the marketplace, the purveyors of these services must come to grips with the most haunting question of all: how many customers want such pushbutton access to information, and what, if anything, are they willing to pay?

The answers to such questions will not be found in market research surveys or focus groups; ultimately, they will be worked out in the hustle and bustle of the marketplace—and at considerable cost to those who make the wrong bets. Nevertheless, in our fascination with getting the technology to work, one aspect of information retrieval services that has been consistently neglected is this critical one of bringing the price of the service into balance with benefits to the customer on the one hand, and with the cost of providing it on the other. True there has been little actual history of consumer videotext services to date, but there is a wealth of experience with conventional publications, as well as with more specialized on-line services for business and professional customers, from which to learn.

The fact is that if it is to be developed at all, videotext must flourish as an information service, not as a technology. Among the important questions, therefore, for those seeking to introduce videotext services are:

- what is the proper audience for these services;
- what type of information is best suited to electronic dissemination in general and videotext display in particular; and
- whether videotext can be used for transactions like shopping or banking.

The first question to be considered is, what is the most logical audience for these services—business/professional or consumer? The business and professional market consists of companies, professional organizations (law firms, medical partnerships), universities and research centers, and individual practitioners like lawyers, consultants, or accountants. Information services directed to these groups are aimed at providing news of an industry or profession, or improving professional or business skills. The information is either bought directly by the business or by an individual who can deduct it as a business expense.

In contrast, the consumer market consists of individuals who use information at

Adapted from *The Future of Videotext: Worldwide Prospects for Home/Office Electronic Information Services*. Copyright Knowledge Industry Publications Inc. and Efrem Sigel; published by Knowledge Industry Publications Inc., 1983.

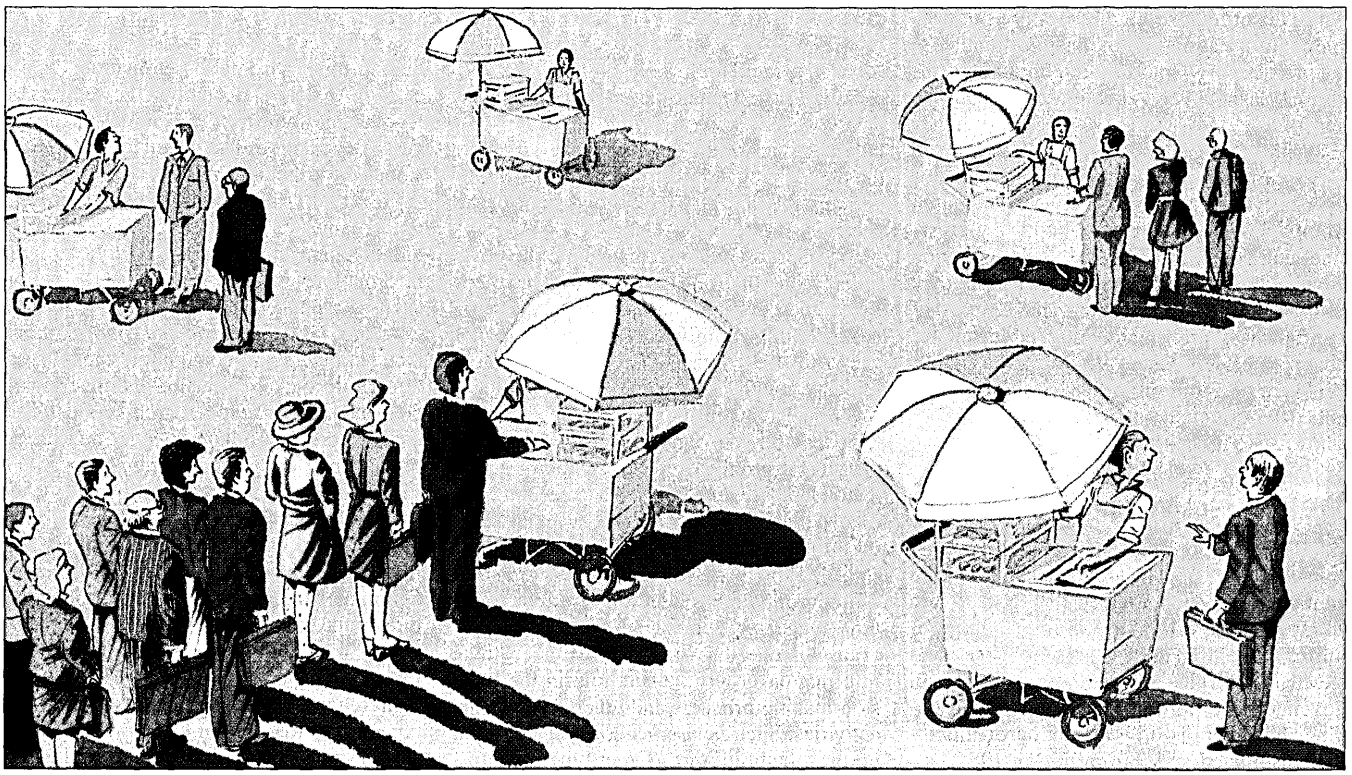

ILLUSTRATION BY ANDREA BARUFFI

Speed and convenience are the obvious reasons that on-line databases have enjoyed such growing acceptance in the business world.

home and pay for it out of their own pockets. Although the information may be related in some way to the person's occupation, he or she is acquiring it out of personal interest or the desire for self-improvement, not to meet a specific business need.

Because a videotext service can be transmitted over telephone lines to a modified tv set, it is often assumed that consumers are the principal users of such services. Phones, however, reach business offices as well as homes, and a computer terminal or other video display terminal will do just as well as a tv set for displaying text. The real determinant of what sort of videotext service makes sense is the information it provides in relation to the needs of the customer.

Business and professional users spend upwards of $9 billion per year for published information and many times that sum for internal information. Internal information for business takes the form of studies and memos; computerized sales and accounting and inventory reports; meetings and presentations. Though the manifestation of this information flow is a blizzard of paper, microfilm, computer tape, and disks, these media account for only a fraction of the true cost of information. The largest expenditures go for the salaries of information workers: managers, secretaries and assistants, researchers, forecasters, accountants, purchasing agents, and dozens of other job categories. The salaries of all white-collar workers in the U.S. total nearly $800 billion annually. In a real sense the product of all these millions of people is information—in the form of numbers, memos, reports, and presentations. That information however, is not the final product of most businesses, but only a necessary ingredient in the production process.

Information *is* the final product of publishers, broadcasters, market research companies, and others who sell to business, and while these total sales are only a fraction of what business spends on information, they still add up to a significant sum. A study of the business information markets estimates that revenues of business information suppliers were $8.9 billion in 1981. The study depicts the principal segments of that total as shown in Fig. 1.

FIG. 1

BUSINESS INFORMATION REVENUES BY SEGMENT, 1981

SEGMENT	REVENUES (IN MILLIONS)
Trade magazines	2,156
Databases	2,610
Newsletters and loose-leaf services	1,018
Research services	520
General business periodicals and services	800
Trade shows and seminars	1,660
Books	155
TOTAL	**8,919**

Source: *The Business Information Markets 1982-87* (White Plains, NY: Knowledge Industry Publications Inc., 1982.)

FIG. 2

GROWTH IN ON-LINE SERVICES

	1975	1977	1979	1981
Number of on-line databases	301	362	528	1,028
Number of records[1]	33,000,000	50,000,000	116,000,000	200,000,000
Number of customers	under 5,000	17,000[2]	57,500[2]	199,145

[1]Bibliographic data bases only.
[2]1977 and 1979 figures interpolated on basis of 84% annual growth rate.
Source: *The Business Information Markets 1982-87* (White Plains, NY: Knowledge Industry Publications Inc., 1982.)

DATABASES GENERATE $ BILLIONS

One of the best indicators of the potential for videotext in the business and professional market is the amount being spent to acquire information in computerized form. According to the figures in Fig. 1, all databases, both in printed and electronic formats, generate $2.6 billion in revenue. The portion that is distributed on-line, however, is only a fraction of this total—estimated at $680 million in 1981.

A tabulation done by *IDP Report* newsletter shows that the market for on-line databases has been growing by more than 80% per year for the last five years, although the rate of growth has slowed, since 1980, to perhaps 40% a year. Fig. 2 shows some of the principal indicators.

Speed and convenience are the obvious reasons that on-line databases have enjoyed such growing acceptance in the business world. Certainly these databases are not cheap to use. Hourly rates for services offered by Lockheed's Dialog, Dow Jones, and Mead Data Central range as high as $125 or $150 per hour; even inexpensive databases can cost from $35 to $75 per hour. Since many database customers spend several hundred dollars a month to use these services, they must feel that the expenditure is worth it.

Though we are accustomed to classifying information products by form or medium (magazine, book, newsletter, tv program), it may be more helpful to examine information in terms of its role in the decision-making proccess and other professional activities. Such a classification will also point up the suitability of different types of information for electronic dissemination.

Analyses done by the editors at Knowledge Industry Publications Inc., suggest five categories of business and professional information:

1. *Transaction-oriented information*—names and addresses, prices, stock quotes, items for sale. Availability of this information leads directly to a transaction, such as a phone call, letter, or purchase.

2. *Decision-oriented information*—facts, numbers, opinions, impressions—used directly to make a decision. Numbers gathered by independent research services, like the Nielsen television ratings, are an example of information that leads directly to a decision, e.g., take a show off the air.

3. *Background decision information*—consisting of the same sources as in (2), but not used the same way: the reader assimilates the information for use in the future, rather than immediately.

4. *General interest information*—from newspapers, trade magazines, radio, tv, conferences, personal conversations. This type of information is much more diffuse and random than in categories 1, 2, and 3, and

FIG. 3

TYPES OF BUSINESS/PROFESSIONAL INFORMATION AND SUITABILITY FOR ELECTRONIC DISSEMINATION

CATEGORY OF INFORMATION	EXAMPLE	SUITABILITY FOR ELECTRONIC DISSEMINATION
1. Transaction-oriented	Names, addresses, stock quotes, classified ads	Good to excellent
2. Decision-oriented	Facts, numbers, survey information, financial information	Good
3. Background decision	Same as above	Good
4. General interest	Newspaper articles, sales reports, information for meetings and seminars	Poor to fair
5. Skills-oriented	How-to techniques of management, sales, accounting	Poor

FIG. 4

CONSUMER INFORMATION AND ENTERTAINMENT SERVICES

(in $ millions)

CATEGORY	CONSUMER OUTLAYS	SUPPLIER RECEIPTS
Newspaper circulation	$6,750	$4,350
Book purchases	6,030	4,330
Motion picture admissions	3,450	1,500
Magazine circulation	4,570	3,385
Cable and pay tv subscriptions	4,200	4,200

Source: Knowledge Industry Publications Inc.

contributes to a manager or professional's general awareness, rather than to specific decisions he must make.

5. *Skills-oriented information*—techniques of management, sales, accounting, etc. Such information usually comes from a combination of face-to-face, printed, and audiovisual sources.

In general, the more information is used for a transaction or a decision, the higher the price it commands—and the more the recipient is willing to pay for the speed and convenience of electronic delivery. In addition, because information in these two categories often consists of specific facts, numbers, names, addresses, etc., it is particularly suited to display on a screen. Electronic information services are best when the user needs to retrieve specific facts, and worst when the user needs to read an entire document or browse through a mass of material. Fig. 3 shows the different types of information and their suitability for electronic dissemination.

CONSUMER INFO MARKET

Although supplying information to consumers is a multibillion dollar business for the world's broadcasters and newspaper, magazine, and book publishers, no one can say for certain exactly what influences consumers to choose one medium over another, or any medium at all, to acquire information. Education, social class, occupation, and personal preference all play a role; it is obvious that the people who watch a televised opera from New York City's Lincoln Center have different tastes than those who, at the same hour, choose to view *Laverne and Shirley*. The person who subscribes to *Scientific American* displays distinct differences from one who picks up the *National Enquirer*. Some broad generalizations are available to distinguish heavy tv watchers from devoted magazine readers; for example, the former are depicted by researchers as less well educated and more passive, the latter as better educated and more active. But these broad statements may tell less than they seem to. Tv watching, after all, is well established in every age group, social and educational class, and most adults read some publication, whether it is the daily newspaper, a favorite magazine, or a best-selling book.

One helpful guide to media behavior is the attempt to understand the different functions that media perform for individuals. In a paper published by the Harvard Program on Information Resources Policy, Christine Urban identifies three such functions: 1) information acquisition, or "surveillance"—people use the media to locate specific facts, from train schedules to box scores to what the prime minister of Great Britain said yesterday; 2) social connection—broad information of use in social situations; and 3) escape—diversions from day to day cares through fiction, movies, tv entertainment.

Although these categories are different from those shown in Fig. 3 for business and professional information, they too can be ranked according to their suitability for electronic dissemination. Only the information in the first category is well suited to electronic display; once again the determining characteristic is the search for specific facts that can be viewed on a screen.

Consumers' need to acquire specific facts, however, it not by itself enough to support a computer-based videotext service. The consumer market for information services has marked differences from the business and professional market, principally with regard to how information is paid for. Newspapers and magazines are the largest segment of the consumer market and these publications derive most of their revenues from advertising, rather than from reader outlays. Books are the next largest segment; when measured in terms of customer outlays rather than publishers' receipts, books significantly outrank magazines. A striking characteristic of the three major printed consumer information media—newspapers, magazines, and books—is their very low cost per unit of information, per page or per word. In part this reflects advertiser support of a large part of the cost of publication; in part the fact that purchase of a magazine or book is highly discretionary.

Whereas the lawyer has no choice but to subscribe to a looseleaf service in his area of specialty, the consumer need not buy any book for recreational reading. He can go fishing, watch tv, or garden in his leisure time; if

The more information is used for a transaction or decision, the higher the price is commands.

he does read, he can choose from over 400,000 books in print at any one time. This choice acts to keep the price of publication down, and to force publishers to seek the widest market for any title. There are some fields of consumer information in which publishers consciously seek to produce higher priced books or magazines for a narrow audience—expensive art books, sometimes in limited editions, or encyclopedia sets—but these are the exception.

Also, when it comes to consumer information services, audiovisual formats—notably radio and television—help to dampen the price that can be charged for printed publications. Services supported entirely by advertising, tv, and radio, appear "free" to the consumer, once he has bought the receiver. Only since the mid-1970s have consumers begun to spend large sums out of their own pockets to receive tv programs via cable television, or to buy prerecorded programs on video cassette or disk.

Fig. 4 shows the outlays by consumers for entertainment and information services. To illustrate the difference between publisher or supplier receipts and consumer expenditures, both sets of figures are given.

FIG. 5

UNIT COST OF INFORMATION IN NEWSPAPERS, MAGAZINES, AND BOOKS

	PRICE	NUMBER OF PAGES	NUMBER OF WORDS	COST PER PAGE	COST PER 1,000 WORDS
The New York Times	$ .30	40	120,000	$.0075	$.0025
Reader's Digest	1.29	110	40,000	.0100	.0300
The Covenant	4.75	800	400,000	.0060	.0100
Webster's New Collegiate Dictionary	21.95	1,532	8,000,000	.0140	.0030
Average Cost				.0090	.0100

Source: Knowledge Industry Publications Inc.

MODEST LEVEL OF OUTLAYS

Several conclusions stand out after examining this pattern of consumer spending for information services. One is the extremely modest level of outlays per household for even the largest categories of information. Consumer purchases of $6.8 billion annually on newspapers are significant, but measured against 83 million households, that sum works out to only $81 per year. And the newspaper is the only one of the printed consumer services that is nearly universal in its reach. Whereas 75% of all households buy a newspaper every day, the proportion that subscribe to magazines or buy books is far smaller. Surveys show that about 60% of all households subscribe to one or more magazines. The circulation of all general consumer magazines totals 298.7 million. This works out to about 3.6 magazines per household. At a typical subscription price of $16 per year consumer outlays for magazines are approximately $4.6 billion annually.

As for book purchases, a smaller proportion of consumers buy books than subscribe to newspapers or magazines. Whereas 75% of all households take a daily paper, and whereas magazine circulation averages three per home, surveys show that less than half the adults in the U.S. have read a book in the past six months. The only truly large volume books in the U.S. are mass market paperbacks; about 550 million of these are sold annually. If we assume, arbitrarily, that 25% of these copies go to schools, libraries, and individual students, that leaves consumer sales of 413 million, or an average of five per household. Studies have consistently found that a large share of paperback sales are made to a small minority of purchasers, some of whom buy or read a book per month.

Since books, with rare exceptions, carry no advertising, consumers pay the entire cost of information. This explains why even paperbacks have much stiffer cover prices than do newspapers or magazines. A revealing way of analyzing what consumers pay for printed information services, and one that is useful in comparing print and electronic delivery, is to measure that cost per page and cost per word. Fig. 5 does this for four examples of printed consumer publications: *The New York Times* (daily), *Reader's Digest* (monthly), a bestselling paperback, *The Covenant*, by James Michener, published by Fawcett Books, and *Webster's New Collegiate Dictionary*, published by the G. & C. Merriam Co.

Fig. 6 gives a similar analysis for business information publications including *Business Week* magazine, the *Encyclopedia of Associations* published by Gale Research Co., the *Daily Report for Executives*, a newsletter from the Bureau of National Affairs, and the *Federal Tax Reporter* from Commerce Clearing House. While it is misleading to compare information services purely on such a quantitative criterion as cost per physical unit of information, the magnitude of such cost does give a useful guide for understanding how consumer and business information services differ. Thus, the significance of Figs. 5 and 6 can be summarized in a single, stark comparison: the business services cost 18 times more per page and 31 times more per thousand words than the consumer services (see Fig. 7).

Striking as this difference is, it is actually understated as a result of including *Business Week* in the business information services tabulation. *Business Week* is usually classified as a consumer magazine because of the breadth of its readership; certainly it resembles consumer magazines in its economic underpinning which relies on advertising for more than three quarters of its revenue. Without *Business Week*, the business service turns out to cost 23 times more per page and 40 times more per thousand words than the consumer publication. Although the role of advertising in certain publications is a central one, this enormous disparity in cost cannot be explained solely by the absence of advertising in many business services. Note that the paperback listed in Fig. 5, *The Covenant*, has the lowest cost per page, and the second lowest cost per word, of the three publications analyzed.

Though we haven't included audiovisual services in this analysis, it would be perfectly feasible to do so. One result would be that tv and radio are incredibly cheap to the consumer when measured on a cost per word basis.

Even where consumers pay for video information, as in monthly cable tv subscription fees, the cost turns out to be infinitesimally small. A cable system with 30 channels, averaging 15 hours per channel per day, will give the consumer access to 13,500 hours of programming per month at an average cost of $9. Each hour probably contains at least 9,000 words of spoken information (there's no ready way to count visual images) and the number of words transmitted comes to a staggering total of 121.5 million words a month for a cost per thousand words of $.00007. Even if we divide this by 30, in recognition that an individual can watch only one channel at a time regardless of how many choices he has, the total words transmitted is still 40 million for a cost per thousand words of $.0002.

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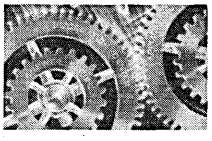

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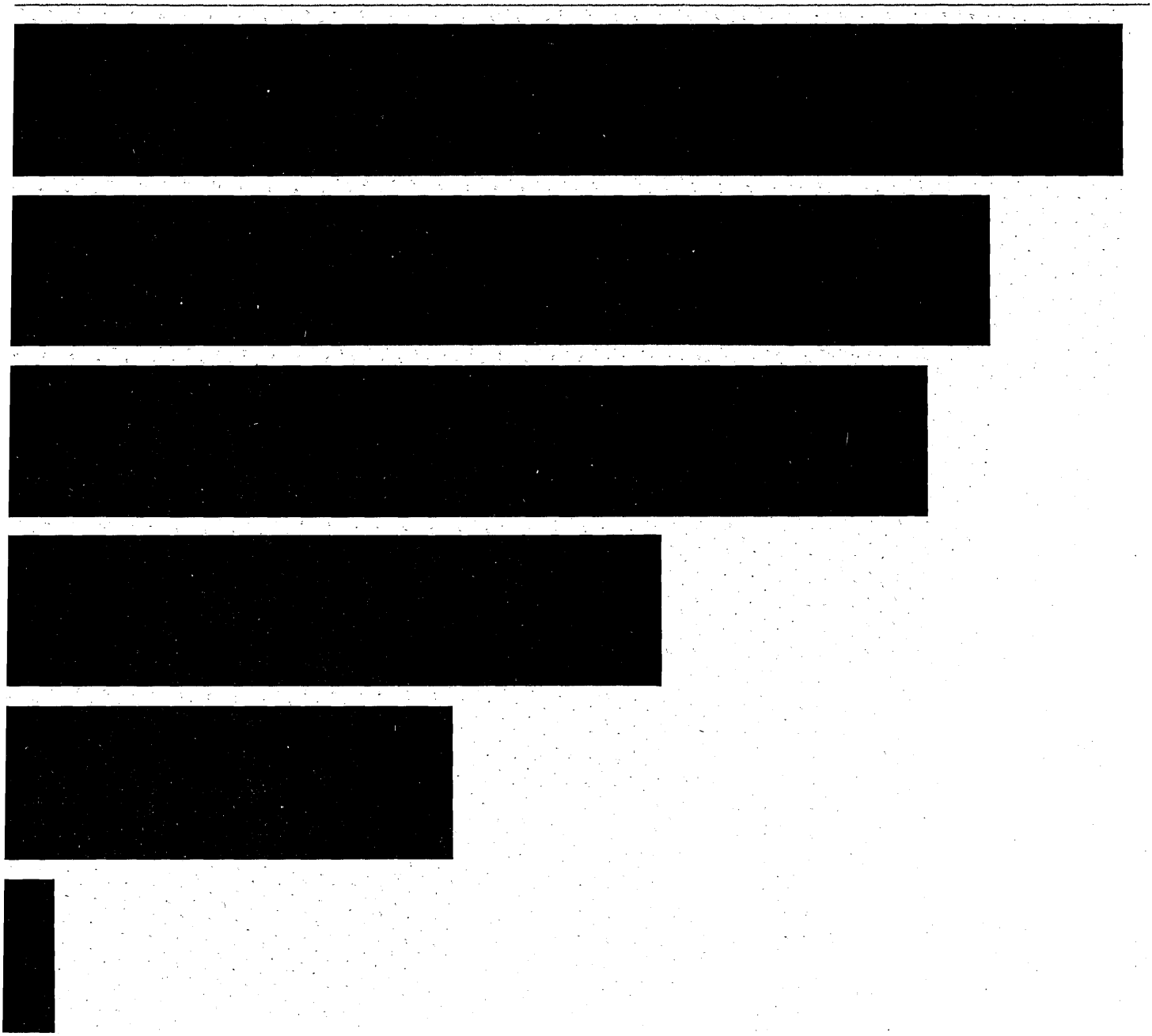

nputers' communications, through loud and clear?

Hewlett-Packard HP3000

Data Decisions, an independent research firm, surveyed users of business computer systems from the major suppliers. When the 3,042 responses were tallied, the award for Best Overall Performance in Data Communications went to Hewlett-Packard's HP 3000 computer family.

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SCIENCE/SCOPE

An easily processed version of a heat-resistant plastic should find new high-temperature industrial and commercial applications, as well as promote more use of advanced composites in such aerospace products as aircraft, engines, and supersonic missiles. The new Hughes Aircraft Company polyimide, which withstands temperatures of 600°F for long periods and much higher temperatures for short periods, can be processed in existing equipment. It uses a simple one-step curing process very similar to state-of-the-art epoxies. By comparison, plastics with equivalent strength and heat resistance require complicated and expensive curing procedures. The new material will be produced and marketed under the trade name Thermid® by National Starch and Chemical Corp. of Bridgewater, N.J.

The new AMRAAM missile will be good at evading enemy detection through a clever improvement to its radar system. The improvement, now patent pending, is done simply and with only a little extra hardware. It greatly reduces inaccuracies caused when the missile jumps from one radar frequency to another en route to its target. Frequency hopping makes it extremely difficult for enemy radar-detection equipment to get a fix on the missile. Hughes designed and developed the Advanced Medium-Range Air-to-Air Missile for the U.S. Air Force and Navy.

An advanced antenna farm designed with the aid of a computer will be carried by Intelsat VI communications satellites. The system will provide different kinds of coverage -- beams transmitting to entire hemispheres, "global" beams, focused regional beams, and very narrow spot beams for broadcasting high-speed data. Hundreds of computer patterns were created to predict antenna performance. These studies led to the choice of transmit reflectors 3.2 meters in diameter instead of 4 meters. The larger size offered only slight improvement at the cost of being much heavier, larger, and more complex. Hughes heads the team building Intelsat VI for the International Telecommunications Satellite Organization.

A wide-field-of-view head-up display can provide pilots with critical sensor and steering information in low-altitude flights at night and under poor visibility conditions. Head-up displays save a pilot from looking down at his instruments by superimposing such data as airspeed, heading, and target information on a glass-like combiner mounted at the pilot's eye level. Hughes pioneered the technology used in its HUD, which incorporates diffraction optics made through a process involving holographic techniques and lasers. The display is brighter, more transparent, and doesn't obstruct the pilot's forward vision. It also resists glare, reflections, and hot spots caused by the sun.

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Consumers' need to acquire specific facts is not by itself enough to support a computer-based videotext service.

FIG. 6

UNIT COST OF INFORMATION IN BUSINESS MAGAZINE, DIRECTORY, NEWSLETTER, AND LOOSE-LEAF SERVICE, 1981

	PRICE	NUMBER OF PAGES	NUMBER OF WORDS	COST PER PAGE	COST PER 1,000 WORDS
Business Week					
single issues	$ 2.00	160	50,000	$.033	$.04
one-year sub.	34.95				
Encyclopedia of Associations (annual)	140.00	1,600	1,100,000	.087	.127
Daily Report for Executives one-year sub.	3,175.00	7,500	13,750,000	.42	.85
Federal Tax Guide Reports one-year sub.	230.00	1,950	1,053,000	.12	.22
Average of 4 publications				.165	.31
Average of 3 publications (excluding *Business Week*)				.209	.40

Source: Knowledge Industry Publications Inc.

PRESENT BEHAVIOR A GUIDE

The point of all this discussion about the cost of existing information services is to see what we can learn about videotext. The world of existing information services is complex, sometimes confusing, often untidy. But it is a world in which customers daily hand over hundreds of millions of dollars and receive information in return. If we want to know what kind of information people want, the form in which they want it and the value they set on it, we have no better guide than their present behavior.

It must be said that there is a tremendous air of unreality about many discussions of videotext because they are not grounded in economic experience. Few such services around the world are receiving any money from customers. The largest commercial service, British Telecom's Prestel in England, is receiving money, but estimates are that Prestel is spending up to several times as much as it is receiving. Even if this ratio were to be reduced somewhat, it's not a state of affairs that can go on very long. The cuts in staff and computer centers announced by Prestel in late 1981 reflect this fact, as does the organization's increasing concentration on commercial customers.

Looking at the cost of information in conventional printed services gives us some groundwork for examining the costs of electronic services, whether in an on-line computer database or in videotext form. The main problem in making the comparison is that printed services are sold outright; cost remains the same whether the customer reads all of a publication or only a fraction; whether he glances at it briefly and throws it away—as in the case with many daily newspaper readers—or whether he keeps it on the desk or by the bedside to refer to repeatedly—as might be done with any number of publications from an industry directory, to the *Guiness Book of World Records* or the Bible.

Most electronic information services today charge predominantly by time—the minutes or hours that a customer is connected to the computer. Some also charge per unit of information retrieved, e.g., about 15 cents per *Chemical Abstracts* citation displayed on a vdt or printed out, or 5 cents for a listing of London restaurants on Prestel, courtesy of the Consumers Association. And a few have an annual subscription fee, or requirement that the customer receive a printed publication in order to use the on-line service.

Charging by the clock favors the on-line customer who knows exactly what he wants, uses the computer to get it with a minimum of wasted time, then moves on to something else. A journal citation from Engineering Index, a summary from the New York Times Information Bank, the latest gold bullion prices on Prestel, may cost him $2 or $5 or 50 cents, but that is the total expenditure. There is no hunt for the information in a book, no time-consuming trip to the library. Paying by the clock can be far more expensive than using a print publication, however, if the same publication is consulted repeatedly over time.

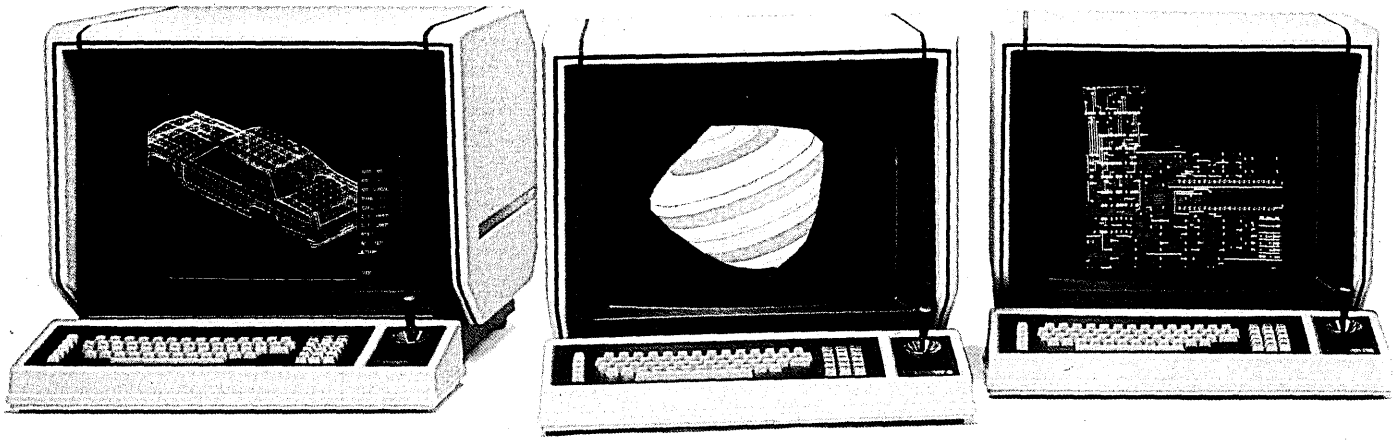
To compare the cost of print publications that carry a one-time price with electronic services charging by the clock, is not a straightforward exercise. It can be done, however, with the aid of a few assumptions. Let's take two examples: a printed newspaper compared to its electronic alternative, and a business directory.

A printed newspaper like *The New York Times*, as noted in Fig. 5, contains 40 full-sized pages of editorial information, with approximately 120,000 words of text. It costs the consumer 30 cents on the newsstand, perhaps 50 cents delivered at home. The cost per 1,000 words is $.0025 (less than three tenths of a cent), or $.0041 delivered at home.

An alternative to buying the *Times* is to subscribe to The Source, one of two leading information services available on-line. The Source charges customers $5.75 per hour in evening hours and delivers information to a vdt or home computer attached to a tv set, at a rate of 300 characters per second. The Source is capable of displaying 25 lines of 80 characters each, or 2,000 characters, although many displays contain fewer characters. Assume that a Source subscriber uses the service for 12 minutes a night to scan the day's headlines and news stories from United Press International, to see sports results, to look at stock market highlights, including closing prices of selected companies. In 12 minutes the customer might look at 20 complete screens of information, containing 225 words each, or a total of 4,500 words. The cost on his Source bill will be $1.15 in computer time. The cost of the telephone time, making a local call during evening hours, will be roughly 12 cents, for a total of $1.27. The comparison between the printed and electronic newspaper then looks as follows:

	The New York Times	The Source	Ratio
Total cost	$.30	$1.27	1:4.20
Cost per 1,000 words	$.00025	$.282	1:110

In other words, The Source is four and a third times more expensive than the *Times* on an absolute cost basis; it is 110 times more expensive on a cost-per-thousand-word basis.



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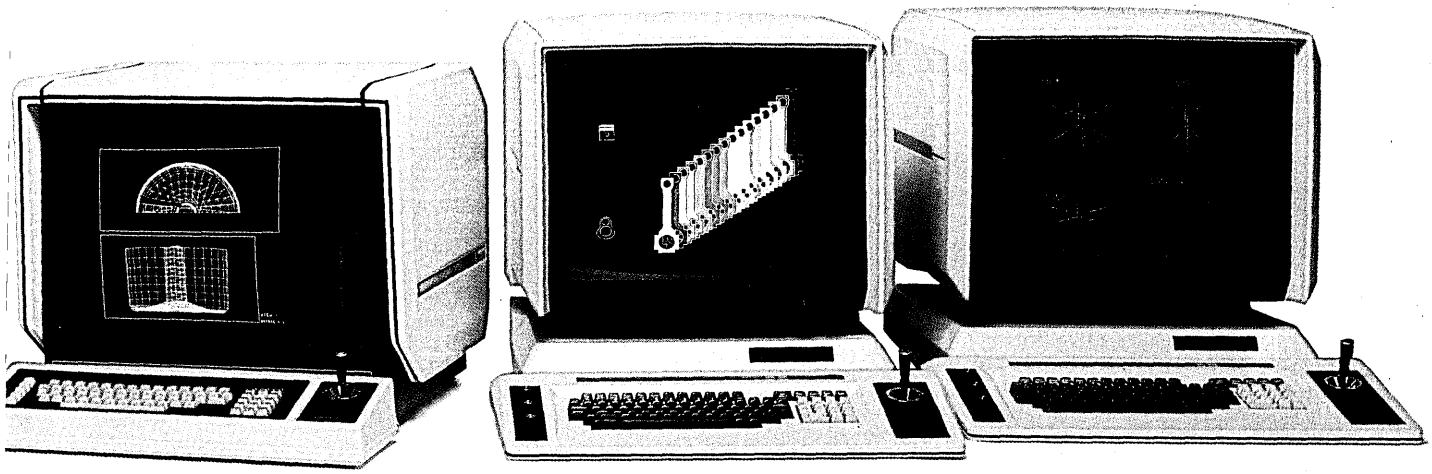

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CIRCLE 150 ON READER CARD

The world of existing information services is complex, sometimes confusing, often untidy.

BUSINESS DIRECTORY DIFFERENT

The comparison between print and on-line versions of a business directory presents a slightly different picture. As noted in Fig. 6, the print version of the *Encyclopedia of Associations* costs $140, and has 1,600 pages of information with approximately 1.1 million words of text. The cost per thousand words is $.127, or about 13 cents.

The on-line version of the *Encyclopedia of Associations* is available from Dialog (a major information retrieval service). Dialog charges $55 per connect hour (not including telecommunications charges) to access the *Encyclopedia of Associations* database, and can deliver information to customers with Dialog-compatible terminals at a rate of 120 characters per second.

For an on-line user, the cost for 10, 30, and 50 lookups per year (assuming each lookup takes three minutes) would be as follows (not including telecommunications charges of from $5 to $8 per hour):

10 lookups = $ 27.60
30 lookups = $ 82.80
50 lookups = $138.00

The cost comparison between owning the printed directory and subscribing to the on-line version looks as follows:

	Print directory	Dialog	Ratio
10 lookups	$140	$ 27.60	5.:1
30 lookups	$140	$ 82.80	1.7:1
50 lookups	$140	$138.00	1.01:1

For the occasional user (10 lookups per year), the cost of owning the print directory is about five times as expensive as subscribing to the on-line version; for the moderate use (30 lookups per year), it's about one and half times more expensive; and for the frequent user (50 lookups per year), the cost is about equal.

The implications of the preceding discussion can be summarized succinctly. Whereas business and professional customers are used to paying large amounts for printed information, and are increasingly ready to pay even more for the convenience of on-line access, residential consumers have no such disposition. Consumers pay only modest sums out of their own pockets for newspapers, magazines, and books. Much of the cost of newspapers and magazines is subsidized by advertising. The fact that most such consumer purchases are discretionary causes intense competition on the part of publishers, thus keeping prices low. When measured by the quantity of information transmitted, even supposedly low-priced on-line services like The Source actually cost 100 times as much as the printed newspaper.

If consumers won't pay for videotext services out of their own pockets, then the consumer market is just not a good bet for videotext. However, there are several ways in which consumers might not have to pay directly for such a service.

FIG. 7

RATIO OF UNIT COSTS OF BUSINESS TO CONSUMER INFORMATION SERVICES

	PER PAGE	PER 1,000 WORDS
Average cost per page, 4 consumer publications	$.009	$.01
Average cost, 4 business publications	.165	.31
Average cost, 3 business publications (excluding *Business Week*)	.209	.40
Ratio, business to consumer (with *Business Week*)	18:1	31:1
Ratio, business to consumer (without *Business Week*)	23:1	40:1

Source: Knowledge Industry Publications Inc.

The most obvious is broadcast teletext. In this case information will be provided free of charge by a broadcaster; in the U.K. the cost is borne by tv license fees; in the U.S. it would probably be borne by advertising. Since costs of storage and transmission are low, and since much of the information is gathered anyway by existing news staffs, there is little economic obstacle to introduction of teletext. It need not be a service with mass appeal, but ought to have a market.

Beyond the market for teletext, however, there are interesting possibilities for advertiser-supported information in computer-based videotext systems. There are also prospects for transaction services in which computer processing actually saves the customer money. The following section will discuss several possibilities.

TRANSACTION SERVICES

Although consumers shell out $25 billion a year for information, this is not a large sum when held up against the total of consumer spending, or even the amount of purely recreational spending. People in the U.S. pay $6.8 billion for newspapers, but $34.2 billion for beer, wine, and liquor. And the $6 billion for books shrivels in comparison with what is spent annually on cosmetics, $30.7 billion.

Because the retail distribution system involves such heavy costs in moving goods from one place to another, and because customers must devote so much time to finding the things they need to buy, one obvious use of electronic communication systems like videotext is simply marketing for marketers and shopping for shoppers.

In concept the idea is wonderfully appealing. The computer stores many thousands of items for sale, with descriptions, prices, and names of suppliers. Information might come from a variety of sources. A huge retailer like Sears Roebuck could give customers electronic access to its catalog—thousands of individual products from a single source. Diagrams or even color photographs of certain products could be stored and transmitted at the touch of a button. After the user has looked at the description of an item, he could then decide to order it. Touching a few more keys would send his credit card or account number to the central computer, which would check his credit and flash an acknowledgement of the order. The supplier, in this case Sears, could use the computer record to produce an invoice, a confirmation or packing slip, and any other paper work to finish the transaction.

Developing such a shopping service involves many problems. But awakening a consumer desire to shop at home is not one of these. Shopping from catalogs or by mail order is already an enormous business in the U.S. One estimate places it at more than $100 billion annually. It has been growing by 11% a year, compared to the 10% rate for retail sales in general. The business is smaller overseas, but still important. In Britain mail order sales are more than $4 billion, in Germany more than $8 billion, according to the Direct Mail Marketing Association.

In all these cases the sums are much larger than the outlays for printed publications. If a videotext system can really operate in the manner sketched above, as a giant catalog shopping service, it has the potential of many billions of dollars annually in transactions.

Such a service has another aspect that should be of special interest to newspaper and periodical publishers—or broadcasters—who derive most or all of their revenues from

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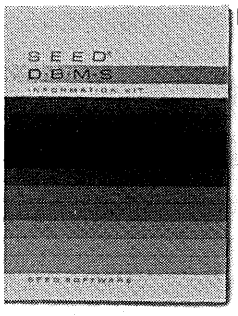

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CIRCLE 151 ON READER CARD

Nothing prevents the videotext systems organizer from having an economic stake in transactions resulting from using the service.

advertising. Advertising today is sold by space or time; the publisher or broadcaster gets paid regardless of how successful the ad is, but if the ad is very successful the publisher gets not a penny more than if it is modestly worthwhile. In a videotext service organized by, say a daily newspaper, this relationship between publisher and advertiser could change significantly. Nothing prevents the videotext system organizer from having an economic stake in the transactions resulting from use of the service. The stake could be a handling charge per order, or a percentage of the value of the order. In either case, the system owner stands the chance of much greater profit than in simply selling advertising space, because he performs the role of active middleman, something that is not the case with conventional one-way printed services.

USES IN BANKING INDUSTRY

If the potential in marketing is great, so are the opportunities in financial services. The number of checks processed annually in the U.S. is beginning to approach the number of grains of sand on the beach. In 1980 the figure was 39 billion, according to the American Bankers Association. At a cost per check estimated at 40 cents, the banking industry spends $15.6 billion just for the physical handling of this paper avalanche. According to several banking organizations, many thousands of people in the banking industry work on check clearing, many of them on night shifts, so that the banks can open their doors to the public every morning showing accurate balances in their accounts.

Electronic funds transfer is not a new subject in banking; it has been the subject of exhaustive study for at least a decade. But the problem of getting citizens to accept and use complex computer terminals to do their banking is a formidable obstacle. Videotext offers a way out of this dilemma. Videotext services use equipment designed to be low cost, and computer protocols that are easy to learn. They offer access to a variety of information and entertainment services. If videotext can be a way of introducing computer equipment into the home, speedy and convenient financial services could be a way of getting people to use the equipment. This is the rationale behind such well-known bank-at-home experiments as Bank One's effort in Columbus, Ohio, and United American Service Corp.'s undertaking in Knoxville, Tenn.

Transactions like shopping and banking are candidates for videotext for another reason besides their sheer size in economic terms. That reason is that in one form or another these activities are obligatory. We can do without a subscription to *Time* magazine, but none of us can go without purchasing the dozens of goods and services—from food to property insurance—that are essential to daily living. In the same vein, a person need not read the paper every day, let alone subscribe to its videotext equivalent, but he can hardly dispense with writing checks or otherwise paying for what he buys. Since shopping and paying for purchases must take place anyway, if electronics makes it possible to do them more cheaply or easily, there is every incentive to adopt these new systems.

Companies engaged in banking, financial services, direct marketing, or other transaction services are among the most sophisticated users of computerized information services in a modern society. American Express, for example, maintains computerized records on 13.3 million cardholders. Visa and MasterCard holders are believed to number more than 158 million. An estimated 39 billion checks are processed annually—which works out to about 2.7 million checks per bank. The worldwide banking industry has developed special computer and telecommunications networks like SWIFT (Society for Worldwide Interbank Financial Transfers) to speed the settlement of transactions among members around the globe.

In fall 1981, U.S. banks began a system whereby credits or debits with European banks were handled the same day, instead of overnight, as previously had been the case. Electronic communication has become the cornerstone of international financial and commodity markets that never shut down—when the London Stock Exchange is finished for the day, New York is still going; when New York closes, the Pacific Exchange is still open, and so on around the globe. A telephone or telex machine and a terminal that can be plugged into any computer around the world are all that a trader needs to be in business, whatever time it is according to the office clock on the wall.

LARGE FIRMS USE RESOURCES

Although not as dependent on instantaneous information, large companies engaged in direct marketing are just as sophisticated in using computerized information resources. The R.H. Donnelley division of Dun & Bradstreet and R.L. Polk Co. maintain computerized files of upwards of 100 million names and addresses for U.S. residents. These files are the basis for a vast mailing list business, as well as for other marketing services involving economic projections, location of new stores or plants, etc. Individual marketers like Sears Roebuck or Montgomery Ward have lists of catalog customers that run into the millions as well.

For certain industries, like airline travel, the existence of a computerized information system is more essential than the existence of the industry's production facilities. An airline can keep functioning if one or two of its planes are grounded for repairs, but it can operate with only the greatest difficulty if its computerized reservation system grinds to a halt. Backup for the computer system is more important than backup for any single plane.

The information stored in these proprietary computer systems is of varying usefulness. Some of it, like a list of yesterday's airline passengers, may be virtually worthless. Other information, like the names and addresses of American Express members who spend $1,000 a month with their cards, can be of enormous commercial value. Videotext technology raises the possibility that this information can be exploited: a marketer can use a videotext system as a means of addressing messages to its best customers. A bank can use terminals installed on customers' premises to deliver other information besides the day's balance. Once a customer is linked to an information provider's terminal, for whatever purpose, the link is a highway along which other information may travel.

It is this fact of modern computer technology that threatens to change the way information is bought and sold in modern societies. If a publisher is someone who has information, an audience, and a way of getting the information to the audience, then Sears Roebuck in Chicago, Barclays Bank in London, and Nomura Securities in Tokyo fit the definition of publisher as well as *The New York Times*, the firm of William Collins & Sons, or the Japanese newspaper publisher, Nihon Keizai Shimbun.

Understanding the role of videotext services requires an understanding of how customers acquire information for business or personal use. Because this process is so complex, there can be no straightforward answers concerning the market for videotext. Nevertheless, the following general conclusions can be offered:

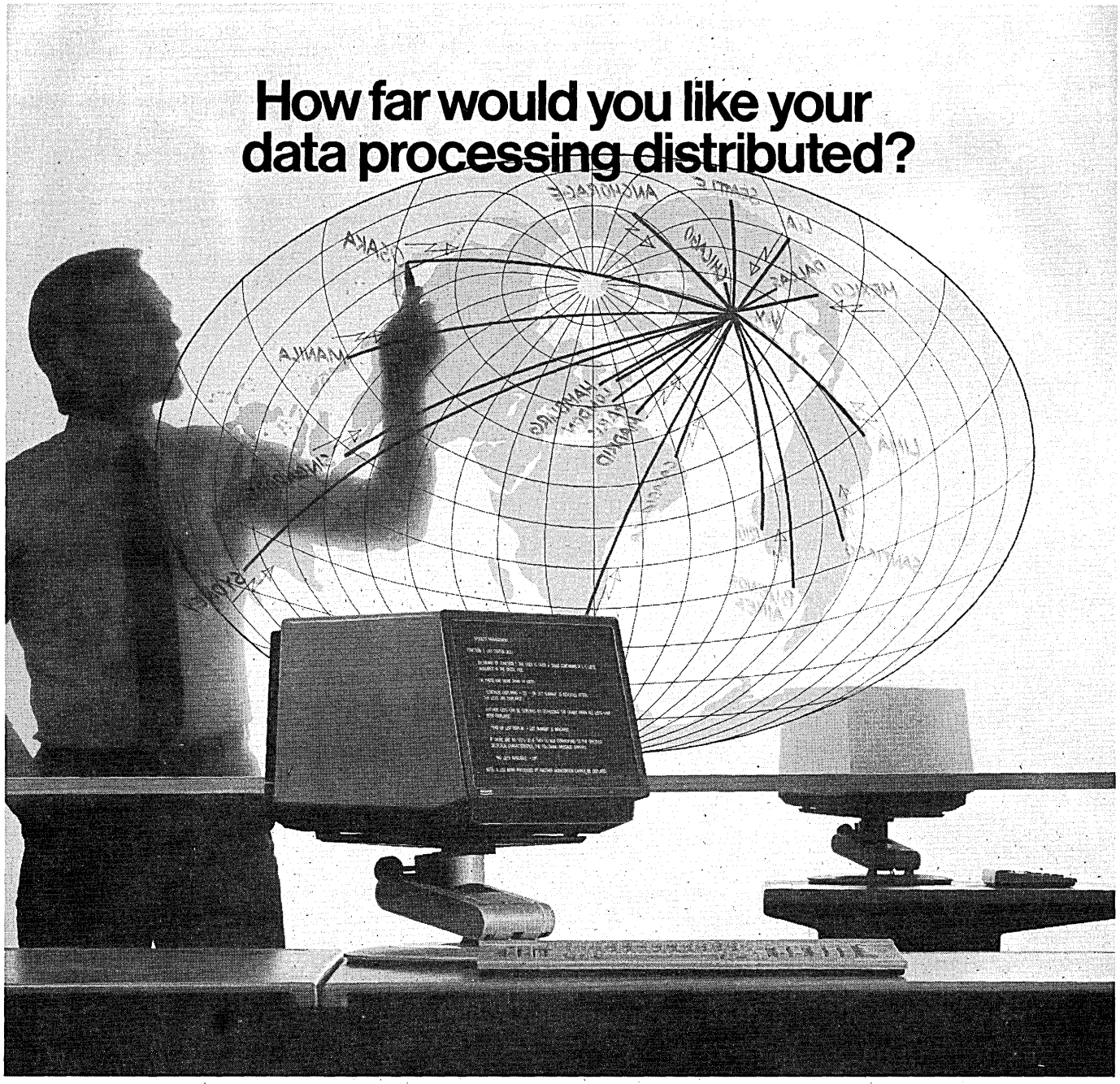
1. the business/professional market is far more promising in the near term than is the consumer market;

2. whether the market is business or consumer, the retrieval of specific facts is the most logical videotext application; and

3. videotext services may first appear in homes as a way for users to conduct shopping or banking; the purchase of information for its own sake should be a more limited activity. *

Efrem Sigel is principal author of *Future of Videotext* and four other books about communications. He was formerly executive vice president/editor in chief of Knowledge Industry Publications. In June 1983 he formed a new company, Communications Trends Inc., New Rochelle, N.Y.

How far would you like your data processing distributed?



Whether you need to keep information flowing across the hall or around the world, here's an important consideration. Thousands of the world's most successful companies have already selected Nixdorf as the best computer company for the job.

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For 31 years, Nixdorf has been providing solutions for the information processing needs of all kinds of businesses. And today, we're a successful international company with 16,000 people and over 110,000 computer systems installed around the world.

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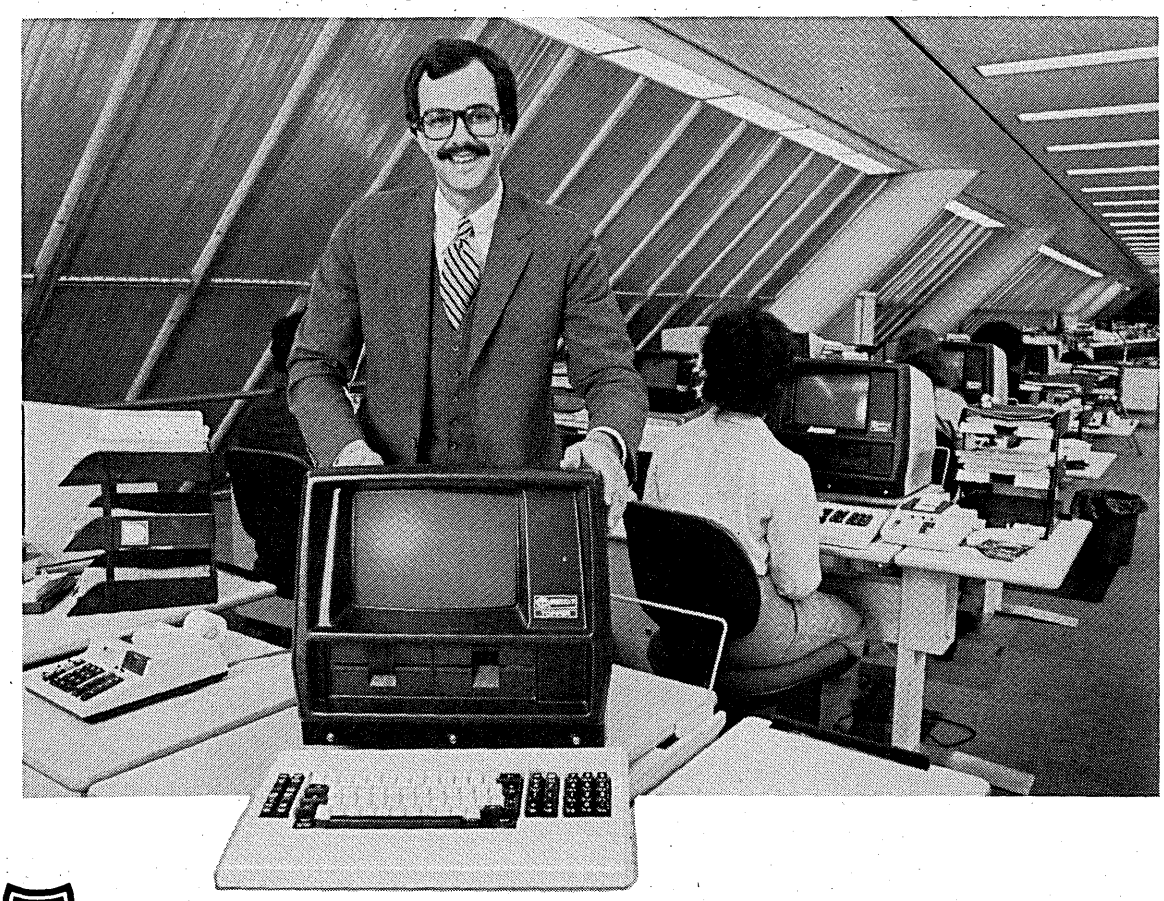
CIRCLE 152 ON READER CARD

"Thanks to Beehive's TOPPER, we'll save more than half a million dollars in claims processing next year."



Savings of as much as $534,000 will be realized by Blue Cross and Blue Shield of North Carolina next year, according to Harry Reynolds, Director of Systems and Programming. It's the result of teaming a number of TOPPER personal computers with the company's IBM 3033 mainframe.

Several months ago, Blue Cross and Blue Shield of North Carolina installed eight TOPPER personal computers in the Professional Claims Section of Benefits Administration for provider claims processing. In a test program, they discovered that TOPPER allowed faster, more efficient processing with less dependence on the central computer. Soon forty-two more TOPPERs will join the original eight to handle numerous segments of the claims processing activity.

Prior to TOPPER, adjudicators processed claims by hand and then passed them on to data-entry operators for preparation of computer-readable tapes. Now, the adjudicator edits claims directly on TOPPER and stores data on diskette. Twice a day, this stored data is transmitted to the host computer under 3270 bisync protocols for complete processing.

Reynolds notes that claims processing is now much faster, and more accurate as well. "The TOPPERs include an edit program that catches errors before the data is transmitted to the main computer. That speeds overall claims processing." As side benefits of this distributed processing approach, system response is the same regardless of the number of users. And adjudicators can continue working even if the main computer goes down.

"We chose TOPPER personal computers because they offered the most practical solution for interfacing to our IBM mainframe," says Reynolds. "In addition, TOPPER is a real value in personal computers and Beehive supports them with on-site service."

Find out how TOPPER can give your people desktop computer power plus access to your mainframe's database under full BSC/SNA network communications control. It's the way more and more companies are boosting productivity and at the same time extending the life of their mainframe investment. Call Beehive today, toll-free, at 1/800/453-9454 for complete details.

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CIRCLE 153 ON READER CARD

PEOPLE

TURN-AROUND ARTIST

"I was never offered a promotion by IBM in 13 years and could see it was going to take me a long time to get to be president, so I left to find greener pastures."

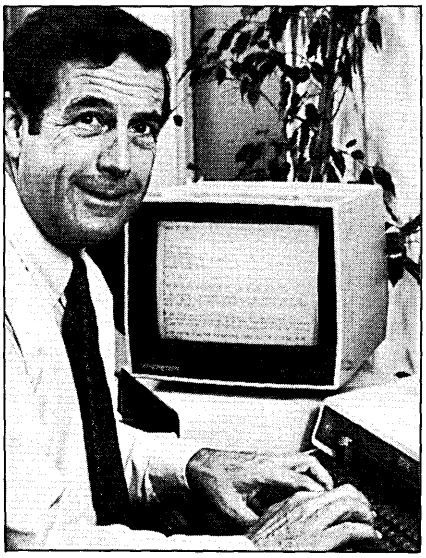
William W. Otterson, 53, humbly corrects himself to admit he did get one promotion from IBM but "it wasn't a very major promotion." In his greener pastures, he's managed to attain the office of president not once, but twice.

Today, he's president of Lexor Corp., San Diego, which offers, in his words, "the lowest-priced data processing known to man." From 1970 until 1979, he was president of Cipher Data Products Inc., a San Diego producer of magnetic tape drives. He took the company from near bankruptcy to $20 million in sales annually.

Both companies were in bad financial shape when Otterson moved in. "I like to jump in and save sick companies," he says. He recalls that when he joined Cipher, "we didn't have the money to meet the payroll that Friday. When I joined this company [Lexor] it was in even worse shape."

Lexor was founded three years ago by Dan C. Stottlemyre, who had left Xerox's Palo Alto Research Center (PARC) with the intention of building the first standalone word processor under $10,000. Stottlemyre did just that. The unit he came up with listed at $8,500. "They were good at developing but not at marketing," says Otterson.

In the meantime, Otterson had returned to an earlier interest in investing in high-tech companies. Lexor was one of them.



WILLIAM W. OTTERSON: "The entrepreneur thing is as exciting as hell for me."

When he left Cipher, Otterson, fighting cancer, went to live for a time in the south of France in the town of Morigins on the Riviera, a town he describes as "completely medieval. My kids played hide-and-seek in medieval walls. I asked myself, why go back to work? I had more than enough [money] from Cipher. I didn't need to, but I began to realize that the entrepreneur thing is as exciting as hell for me."

So it was back to San Diego and high-tech investing. In addition to being an investor in Lexor, he was on the board. "It became clear to me that here was a disaster if someone didn't step in and take over. Stottlemyre came to me. It was the sort of thing that just makes you feel so good you can't stand it. You think, *me,* they want *me* to be president of the company."

He says he approached his new job much as he had at Cipher. He calls it the team approach: "My staff meetings are kind of long. We come up with a team answer. At Cipher it was the streaming tape drive and here it was an add-on word processor.

"The nice thing about the second time around," he says, "is that you have the money to do things." He had heard that Adler-Royal Business Machines was looking for an add-on product that would convert an electronic typewriter into a word processor and he was looking for a large company's endorsement. "We took the standalone product and shoved it into a box and within one month did the typewriter interface. Then, with the product in hand, I went to Royal with my 17 different ways to ask for front money."

Royal said yes to the 17th, which was a request for shelf space in a Royal booth at a National Office Machine Dealers Association (NOMDA) conference plus a letter of intent for 2,000 units. Based on the letter and reaction to the product at the show, he raised $2.5 million in venture capital. This year, he expects company sales to top $36 million.

Otterson's career has had some convoluted relationships. While he was heading up Cipher, the tape drive company was acquired by Computer Machinery Corp., a data entry company that later was acquired by Pertec, a Cipher competitor. Otterson and others then bought Cipher back and Otterson ultimately brought in Don Muller from Pertec to run Cipher. And Al Lay, a founder of Pertec, is a consultant to Lexor and a member of the board.

Last but not least, Lexor's leg up in the word processing business, Adler-Royal Business Machines, is a subsidiary of Triumph-Adler, now parent to Pertec. ✱

Our 14" screen option won't strain your eyes. Or your budget.

With our new large-screen option, the advantages of Qume's QVT™ family of terminals are even easier to see.

In the ANSI X3.64 environment, our QVT 103™ can now give you one of the clearest, most readable 132-column data displays you've ever seen. As well as the low price and high flexibility that already make it the ideal alternative to Digital's VT100 terminals.

And the big screen gives extra eye appeal to our other QVT models—the QVT 102™, our low-cost terminal that emulates the most popular CRTs at the touch of a key, and the QVT 108™, which gives you the power and flexibility of 11 function keys, 12 editing functions and two pages of memory. Choose the 14-inch screen option for either, and you've added unparalleled readability to what is already the best CRT in its class.

Screen size is only one reason why QVT terminals have the clear edge for operator comfort and convenience. There's also Qume's superior ergonomic design: a non-glare green or amber display, with full tilt and swivel. A big 9x12 character cell to even further minimize eyestrain. And a low-profile, detached keyboard.

Before you choose any other brand of terminal, size it up against a QVT terminal from Qume. Whatever your application, you'll find the QVT family of terminals is easy on your eyes. And your budget. Talk to your Qume sales office about filling all your terminal needs. Or write Qume Corporation, 2350 Qume Drive, San Jose, California 95131.

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CIRCLE 154 ON READER CARD

HARDWARE

OFF-LINE

Although Hewlett-Packard's powerful handheld computer, the HP-75C, has been out for about six months, it has been hampered by a lack of packaged software. Early this month HP announced a series of five programs for the machine that are available on ROM capsules. Applications include a text formatter, data communications, mathematics, surveying, and, yes, a VisiCalc program. The one-line display shows a single cell at a time, although the entire spreadsheet can be seen when the unit is hooked to a full-screen monitor. The programs cost about $200 each.

Slightly larger machines, which have multiline displays but not full 24 x 80 displays, have also been hurt by a lack of software, since conventional micro software often needs to be modified to run on these machines. QuickView Systems, a Los Altos, Calif., startup, hopes to remedy that situation with its as-yet-unannounced line of software. The company is headed by portable computer guru Paul Heckel.

SAS/GRAPH, the popular graphics package available from the SAS Institute, Cary, N.C., for IBM mainframes, is now also available on the IBM Personal Computer, when the P.C. is used as a terminal connected to the IBM host. The P.C. support comes at no extra charge with the 82.3 release of the mainframe SAS/GRAPH.

The market for microcomputer business applications software will exceed $7 billion in four years, according to Creative Strategies International, a San Jose, Calif., research concern. You can pay $1,450 for the particulars of this market analysis, which lists and discusses many of the factors influencing the market. When 1987 arrives, we'll see how accurate it is.

VOICE DATA TERMINAL

The VoiceStation is a desktop unit that includes a telephone handset and personal computing capabilities in a triangular shaped box. The system is designed to replace conventional telephone, Rolodex, in/out boxes, pencil and paper, and calendar. Softkeys on the face of the display unit, in conjunction with the unit's voice features, allow for keyboard-free operation of most functions.

The unit includes a voice store and forward capability, voice annotation of text documents for electronic mail, and the Xenix operating system for personal computing capabilities. The unit operates over existing twisted pair telephone wires and is supported by a 68000-based multiprocessor. From eight to 300 workstations can be supported.

The personal computing capabilities are provided by Xenix, an intelligent disk interface, a PBX interface, ECC main memory, a 160MB Winchester disk drive, a 160MB streaming tape drive, and a ½-inch nine-track tape drive. The SyLInk connects a VoiceStation or other RS232 compatible devices to the central unit over dedicated 320Kbps digital lines using twisted pair wires. Voice and data are multiplexed over this link. A typical configuration would cost between $6,000 and $7,000 per user. SYDIS INC., San Jose, Calif.

FOR DATA CIRCLE 301 ON READER CARD

APPLE-IBM PC LINK

The Quadlink board is functionally equivalent to an Apple II, II Plus, or IIe computer on a single card for the IBM Personal Computer. Once installed in the P.C.'s expansion slot, Quadlink allows any Apple program disk to run on the IBM box without having to reformat or convert any disks.

Quadlink allows use of all IBM peripherals and enhancements while running the Apple-compatible software. Apple-compatible programs will appear on the IBM color or monochrome monitor. The board comes standard with a 64KB RAM memory and a game port that is both Apple and IBM compatible. A display adapter, IBM interface, disk controller, and software are also included. The board costs $680. QUARD-RAM CORP., Norcross, Ga.

FOR DATA CIRCLE 302 ON READER CARD

MEGAFRAME

The MegaFrame computer system is field upgradable from a basic eight-user supermini to a 128-user mainframe with 24MB of ECC RAM and 21.6GB of external disk storage. The multiprocessor architecture permits use of both the CTOS and the Unix operating systems simultaneously, with each having access to all system resources.

The system is designed to let users mix and match dumb RS232C terminals, the vendor's workstations, and the vendor's PT terminals. The MegaFrame links up to 36 board level processing units working in parallel on a high-speed 32-bit system bus. Systems grow by plugging additional processors into each cabinet enclosure; up to six card slots can be filled by processors in each enclosure.

Each processor board contains up to 4MB of RAM and its own copy of operating system software. The processor can be an application, file, cluster, or terminal processor; the application processor runs Unix applications off a 68010 virtual memory chip, while the file, cluster, and terminal processors run CTOS for resource sharing, communications, and I/O control. A basic eight-user system costs $17,600, a typical 32-user system costs $46,850, and a 128-user system costs $110,250. MegaFrame is sold only through oems. CONVERGENT TECHNOLOGIES, Santa Clara, Calif.

FOR DATA CIRCLE 303 ON READER CARD

16032-BASED MICRO

The MegaMicro computer system is based on National Semiconductor's NS16032 cpu chip, with virtual memory and internal 32-bit addressing. The units run the Unity operating system, a Unix emulation from Human Computing Resources, with Pascal, FORTRAN, and C languages.

The unit provides demand-paged address and data space of 16MB for each of 32 users, support for 16 hard disk drives,

and the ability to perform 161,000 64-bit double precision floating point multiplications per second. Total memory access for the MegaMicro is 1,600MB. The computer is built around the Multibus backplane for standard peripheral devices and minicomputer software. The systems start at $15,000. LOGICAL MICROCOMPUTER CO., Chicago, Ill.

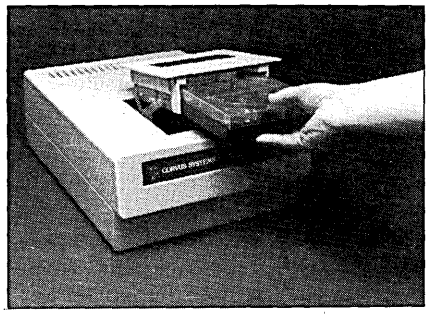
FOR DATA CIRCLE 304 ON READER CARD

200MB MICRO STORAGE

The Bank, as this device is called, features removable tape cartridges capable of holding up to 200MB of data for microcomputers. The unit, which is approximately the same size as a micro Winchester disk drive, is perceived by the cpu as a fixed disk. The media is in the form of a continuous loop of 100-track magnetic tape encased in a cartridge about 5½ × 5½ × 1½ inches. Cartridges are available in 60MB and 100MB sizes as well as the 200MB size.

The vendor considers the device to be a random access storage unit, since individual files can be addressed and loaded either onto a disk or into the cpu's main memory. The unit can also perform all of the tasks normally associated with streaming tape drives. The unit is designed to operate within the vendor's Omninet local area network, providing shared storage for up to 64 computers and peripherals. The unit costs $2,200. CORVUS SYSTEMS INC., San Jose, Calif.

FOR DATA CIRCLE 306 ON READER CARD



REMOTE P.C.-3270 INTERFACE

Irmaline is a decision support interface that allows personal computers in remote locations to communicate with 327X controllers over standard telephone lines. Irmaline attaches via coaxial cables to the 327X controllers, and provides remote personal computers with 3278 emulation and data transfer capabilities. The self-contained device also permits local attachment of PCs to the 3274 or 3276 controller.

Several remote users can share an Irmaline box on a contention basis, reducing the number of devices needed. Irmaline supports 3278-2 emulation for any personal computer or standard async terminal that can emulate a DEC VT100 or IBM 3101 terminal. The 3278-3 and 4 terminals are emulated only if the PC is connected locally. Currently, the IBM P.C., the Apple Lisa, and the DEC Rainbow personal computers are supported by the $1,400 device. TECHNICAL ANALYSIS CORP., Atlanta, Ga.

FOR DATA CIRCLE 307 ON READER CARD

WP/OA SYSTEMS

The OIS 40 and OIS 50 office information systems offer standalone and clustered hardware that can be integrated with Wang-Net or with IBM networks through 3270, 2780/3780, and Teletype emulations. The OIS 40 consists of a terminal with detached keyboard and movable monitor, and a system master cabinet. The system master contains the cpu, a 10MB 5¼-inch fixed disk, and a 320KB 5¼-inch floppy disk drive. When configured with a 20cps daisywheel printer, the unit costs $8,200.

The OIS 50 includes the same system master and printer, but can support up to four workstations. An entry-level system costs $9,800 and each additional workstation costs $2,600.

Standard software on both systems includes word processing, a glossary/speller, "decision processing," sorting, security, and arithmetic. A message control function is also standard, allowing a user to send and receive messages between workstations.

Communications with IBM equipment cost extra, as much as $2,000 for the 3274 SNA protocol. WANG LABORATORIES INC., Lowell, Mass.

FOR DATA CIRCLE 308 ON READER CARD

SUPERMINI

The 3205, at $9,950, is the lowest priced of this vendor's 3200 series of supermini systems. Packaged in an eight-slot chassis, the model 3205 processor is implemented on a single board with floating point capability, a selector channel, and up to a megabyte of main memory.

A multiperipheral controller uses microprocessor technology to implement the most commonly used I/O functions on a single card. An optional third board enables the user to expand the system to a maximum of 4MB. The system is completely compatible with the entire 3200 line of hardware and software and can be upgraded in the field.

The OS/32 operating system runs FORTRAN, Pascal, COBOL, BASIC, CAL MACRO, RPD II, and CORAL 66. The processor can be packaged as a complete system, with 512KB of MOS memory, a system console, power supply, 40MB Winchester disk, disk controller, and selector channel; in that configuration, it costs $24,950. PERKIN-ELMER CORP., Data Systems Group, Oceanport, N.J.

FOR DATA CIRCLE 305 ON READER CARD

FIBER OPTIC MUX

The 5100 fiber optic communication system uses time division multiplexing to send 64 discrete RS232C signals through a fiber optic cable for distances up to a mile. Information from each channel is transmitted after being assigned unique address/time slots. Front panel indicators monitor communication status and verify data received from remote centers. Up to 32 full duplex channels can operate asynchronously at up to 19.2Kbps, or synchronously at up to 38.4Kbps. The remaining 32 channels can be used for 300 baud async data or as control signal lines. A four-channel version

HARDWARE SPOTLIGHT

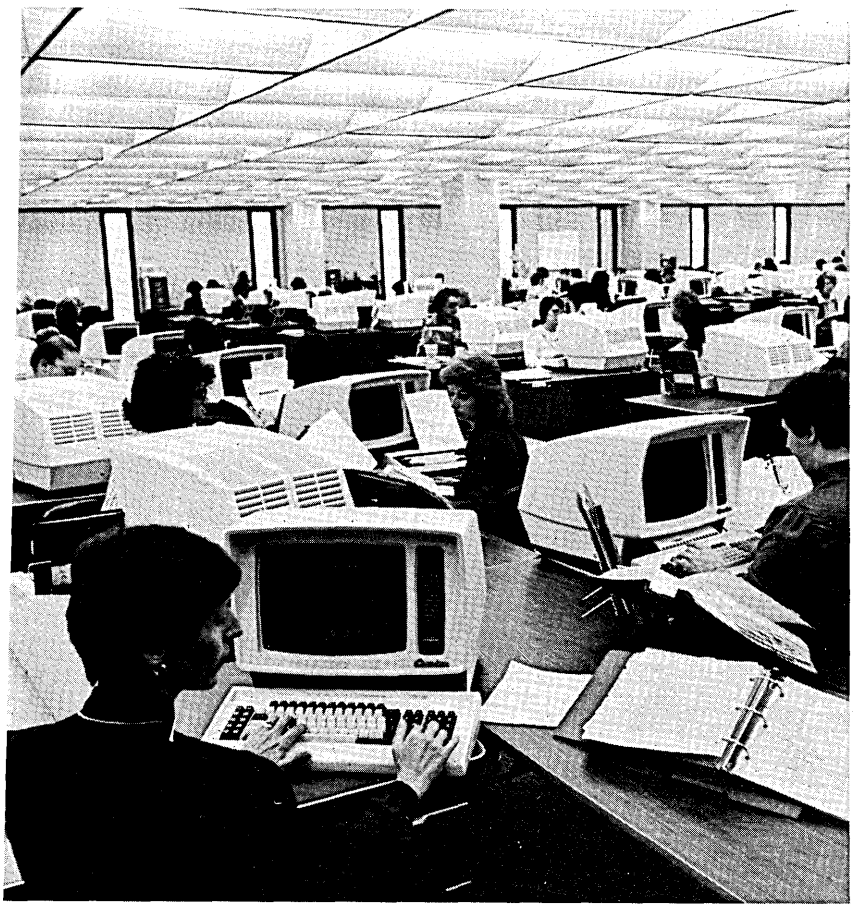
VAX ENHANCEMENTS

The VAXcluster multisystem technology permits a configuration of up to 16 VAX computers and intelligent storage subsystems to function outwardly as a single system. The approach allows users to implement cluster-wide data sharing and software tools to ensure data integrity and higher system availability. Data accessed from anywhere in the cluster of VAX cpus will appear as if they were local; clusters will also support external and internal communciation through DECnet interfaces and local area multiple device access via Ethernet.

Hardware components of a VAXcluster include VAX-11/780, VAX-11/782, and VAX-11/750 processors, a dual-path computer interconnect bus, an intelligent bus interface for each processor, a star coupler for physical interconnection of processors and storage subsystems, and a mass storage controller. Cluster operation will be managed under new versions of the VMS operating system. Future releases of VMS software will take advantage of the VAXcluster potential for data protection and fault tolerance. They will provide the capability to survive and reconfigure around failed nodes. Each computer interconnect interface costs $19,500; the cable sets vary in price according to length. The star coupler, equipped to receive eight nodes, costs $7,500, with an 8-node upgrade kit an additional $5,500.

A second enhancement to the VAX series is a 64KB memory subsystem that quadruples the VAX-11/780's maximum main memory to 32MB. The memory subsystem consists of a memory controller and memory array boards that have four times the capacity of the older 16KB modules. The subsystem plugs into the new memory backplane that attached to the VAX-11/780 SBI in the same manner as the older boards. The memory is available in 2MB increments. Including the controller, 4MB costs $36,000 and 2MB costs $28,900. Add-on memory modules cost $9,000 for 2MB, $17,000 for 4MB, $24,000 for 6MB, and $34,000 for 10MB. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 300 ON READER CARD



You have the information.

We have the way to move it.

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It seems clear that something must be done to bring the movement of information outside the office to the same sophisticated level as inside the office.

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And we're continually adding new features with an eye to satisfying your future requirements.

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Best of all, our Spectrum was created with the same expertise and quality we're known for around the world.

The way we look at it, whatever other productivity problems American business has, it's producing more and more information.

And getting that information where it's needed speedily, reliably, efficiently and economically—that's what ITT Worldcom is all about.

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10004

ITT

ITT World Communications Inc.

CIRCLE 155 ON READER CARD

costs $3,228, while a 32-channel version costs $6,460. OPTELECOM, Gaithersburg, Md.

FOR DATA CIRCLE 309 ON READER CARD

INK JET PRINTER

Bring technology to the masses! In this case, it's ink jet printer technology, usually reserved for expensive graphics printers. The PR2300 printer, however, is designed for personal computer or workstation users, and costs $575. It uses a single-jet printhead to direct carbon particles onto plain paper in a 7 × 7 dot matrix, using a technology similar to dry paper copying.

The desktop printer is capable of producing 96 ASCII characters with seven foreign language and symbol fonts. The unit produces 50 bidirectional lines per minute throughput over 80 columns; three print pitches—10, 12, or 15 cpi—are available. Double height, double width, and bold printing are also provided. The printer uses a Centronics parallel or RS232C serial interface. DOCUTEL/OLIVETTI CORP., Dallas, Texas.

FOR DATA CIRCLE 315 ON READER CARD

DEC PC CONVERSION

This vendor has converted DEC's Rainbow 100 personal computer to operate as a Burroughs display terminal as well as a microcomputer. The unit was chosen for adaptation because of its dual 8-bit Z80 and 16-bit 8088 microprocessors.

The unit can operate standalone using DEC's CP/M-86/80 operating system or can emulate a Burroughs TD830 or MT985 terminal. The Rainbow 100/Burroughs, as it is named, operates on all Burroughs computer networks using poll, select, fast select, broadcast select, and multipoint contention modes in synchronous, asynchronous, or two-wire direct interfaces.

The Rainbow 100/Burroughs comes with the LA-50 compact personal 100cps dot matrix printer. Total cost is about $5,000. 3 P.M., INC., Livonia, Mich.

FOR DATA CIRCLE 316 ON READER CARD

PORTABLE TERMINAL

The latest in this vendor's line of "Silent 700" teleprinters features battery operation and weighs six pounds for ease of use in a variety of environments. The model 707 includes a full-size typewriter-like keyboard and print formats of 80 or 132 columns as well as an integral single-chip modem that allows a user to plug directly into a modular telephone jack.

The terminal can be equipped, as an option, with solid-state software cartridges that provide capabilities not found on other TI terminals. The first cartridge available allows the user to set up her own directory of phone numbers and log-on sequences. To access a commercial or private database, the user keys in her code word and the

Auto-Access cartridge dials the phone number and provides the host with the user's log-on sequence.

The terminal costs $700, not including the battery pack. The model 703 desktop version (which includes an RS232C port) costs $600. TEXAS INSTRUMENTS, INC., Data Systems Group, Dallas, Texas.

FOR DATA CIRCLE 317 ON READER CARD

NONSTOP FIBER OPTICS

The Fiber Optic Extension (FOX) link allows the connection of up to 14 close-proximity NonStop II systems into a very high-speed communication network. Since each system can contain up to 16 processors, the total network size for a local cluster would be 224 processors.

Information can be sent and received concurrently across the link at 4MBps. The link is compatible with the vendor's proprietary Expand networking software, which can be used to link nodes more than a kilometer apart. The fiber optic link operates in a full duplex, fault-tolerant mode by using two pairs to transmit/receive fibers between every two systems on the link. An extra fiber is included with each bundle of four to facilitate repair. The FOX link costs $38,750 per node, including controllers, backplane, interprocessor bus cables, and five 100-meter fiber optic strands with terminators. TANDEM COMPUTERS, INC., Cupertino, Calif.

FOR DATA CIRCLE 318 ON READER CARD

NETWORK MONITOR

The SMART network monitor system is designed to meet the requirements of managing large datacom networks from a central site. SMART (System Monitoring and Reporting by Tesdata) features proprietary data collection hardware and software as well as a central control terminal running CP/M with Multiplan and other packages.

The system includes a master workstation, with 40MB of on-line storage; a color analytical workstation with 16MB of storage; a graphics/line printer and a color plotter; and line interface modules for data collection from up to 32 lines. The workstations are provided by Convergent Technologies; this vendor manufactures the line interface modules for the data collection, as well as the interfaces to the off-the-shelf software for analysis.

Applications include network planning, organization and real-time control, and configuration management. A typical entry system costs about $100,000. TESDATA SYSTEMS CORP., McLean, Va.

FOR DATA CIRCLE 319 ON READER CARD

A-E-C WORKSTATION

The Sigma III CAD workstation provides a superset of the capabilities found in the Sigma II, but is based on the 68000 microprocessor and the Multibus backplane; the result is a greater range of applications and a lower price. The workstation is intended for the architecture-engineering-construction (A-E-C) market and starts at $83,000 for hardware, software, printer, and plotter.

Input is generated through a movable keyboard, to which is attached a joystick and an array of 294 membrane pushbuttons, each of which can represent up to 128 ASCII characters. In addition to the keyboard/membrane pad, data can be input through a digitizing tablet; the tablet has another hundred membrane pushbuttons, many of which repeat keyboard items for ease of use.

Output is generated on a high-resolution color graphics monitor; alphanumeric data and other information can be displayed on a smaller monitor attached to the color monitor. The two monitors swivel independently but travel together around the circumference of the curved workstation table. The central electornics complex is housed in a cabinet under the workstation; it can support up to 400MB of Winchester storage, with a 45MB tape backup. SIGMA DESIGN, INC., Englewood, Colo.

FOR DATA CIRCLE 320 ON READER CARD

INK JET PRINTER

The Series C color ink jet printer utilizes drop-on-demand technology to address the image processing and graphic requirements of personal computers, professional workstations, and business systems. The printer generates integrated text and graphics by using special symbols and mosaics or complementary image bit-mapped addressing.

The four- and five-pass, 20cps printer features switch-selectable uni- and bidirectional printing capabilities on cut sheet or roll paper. The printer's 16-nozzle head can place 120 dots per inch in both directions. The printer costs $1,250.

The vendor, continuing its diversification away from daisywheel technology, also introduced a Series 200 EPM plain paper thermal transfer printer. The EPM (for electronic printing machine) uses a solid state raster-line printhead capable of producing 200 × 200 resolution per square inch. The printer can mix fonts, pixel density levels, protrail and landscape images, graphics, and gray-scale features. The 300 1pm printer costs $5,000. DIABLO SYSTEMS, INC., Hayward, Calif.

FOR DATA CIRCLE 321 ON READER CARD

—Michael Tyler

The buck starts here.

Making a start is probably the most important step toward saving. For those who find saving difficult, it's too easy to say, "I'll start tomorrow... or maybe next payday... or next month."

Then, if you finally do save something three or four paydays in a row, it seems OK to skip one or two, since you've been doing so well. And soon you're right back where you started.

There is a way to take that initial step and know you're on the right track toward a regular, scheduled savings. Just join the Payroll Savings Plan at work. A little is taken out of each paycheck toward the purchase of U.S. Savings Bonds. You never see that little extra. You never miss it. You don't have to worry about making a special effort to put something aside each payday. It's all done for you. Automatically.

The bucks start piling up, the interest grows, and you realize you've found one surefire way to save. You finally have a plan for the future.

And when the bucks stop coming in, you'll have something to show for all those years of hard work.

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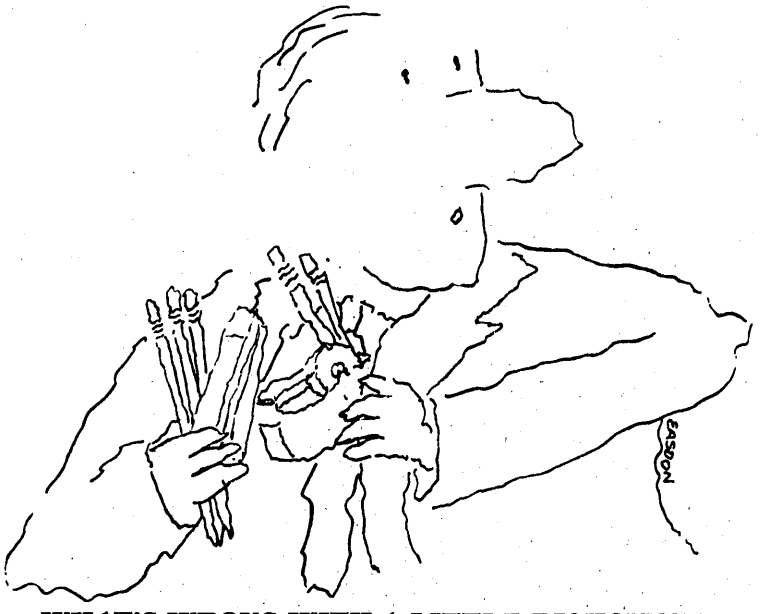

WHAT'S WRONG WITH A LITTLE DISHONESTY?

Nothing, according to a lot of people. In a recent survey, two out of five job applicants were admittedly "a little dishonest". What happens when dishonesty becomes the "in" thing? The possibilities range from continued inflation to the loss of our political freedom, says *Common Sense & Everyday Ethics.* It's a new 36-page booklet from the Ethics Resource Center, a non-profit Washington, D.C. research corporation. *Common Sense & Everyday Ethics* is for anyone who needs a simple but authoritative guide to making ethical decisions in everyday life. And for anyone who wants to know what one person can do. Send your name, address, and $1 for one copy, $10 for a dozen.

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Users and DP form powerful team, thanks to INQUIRE

Anthony Gambatese
Vice President, Data Processing

Robert W. Amick
Vice President, Marketing

The day-to-day insurance business of $1 billion-a-year Blue Cross of Northeast Ohio (BCNO) has been automated for a long time. Enrollments are made quickly. Claims are paid promptly.

But competition for group insurance business had become strong in the eleven-county market surrounding Cleveland. Blue Cross marketing executives knew there was a considerable amount of information already on the computer which would help the company stimulate aggressive growth in its market. "The challenge," said Vice President of Marketing Bob Amick, "was how to turn existing customer information into meaningful marketing information."

Using INQUIRE, a small team of DP people were able to prototype each part of the required application as marketing people looked on. The final system met the users' objectives because they had been directly involved in its development. INQUIRE was used to retrieve ad hoc reports from diverse and widespread databases. INQUIRE made it possible to do user-specified multi-key searches for information. The INQUIRE User Language allowed DP people to develop complex systems for end-users to run themselves.

Said Vice President of Data Processing Anthony Gambatese, "The Marketing Information System has shown us what is possible for application development through INQUIRE. Now we're turning to INQUIRE for Executive Decision Support, budgeting, HMO utilization, and much more. We call INQUIRE our user-enabling tool."

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CIRCLE 157 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

It may be inevitable that every college student may someday have access to a computer from his dorm room, but don't count on it too soon. Engineering schools, like Drexel and Carnegie-Mellon, have embraced the idea warmly, and even a tiny liberal arts institution like Union College now offers a terminal in every roon -- but there are those who resist. At Princeton, administrators and engineering students question the idea of liberal arts students monopolizing cpu time and terminal access with word processing applications. Liberal arts majors contend that they need any computer experience they can get, including wp.

Similar issues are being raised in corporate America, where the MIS staff has to allocate computer resources. One way it will be doing that in the next few years, says industry consultant David Ferris, is by acting as a "retail" outlet for users who want micros. He foresees MIS offering users significant post-sale support.

For years industry analysts have been saying that IBM compatibility is the only way to go, and the BUNCH may be listening. Witness Sperry, which recently announced plans for computer interfaces that would link Sperry and IBM hardware via SNA. The plan offers a way for Sperry to continue to support its user base while, perhaps, moving toward IBM plug-compatibility.

IBM's ability to lead by example also takes stranger forms. Since it placed a rose in its ads for the Personal Computer, we have seen other vendors adopt the flower: TAC's Irma and Anderson Jacobson's Executive PC come to mind. Then there's Durango's Poppy; they at least chose another flower. It's enough to cause hayfever.

INTELLIGENT COMMUNICATION

This pair of products is intended to provide an intelligent connection between personal computers and large databases on IBM mainframes. VisiAnswer runs on the IBM Personal Computer, and Answer/DB runs on the mainframe.

VisiAnswer provides a human interface on the P.C., helping the user formulate queries and select desired data. Then the Answer/DB selects and extracts data from any database maintained on the mainframe, summarizes the data, and downloads them to the P.C. VisiAnswer handles all communications with the mainframe and Answer/DB automatically, so the user need not deal with accessing the mainframe. The extracted and summarized data are stored in the P.C.'s floppy diskette in a format immediately usable with VisiCalc, VisiTrend, VisiPlot, and other VisiSeries applications.

Answer/DB allows the MIS manager or database administrator to set up user profiles, specifying which parts of the database should be accessible to each user. These profiles provide controlled access and security for corporate data, as well as names and descriptions for the data to be defined for each user; this can help the user in formulating queries.

Answer/DB provides access to IMS, IDMS, VSAM, ISAM, and other databases. It initially operates under the IMS/DC TP monitor, with CICS, CMS, and TSO versions to follow. VisiAnswer is available on the IBM Personal Computer and will also operate with VisiOn when that becomes available. Customer shipments are slated to begin in the third quarter. A typical configuration, consisting of an Answer/DB module on a single mainframe and VisiAnswer for 50 P.C.s, costs $45,000. VISICORP., San Jose, Calif.

FOR DATA CIRCLE 326 ON READER CARD

INFORMATICS GENERAL CORP., Woodland Hills, Calif,

FOR DATA CIRCLE 327 ON READER CARD

UNIX UNDER VMS

Eunice 3.1 is designed to emulate the Unix operating system under VAX/VMS releases 2.5 to 3.1. It provides the source code control system, a facility originating from the Bell Labs Programmer's Workbench version of Unix, as well as control and access protection for programs and documentation.

Using VMS with Eunice 3.1, both the VMS and Unix environments can be operating simultaneously, depending on the users' application needs. Users can operate in a Unix environment using any Unix or VMS utilities, or in a VMS environment with the ability to use all the Unix tools with VMS utilities. Eunice 3.1 costs $5,250, which includes an installation guide, documentation, and a one-year warranty. In addition, the package is offered with on-site installation and orientation services for customers whose internal support staff is inexperienced with Unix system configuration and organization. THE WOLLONGONG GROUP, Palo Alto, Calif.

FOR DATA CIRCLE 328 ON READER CARD

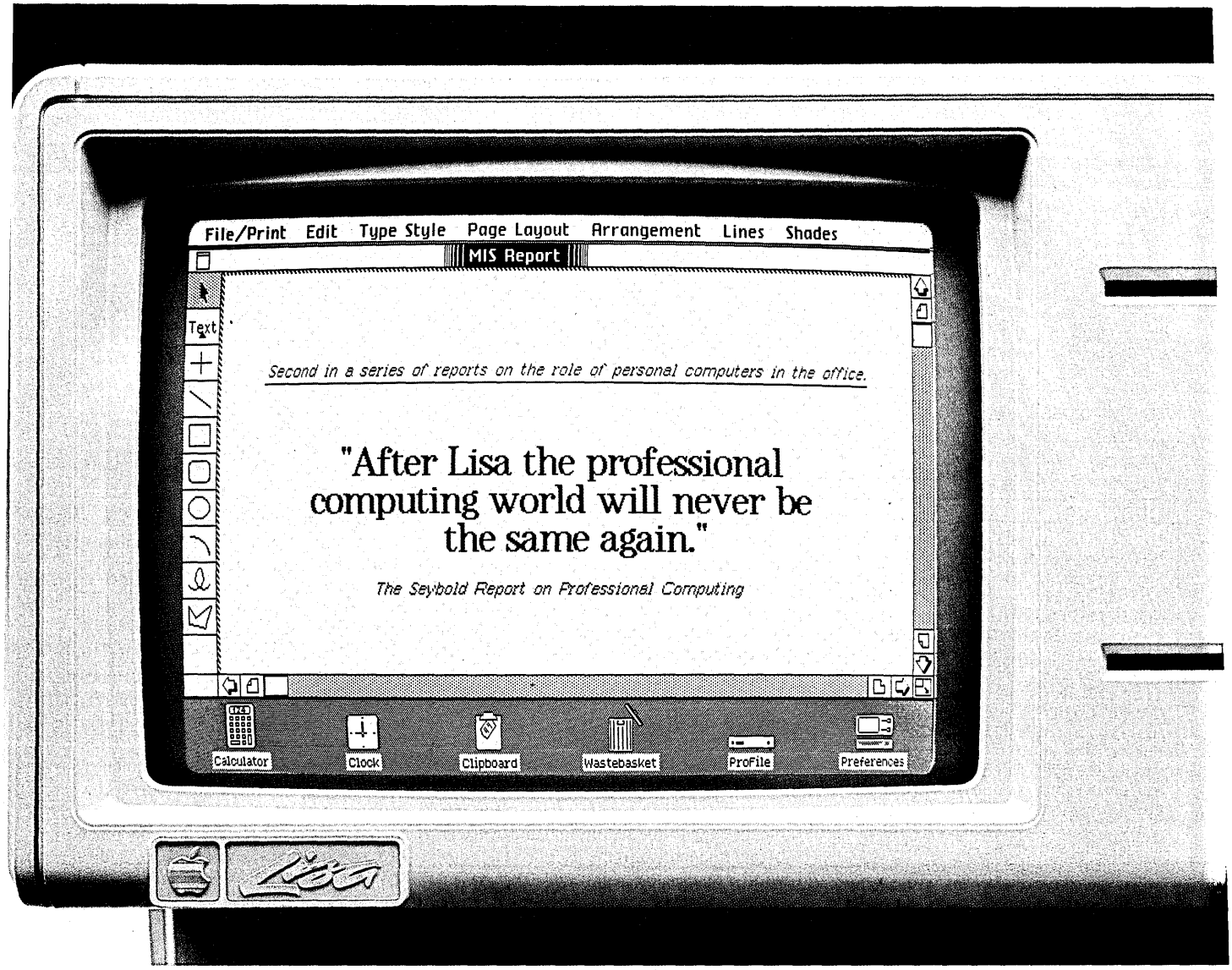
P.C. COMMUNICATIONS

Relay offers IBM Personal Computer users the ability to send and receive messages or files simultaneously between P.C.s, while also printing and editing locally. It also offers the ability to communicate with mainframe hosts running VM/370. When used in conjunction with a VM/370 mainframe running the vendor's not-yet-released PC3270 package, Relay will simulate a locally attached 3270 terminal on the P.C., including all function keys.

Relay can send and receive messages or files in any format, including spreadsheet models, electronic mail, word processing documents, and program files. Performance is limited by the speed of the modem used and is aided by error detection and correction in both directions.

Relay, which can access service bureaus and convert the P.C. to an APL terminal, includes a full-screen text editor that can be used to create or modify files while on Relay or as a dynamic off-line tool. The product costs $90. VM PERSONAL COMPUTING INC., New York, N.Y.

FOR DATA CIRCLE 329 ON READER CARD



Apple's new Lisa is the world's most powerful personal computer.

Its 32-bit MC68000 microprocessor gives it the processing capability of a mid-range mainframe.

It also has one million bytes of internal memory. And, with a 5-Megabyte hard disk, more than 15 times the on-line mass storage of standard microcomputers.

Given these most imposing credentials, one could get the impression Lisa was designed solely to scare one's socks off.

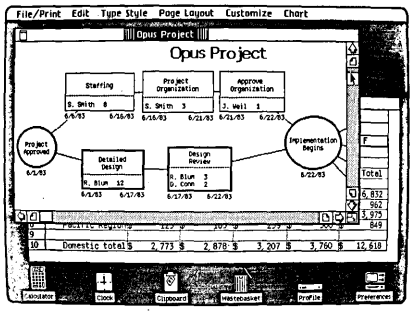
On the contrary.

What makes Lisa totally revolutionary is that, for the first time, all this phenomenal power is contained in a business computer you can learn to use in under 30 minutes.

200 years of hard work made it easy.

To tell Lisa what to do, all you have to do is point.

But achieving this simple concept required a totally new approach to software and 200 person-years of development.



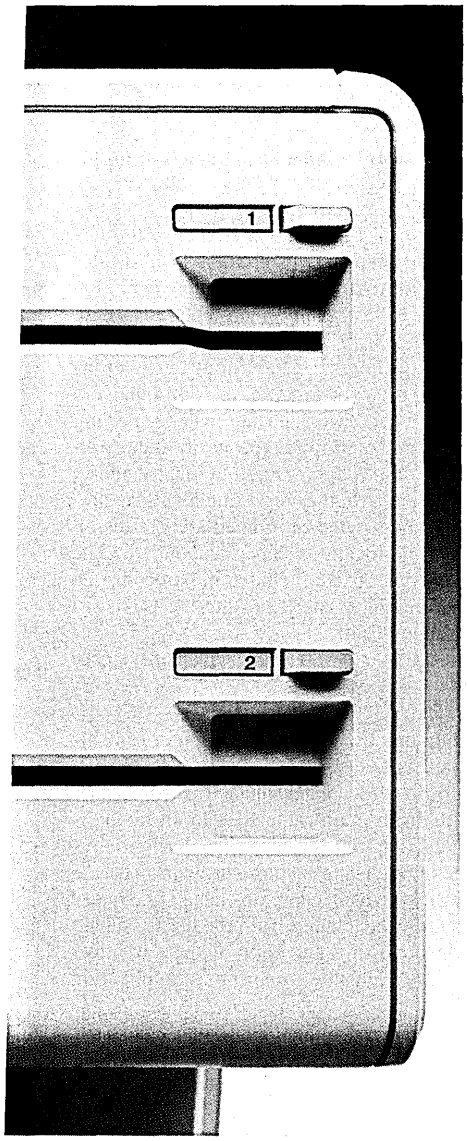
Lisa's revolutionary software lets users perform several applications simultaneously, even "cut" and "paste" them together. The powerful project management program seen here is a Lisa exclusive.

Lisa replaces complex computer commands with symbols familiar to anyone who's ever worked at a desk.

Even someone who's never touched a computer before can learn Lisa in under half an hour. Versus the 20 hours or more required to unriddle conventional PC's.

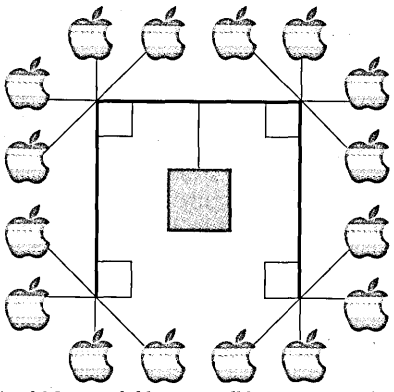
To information managers, that means dramatically reduced training time and increased productivity.

But people don't just learn faster on Lisa, they also work faster. Each of Lisa's powerful applications* use symbols and commands common to all. So with little practice, users can move from LisaCalc to LisaGraph to LisaWrite without missing a beat. Or use them all at once, "cutting" information from one program and "pasting" it directly into another.



There's even a program — LisaProject — that lets you use the mouse to chart the progress of complex projects, automatically recalculating when deadlines or resources change.

On paper, Lisa is just as exceptional. With its dot matrix and daisy wheel printers, it produces printed materials just as you see them on the screen.



AppleNet, available soon, will let Lisas and other Apples share information, and costly peripherals.

Powerful connections.

Any Lisa system can become part of a powerful Lisa network through AppleNet, our own low-cost local area network.

It enables a user to transfer documents from one department to another, so they can be rapidly reviewed. Or modified. Or passed on to other Lisas.

The same network allows Lisas to branch out to other Apples. Or share disks, printers and other costly peripherals.

Using the LisaTerminal program, Lisas can tie into mini and mainframe computers, by emulating VT 100-type or 3270-type terminals.

And soon Lisa will provide a revolutionary link to Cullinet's Information Database for mainframes.

In short, one Lisa can do the chores of many terminals. All of which means swifter response times and better distribution of resources.

Stay on top of new developments.

Lisa's unique user interface lets programmers develop programs with unaccustomed speed.

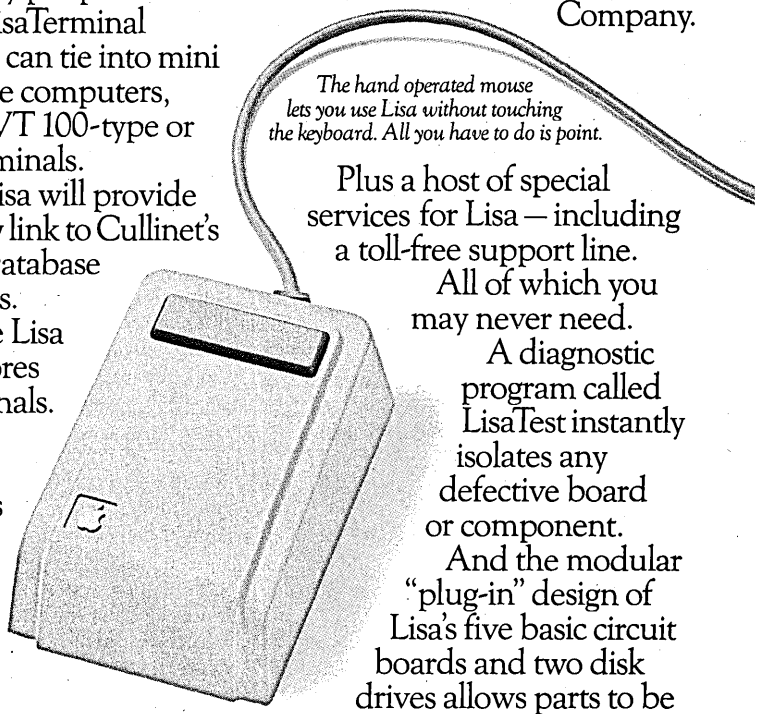
But that's not Lisa's only programming attraction.

The Lisa Workshop provides a powerful environment in which to develop COBOL applications. A full screen Lisa-like editor, code generator, and multiple windows make a visible difference in development times.

Apple also supplies all the documentation, instruction, and support a developer requires to integrate applications into the Lisa environment — no matter how sophisticated their information processing needs.

We support the whole family.

Apple now offers nationwide on-site service for all Apples in conjunction with RCA Service Company.



The hand operated mouse lets you use Lisa without touching the keyboard. All you have to do is point.

Plus a host of special services for Lisa — including a toll-free support line.

All of which you may never need.

A diagnostic program called LisaTest instantly isolates any defective board or component.

And the modular "plug-in" design of Lisa's five basic circuit boards and two disk drives allows parts to be replaced in seconds, with just one tool: Your fingers.

For the whole story, call our National Account Program at (800) 538-9696.

No matter how large your company, Apple has all the elements to improve your information systems management.

Including Lisa, the computer that makes headlines.

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*With more programs on the way, Lisa's library now includes LisaCalc electronic spreadsheet, LisaList data base, LisaWrite word processing, LisaGraph business graphics, LisaDraw presentation graphics, LisaProject electronic project management and LisaTerminal data communications. For information regarding corporate purchases through our National Account Program, call **(800) 538-9696.** In Canada, call (800) 268-7796 or (800) 268-7637. Or write to Apple Computer Inc., MIS/EDP Marketing Dept. 20525 Mariani Ave., Cupertino, CA 95104.

SOFTWARE AND SERVICES

HP 3000 TO IBM

Imas/3000 gives HP 3000 users access to IBM mainframes with 3270 emulation. The vendor says that the product offers half the response time and two thirds the cpu time of Passthru, the Hewlett-Packard product. The product enhances the terminal handling performance by avoiding the HP block mode data transmission in favor of character mode transmission; the result is less terminal I/O.

The package utilizes the HP facility of soft keys on the 262x terminals, so that all 12 (or 24) function keys on the IBM 3270 terminals can be emulated using the HP mainframe, with the use of an automatic dialog facility.

The automatic dialog is a description of a set of interactions between a user and a mainframe application that is executed by Imas. Operations that are performed repeatedly—like logging onto or off the mainframe—are performed automatically. Automatic dialogs can also access files on the HP3000 and perform data transfer operations between on-line mainframe applications and MPE files. An MPE facility is also provided, wherein users can run HP3000 applications locally while the IBM session is still active. FJERNDATA A/S, Hovik, Norway.

FOR DATA CIRCLE 330 ON READER CARD

OA SERVICE

The Eckerly Reports on Office Automation Productivity are intended to analyze the ways in which electronics in the office enhance job performance. The quarterly reports examine word processing, desktop computers, and telephone systems, as well as the changes in managerial and functional skills that result from office automation. The reports include analyses of how users are integrating their various pieces of equipment. Report sponsors can determine where bottlenecks occur as word processing volume changes, whether the right people are using personal computers for the right tasks, whether more training rather than more horsepower is required, and whether format procedures are being supported or subverted by custom and habit. The reports are individually priced. THE ECKERLY CO., Brookline, Mass.

FOR DATA CIRCLE 332 ON READER CARD

AUTOMATED REPORTING

Automated reporting features added to this vendor's electronic mail service, called Notice, are intended to eliminate manual calculations, retyping, and other time-consuming aspects of business reporting functions. The enhanced service, available on the worldwide Infonet communications network, enables a user to design reports that prompt clerical personnel for the information required to complete the report.

The clerk can then order the data to be analyzed by sets of predeveloped computer programs, consolidated with similar information from other sources, and forwarded to designated recipients anywhere in the network. The clerk can also send the report as a message to various destinations on the network, including individuals, a file, or a database. The automated reporting features also allow the program to consolidate data in messages automatically and to send them to higher reporting levels on preestablished dates or immediately after all reporting locations have responded. The enhancements are included in Notice for no extra charge. COMPUTER SCIENCES CORP., El Segundo, Calif.

FOR DATA CIRCLE 331 ON READER CARD

INTERACTIVE P.C. LINK

The Interactive Personal Computer Link allows users of this vendor's mainframe software to download selected records and fields from mainframe files to an IBM Personal Computer for immediate use with microcomputer application software. The capability stems from an on-line ad hoc query capability, executed from the micro, which allows real-time selection of specific information from the mainframe application files.

Data can then be manipulated at the P.C., and users can perform real-time updates to the system mainframe files with the new data. The real-time uploading eliminates the need for rekeying of data.

The vendor will supply custom micro and mainframe software to provide users with the capability to develop budgets on the Lotus Development Corp. 1-2-3 micro program and then upload the data. The Interactive P.C. Link, which will initially support the vendor's G/L Plus general ledger program in the third quarter, runs on OS and DOS operating systems. Pricing is set at $25,000 per mainframe cpu site and $2,500 for each personal computer linked to the mainframe. The price includes 1-2-3 and custom software, as well as hardware required to interface the P.C. to the mainframe via 3270 protocols. (The hardware comes from Technical Analysis Corp.) MCCORMACK & DODGE CORP., Needham Heights, Mass.

FOR DATA CIRCLE 333 ON READER CARD

MAINFRAME SPREADSHEET

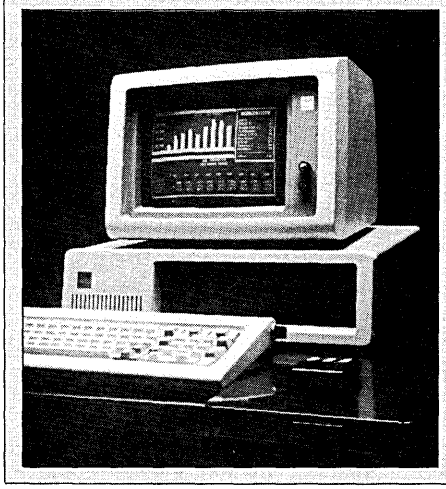
The ESS electronic spreadsheet for IBM mainframes provides users with VisiCalc compatibility and up to 16MB of storage. Each spreadsheet written with ESS can be viewed in up to four separate windows simultaneously. The product, which runs on VM/CMS and MVS/TSO systems, is written in assembler to give the user faster performance without the requirement for other

SOFTWARE SPOTLIGHT

FENESTRA

DesQ is a multiwindow, multitasking operating environment that enables personal computer users to run and integrate several off-the-shelf applications packages from different vendors simultaneously. Each application—be it WordStar or dBASE II or MultiPlan or any other—can be loaded directly into a window on the screen. Windows can be any size the user desires and can be placed in any location on the display. The windows can be moved around, covered when not in use, and partially overlaid by other windows.

Users can mark information in one window and then transfer that information into another window. For example, a column of numbers from a spreadsheet may be moved into the WordStar window for inclusion in some report. The applications software does not have to be modified in any way to permit the user to establish windows or to transfer data between windows.



The package is designed to be used with a keyboard rather than a mouse as the input device, although a mouse can be added at any time. The product requires 256KB RAM, 5MB of Winchester storage, and a standard 25 x 80 monochrome display; a color display can be used as well.

The system can be "taught" to do the same procedures many times. The user performs a task, such as comparing actual and budgeted expenses, by finding the needed data, printing them, and then moving them into another window for use in another program. Once the package has been shown the procedure, it can handle the entire process unattended the next time it is required.

The package runs off MS/DOS, Unix, or CP/M, and adds multifile directories, unlimited-length file names, sorted file directories, and archival storage support to the operating system. The package costs $395. QUARTERDECK SOFTWARE, Santa Monica, Calif.

FOR DATA CIRCLE 325 ON READER CARD

How to cure the IMS testing complex.

Testing new programs that use IMS* data bases is so complicated, it can give any programmer a complex. IMS requires tedious creation of test data, manual comparisons and other time consuming tasks that can really depress productivity. Fortunately all these problems are curable with DataVantage.

DataVantage simplifies all aspects of IMS testing. With one command, DataVantage creates a subset of your production data base for use as test data. You're able to test all program logic quickly and thoroughly. Ad hoc programs and incomplete samples become a thing of the past.

Determining a program's effect has also been made easy with DataVantage's logical compare function. It automatically compares the data bases before and after the test is run and lists the differences. No need to wait for dumps and comb through computer printouts.

And our unique Save/Refresh feature lets each programmer save and restore various versions of the test data base. So if one version is damaged, the others remain untouched (including the master test data base). Best of all, you can recover a test data base with a single command.

Don't let IMS testing get you down. Try DataVantage free for 30 days. You'll see DataVantage not only lightens your workload but also takes a load off your mind.

*A product of IBM.

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CIRCLE 159 ON READER CARD

products, such as APL. Spreadsheet size is limited only by the amount of memory the user can access. The program makes full use of the 3270 line of terminals, with the programmable function keys and large screen capabilities accessible within the software. The product costs $220 per month. TRAX, Los Angeles, Calif.

FOR DATA CIRCLE 334 ON READER CARD

INFORMATION CENTER

The Nomad2 Information Center is a software and service package designed for companies who are considering implementation of internal timesharing operations or Information Centers. The package combines the Nomad2 database management system with services designed to promote greater responsiveness to end-user computing requirements.

The service includes Information Center Support Staff training, a comprehensive training program based on the materials and techniques used by the vendor in training 1,000 Nomad and Nomad2 support personnel in the last seven years. The service also includes product training programs, which have been used by the vendor's branch personnel and in-house installations to train end users in the use of Nomad2. Product documentation and copies of training materials are also provided. Support includes training of Information Center staff through local consultants and a "hot line" telephone number. NATIONAL CSS, Wilton, Conn.

FOR DATA CIRCLE 342 ON READER CARD

68000 FORTH

IoForth is a complete Forth system that can be installed on any 68000-based microcomputer with two disk drives. The product features a 32-bit parameter stack and arithmetic logic operators and support for multiple users and background tasks. It includes kernel, assembler, compiler, job swapper, 32-bit floating point capability, virtual memory support, FIFO data structure support, and a screen editor.

The product is written for high execution speed and simplicity. It includes a 200-page manual with a 110-page dictionary. Additional optional software supports disk file structures and graphics. The product comes on an 8-inch floppy disk, although other media are available for a fee. The interface of IoForth to a user's system is accomplished through several subroutines that must be supplied by the user; these would do primitive I/O functions such as printing characters on terminals and reading sectors from disks. Interface examples are available for several cpus. IoForth costs $1,990 for the source text for all software except the kernel and the assembler. The complete source text, as well as sysgen software, costs $5,000. A user manual is available for $25. IO INC., Tucson, Ariz.

FOR DATA CIRCLE 343 ON READER CARD

P.C. DSS II

Micro Impact is the microcomputer version of the Impact decision support system introduced in 1976 for IBM mainframe computers. The microcomputer version, designed for the Intel 8088 and 8086 processors using the CP/M or MP/M 16-bit operating systems, provides complete compatibility with the mainframe system, offering users the choice between local and centralized processing. The product costs $2,500 for each personal computer installation. A user manual for Micro Impact costs $50. MDCR, INC., East Brunswick, N.J.

FOR DATA CIRCLE 335 ON READER CARD

DBMS/PROGRAM GENERATOR

The Next Step is composed of a database management system designed to help a user organize data easily and an "electronic programmer" designed to retrieve and process data to create any type of report. Applications include accounting, cash flow reporting, order entry, sales planning, and others.

The database is built by the user to reflect his company's individual requirements. Data fields to be stored are painted on the screen and can be modified or moved. The user selects which data fields will be considered keys, around which searches can be generated. The program calculates values for fields derived from other data, so that such derived data need not be input by the user.

The "electronic programmer" allows the user to generate customized reports that can incorporate data fields, calculations, totals, and text from WordStar or EasyWriter files. Formatting commands are available for page breaks, report length and width, and other variables. The nonprocedural commands are automatically converted into BASIC programs that can be compiled using the Microsoft 1.0 compiler. The program costs $300. EXECUWARE, Charlotte, N.C.

FOR DATA CIRCLE 341 ON READER CARD.

SPREADSHEET GRAPHICS

The Enhanced Business Graphics Package operates on microcomputers running MS/DOS, PC/DOS, or CP/M with at least 64KB of main memory. The program reads directly from VisiCalc or SuperCalc files or manually entered data, and converts the information to color pie charts, bar charts, or other graphic representations.

Charts can be plotted in user-specified formats from a full page to a quarter page in size. The same data can be plotted as either bar, pie, or line graphs without reentry of data. Line graphs can use up to eight lines, and pie charts can be segmented into 15 slices. Up to 48 bars can be included on a single bar graph.

The menu-driven program features user-defined default parameters for quick-start plotting. The package costs $200, including user manual. STROBE GRAPHICS SYSTEMS, INC., Mountain View, Calif.

FOR DATA CIRCLE 344 ON READER CARD

VOICE INTERFACE

VoiceDrive is a voice recognition software interface for use with the vendor's ScratchPad financial spreadsheet program. The product is compatible with the Tecmar voice recognition card, currently available for the IBM Personal Computer. As other microcomputers support voice recognition hardware, the vendor plans to make VoiceDrive available for those machines.

The software allows the user to intermix voice and keyboard (or mouse) input. For example, the user may input data from the keyboard, with periodic voice commands to save the data or perform "what if" analyses on them. The software's integration with the spreadsheet application enables the program to limit the number of words it will attempt to match at any time.

VoiceDrive is currently being sold bundled with ScratchPad for $500. The vendor will also include the Tecmar card for a total of $1,000. VoiceDrive runs under PC-DOS and requires 128KB of memory. SUPERSOFT INC., Champaign, Ill.

FOR DATA CIRCLE 345 ON READER CARD

P-SYSTEM WP

The WordExec word processing program for microcomputers running the p-System offers the same features that are present on most word processors running under the CP/M or MS-DOS environments. The package comes with extensive training for managers and executives who would use the word processor. This includes an interactive tutor that covers enough for new users to learn to type and print documents.

The training also includes four productivity guides, two for executives and two for secretaries and office managers. The Executive Productivity Guide, the Adoption Guide, the Office Management Guide, and the Great Business Letters Guide cover topics including time management, setting up paragraph libraries, model business letters, supplies, work space arrangement, security, sound control, format standards, daily work flow and operation, and productivity measurements. The training materials included in the guides are intended to teach office tasks and personal productivity as much as they are intended to teach word processing.

The program allows users to preview prints on the crt, list files in the editor before editing or copying, and use the cursor either by line, sentence, paragraph, word, or character. The package requires 64KB memory. AMERICAN SOFTWARE, Houston, Texas.

FOR DATA CIRCLE 346 ON READER CARD

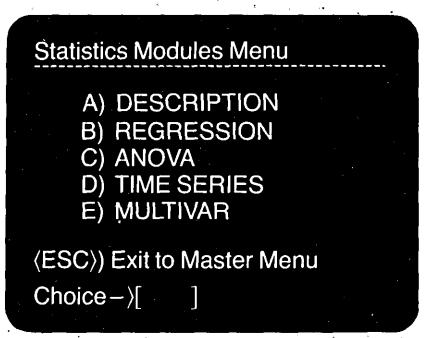
—Michael Tyler

Statpro™

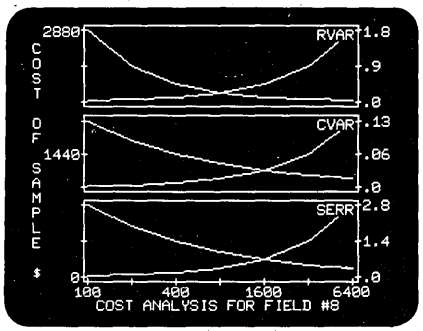
The most comprehensive and sophisticated statistics and graphics database workstation ever developed for the personal computer.

Years of research, development, and field testing have resulted in the most extensive statistics and graphics database program specifically designed for the personal computing environment. STATPRO™ provides the data analysis capabilities and flexibility previously available only on a large computer. Researchers, business professionals, and other data analysts will welcome the breadth yet simplicity of this program! STATPRO requires no previous computer experience, no special command language. Single keystrokes access all of the data manipulation, statistics, and graphics power of STATPRO.

STATPRO allows easy access to its extensive numerical data capabilities.
The strength of STATPRO is found in the functions of its user friendly, menu-driven database. You can easily learn to enter and edit, manipulate, transform, and print out data. STATPRO's searching capabilities allow these functions to be performed on all your data or a user defined subset of your data.



Transformations and over 400 conversions are available. You can place the results of these transformations into the same field or any other field in STATPRO's database.



STATPRO offers a comprehensive collection of statistical procedures.
The statistics component of STATPRO contains a multitude of procedures, grouped into the following modules:

Descriptive: Contingency analysis, cross tabulation, normality tests; descriptive, comparative, range and non-parametric statistics.

Regression: Linear, non-linear, stepwise, and multiple regressions; residual analysis and statistical matrices.

Analysis of Variance: Single and nested classifications, two and three way equal and unequal sample size and non-parametric ANOVA.

Time Series: Moving averages, multi-stage least squares, fitted polynomials and trig functions, additive and multiply forecasting.

Multivariate: Principal components, factor, orthogonal factor, oblique factor, pair-weighted cluster, discriminant function, multiple contingency, and canonical correlation analysis.

STATPRO provides graphic representation of your data in minutes.
STATPRO graphics plot *all* the results of your STATPRO statistical analyses including scatter, triangle regression, and box plots; pie-charts, histograms, and dendograms. Further, with STATPRO you can custom edit with any of four character sets from the keyboard. You can also edit using paddles, joystick or special graphics commands. Mix text with data fields. Place multiple plots on each screen. Define your axis limits.

You can save your graphics on a disk for a multiple color "slide show" presentation, or print them out through a variety of compatible printers.

STATPRO documentation wraps up the package.
Although STATPRO software is essentially self-documenting, complete print documentation is provided. This includes a walk-through Introductory Tutorial, a Menu Chart, and a comprehensive User's Guide for each STATPRO component.

STATPRO currently runs on all versions of the Apple® II personal computers. It will be available for the IBM® PC in September.

To find out more about **Statpro: The Statistics and Graphics Database Workstation,** contact your local dealer, or

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SOURCE DATA

CRITICAL ISSUES IN SOFTWARE
by Werner L. Frank

Werner Frank has written articles and given speeches about the business of producing software for many years. He has been published here and abroad numerous times. Now, for the first time, he's pulled together many of his earlier writings and placed the bits and pieces within a coherent structure.

This book is basically an effort by Frank to challenge the cherished myths of the software world. Frank disagrees with the generally published assertions about the cost of software relative to hardware, the alleged high price of software, and the claim that software is no better now than it was years ago. In fact, he specifically sets out to prove software is cheap relative to hardware because it can be leveraged. He also points out that software is priced at bargain levels and that it enhances and substantially improves the use of hardware. To reach his conclusions, Frank has to destroy long-held, oft-repeated assertions. He does this quite effectively.

As might be expected of a man who spent two decades helping build what is today Informatics General Corp., there is perhaps a bit more in the volume on Mark IV than many would have desired. But, as a counterbalance, Frank does a pretty good job of debunking the Ada publicity machine, so we can forgive him for illustrating much of his material with Informatics-related products.

If anybody still believes building standard commercial software is cheaper than buying it, Frank states the "buy" case so convincingly that only a very stubborn old-timer would disbelieve. By the time he gets through, there is no room left for serious argument about the matter.

While some of Frank's materials are a bit dated, he did include more recent works. Thus his comments on the very important Sloan School report, published in 1980, regarding a hidden backlog of applications, is worth a second look. It isn't just the two-and-a-half to three-year applications backlog of which managers are already aware, but the unidentified pile, probably as big as that already known, that ought to scare MIS managers.

Werner Frank has been selling software for a long time, so it wasn't surprising to find he did not expose many tricks of the major software houses. His book is written for large-scale MIS installations; it is not a guidebook on how to run a software house and be profitable. This is just a little unfortunate because Frank knows how long it takes a software house to recover its investment, how much of each revenue dollar must be stuffed into marketing, what the long-term costs of supporting a product look like compared to initial developmental costs, and all the other "insider" material. Call this a challenge or an appeal, but perhaps he will consider doing this needed second and companion volume now that he is no longer associated with a major software house. If you read this book carefully, you'll get hints about some of the questions of interest to software house management (particularly in chapter 10), yet there still isn't enough detail for it to serve as the guide to profitability.

The only other criticism, albeit a minor one, is in Frank's list of useful addresses. Sorry, Werner, DATAMATION did it to you again and moved; so did ACM. Come to think of it, both of these moves were well back in 1982, hardly a tribute to the speed at which the publisher got this book out. Otherwise, we have no bones to pick with Wiley; the printing is clean, the typeface highly readable (even for aging reviewers), and the diagrams quite understandable.

This is one of the more important books of recent times because Werner Frank has an understanding of the software business that most others lack. He does not accept the standard mythology, much of which he prints early on for your inspection, and proceeds to prove his own case. His claims are conservative; he cites only a 15:1 cost ratio for making software versus buying it, when many installations know the real ratios are far more severe. Frank's case is good enough to allow understatement.

The book is highly recommended for senior MIS management, applications programming management, vendors, and software houses alike. It should be required reading (hopefully followed by a written examination) for all consultants who continue to push custom-tailored software on clients. John Wiley & Sons, Inc.; New York, N.Y. (1983, 238 pp., $25).

—Philip H. Dorn

ENCYCLOPEDIA OF COMPUTER SCIENCE AND ENGINEERING, Second Edition
edited by Anthony Ralston

When I started to review this hefty tome (it weighs about four and a half pounds), I found it did not meet my expectations. I paused, analyzed it for what it did contain, and then formalized my expectations.

Some years ago the encyclopedia's first edition was published. This present edition, completed in 1981 and published in 1983, is an update of the old version with about 20% new material. It consists of 1,664 pages, 550 articles, and contributions from 301 writers. It was a monumental effort.

My desk dictionary gives the definition of encyclopedia as a published work that treats comprehensively a single branch of knowledge and contains articles arranged alphabetically by subject. It's too bad the editors did not expand that definition to include the concept of audience profile, e.g., those persons to whom the body of knowledge is to be conveyed. In the absence of this fundamental decision by the editors, the individual authors wrote for each other! This severely limits the usefulness of the book since one needs an encyclopedic knowledge to understand the encyclopedia.

Each of the 301 authors was given freedom to explain his particular assigned topic (usually his own professional specialty) in any way he saw fit. Thus the individ-

ual articles are independent vignettes that might be culled from some professional newsletter and are not stylized as to format, vocabulary, or level of detail.

It would have helped if each author had started with a simple dictionary definition of his subject. Instead, some authors, trying to be clever or interesting, branch into a discussion of the subject without ever assuring that the reader and author share a common subject definition. Depending on the intended audience, this could be inexcusable. We all know the vocabulary of the computer trade is ill disciplined, and to assume that you and I share the same definition for complicated subjects such as communication control unit, real-time application, or partial differential equations is asking for trouble.

The problem of audience definition goes even deeper. The phrase "state of the art" was evidently too general to warrant inclusion. The multiple authors, however, should have understood (which evidently they didn't) that the meaning of the concept varies depending upon one's viewpoint. State of the art may indicate to the researcher that he just about knows how to start, whereas state of the art to the industrial practitioner means he can order it from a reputable commercial vendor, have it delivered on a schedule, and get maintenance and service if it malfunctions.

Most readers will not appreciate these gradations unless reminded of them. So when one reads an article on complexity that says the problem is solved and here are the answers, one could easily and erroneously be led to include a complexity measure in a software contract and try to get the vendor to commit that none of the code would be more complex than .5 (whatever that means).

I suggest a parlor game for anyone who is extremely well read in the field. Open this book at random, look at the author's signature at the end of an article, and remember the background and mindset of that author from all you have read by him before. Then, charitably read his contribution to see if he did a good job based on your knowledge of the subject and his own native mindset.

In my consulting business I occasionally come across mature professionals, skilled in other disciplines, who suddenly have an intense interest in computing. The other day an aerospace company reorganized and my client got a new boss. This boss was an executive vice president, an engineer by training, 58 years old, and making about $150,000 a year plus bonus.

Since the boss was suddenly given policy responsibility for a few hundred million dollars' worth of computers, and because he is not what you would consider computer literate, we launched an immediate and urgent education program. This company uses a lot of IBM equipment, so we sent the new boss and a coach to the IBM executive training course. IBM trained during the day and the coach interpreted in the evening hours. We also subscribed to a series of magazines on various subjects of interest so the boss could become familiar with current topics in the trade press. Further, we devoted many man-months to preparing technical briefings for the new boss so he could understand in detail the computer facilities and systems now in place, meet the people who developed and maintained them, absorb the local lingo, and get answers to his initial set of questions.

When the copy of Ralston's encyclopedia arrived, I had hoped to present it to the new boss so he could answer some of his own questions in the privacy of his office without embarrassment. After spending about a day with this tome, I've decided it is totally unsuitable for this purpose.

If I can't give it to the young and uneducated, or the mature and unfamiliar, just what is the appropriate audience for this volume? Unfortunately there is none! While the individual authors can read each other's contributions, if they are not familiar enough with the subject to know the author's built-in biases, they are likely to think he covered his subject well. In the case of intellectually simple subjects such as terminals, that's a fair assumption. For more complex terms, however, coverage of most subjects has serious deficiencies.

The industry needs a good encyclopedia written to the intelligent but ignorant. It should attempt to establish a standard vocabulary even though we lack one. It should use this vocabulary in a consistent way throughout the volume. The individual articles should be prepared to a consistent format, use the standard vocabulary, and either be exhaustive in their treatment of a subject, or acknowledge the omissions. Since some authors can't write to a specification, the editors must correct the flaws in the copy they receive or the published tome will not be very useful. The problem in the second edition is not with the authors, but with the editing. Let's hope they do better the third time around. Van Nostrand, Reinhold Co., New York, N.Y. (1983, 1,664 pp., $87.50).

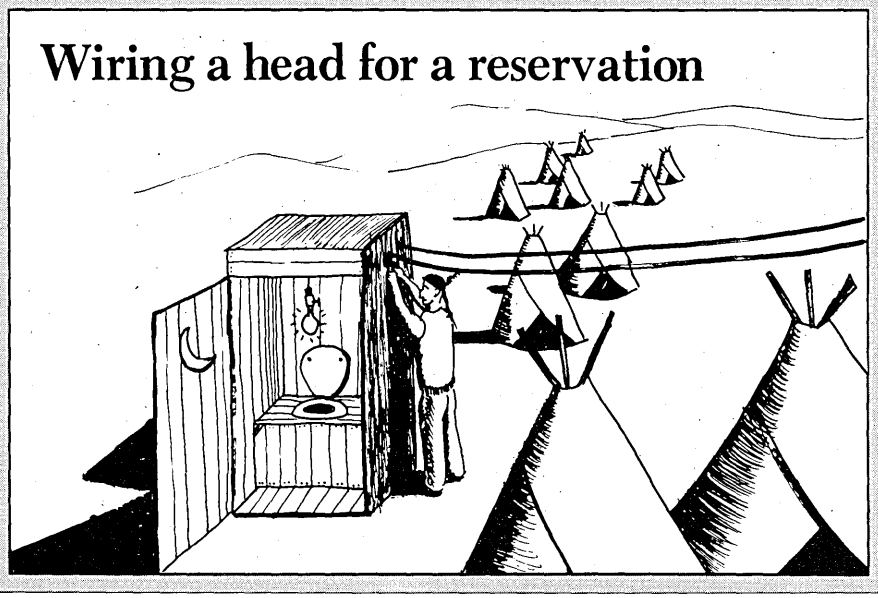
—Robert L. Patrick

BOOK BRIEF

GOPHER BROKE AND 59 OTHER PUNJABS

by Alan Rubin

No, this isn't a data processing book, but it is good for a few laughs. According to the publisher, a punjab is a "new kind of visual pun." The author created his first such pun at the age of six, when his Austrian pediatrician told him to "open your mouse and breath." Now Rubin's got a book full of punjabs for sale. Harmony Books, a division of Crown Publishers Inc., New York (1983, 64 pp., $2.95).



REPORTS & REFERENCES

ROOM FOR IMPROVEMENT

According to Technology Training Systems, the computer user's most common complaint is the lack of easy-to-use documentation. Therefore, this company is offering a booklet, "25 Ways to Improve Your Software User Manuals," to give manual writers some guidelines. "25 Ways" costs $3 and can be purchased from Technology Training Systems, 1078 Ravine Ridge Dr., Worthington, OH 43085, (614) 431-2174.

SPEAKING OF SUPPORT

Visual Horizon's new Speaker Support Slide Kit will "help turn a ho-hum slide presentation into a more interesting and ap-

Memorable

With 3M diskettes, your computer never forgets.

3M diskettes remember everything, every time. Because at 3M, reliability is built into every diskette. We've been in the computer media business for over 30 years. And we've never settled in. We're constantly improving and perfecting our product line, from computer tape and data cartridges to floppy disks.

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CIRCLE 162 ON READER CARD

New IBM System/36 uses the strengths of our System/34. And goes on from there.

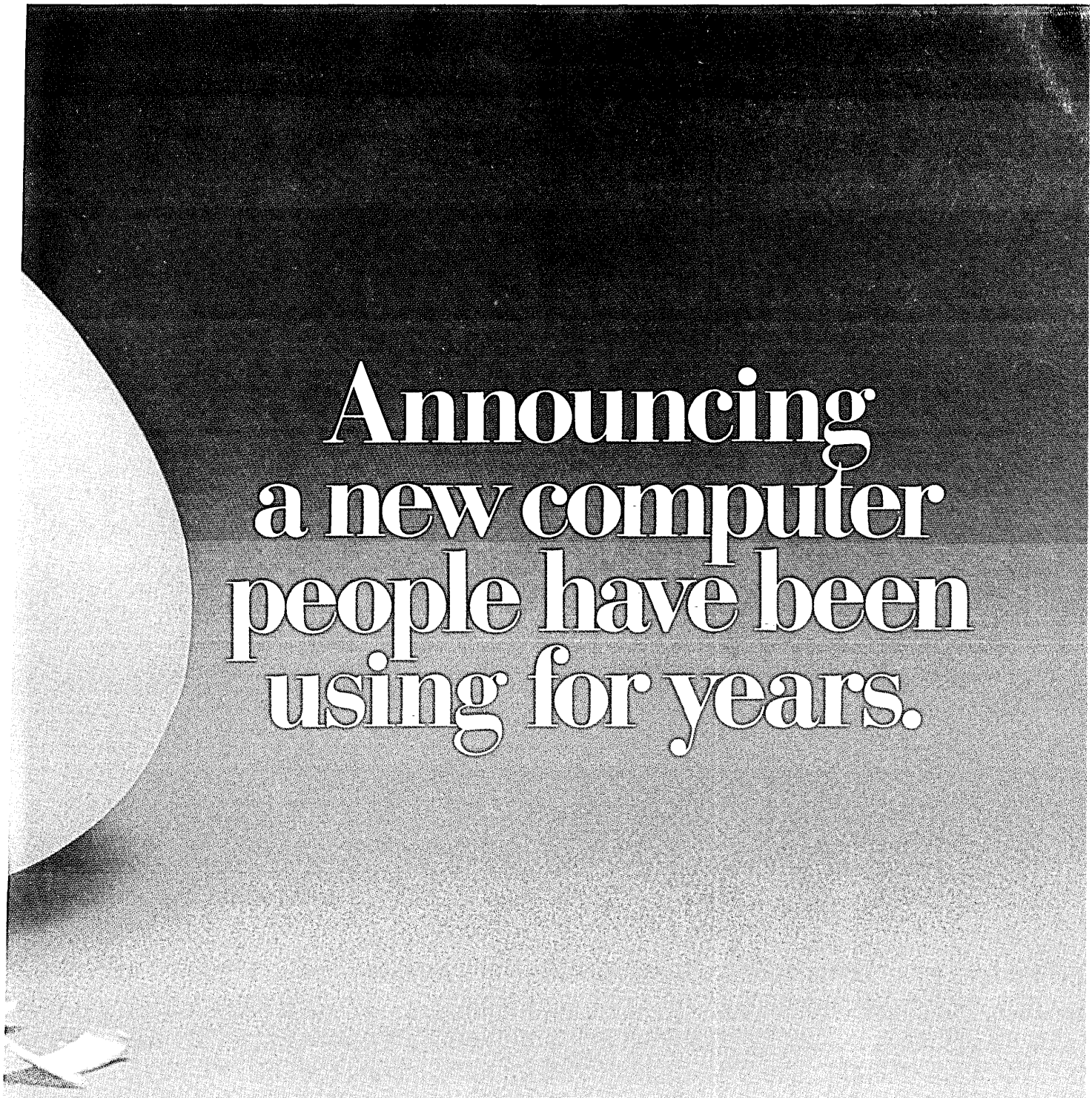
It's a new computer with even higher levels of performance than one of our most popular computers.

We doubled the memory, up to 512K bytes. Boosted disk storage up to 400 megabytes. Added a magnetic tape storage unit. Increased local work stations from 16 to 30, including color displays.

And the System/36 has available hundreds of software packages, covering most major industries. Many are recompiled from programs already running on our System/34; others are the new system's own software, including office applications like text management, spelling check, local electronic mail and color graphics.

System/36 can operate stand-alone with as many as 64 remote work stations, among them the IBM Personal Computer. It can also work in a distributed processing network communicating with a large host or with other System/36s. And, if you're moving up from a System/34, your I/O investment is protected because virtually all of its peripherals work on the new system.

What's more, System/36 is very friendly. Users are guided by easy-to-understand menus. A HELP key



simplifies things, even for first-time computer users. Another key lets them start over without having to retrace every step.

Extensive diagnostic features troubleshoot automatically, and even correct problems as you work.

It's one of the most thoroughly tested products we've ever made. We gave it the equivalent of a century of testing before we put it on the market.

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SOURCE DATA

pealing show." Each kit contains a slide rule, registration set, 80 write-on slides, audio image planner kit, slide wallet, slide cropper, Kodak's planning and producing slide shows booklet, pointer, blower brush, one pair of gloves, 30 Murphy's Law slides, 30 Time and Money slides, and 20 Education and Training slides. The kit sells for $129.95 and comes with a money-back guarantee. Contact Visual Horizons Inc., 180 Metro Park, Rochester, NY 14623, (716) 424-5300.

Z SOFTWARE

The "Winter 1982 Software Catalog" is a 155-page volume that provides information on the software available for Zilog components and microcomputer systems. It lists all vendors supplying software compatible with Zilog's microprocessors, microcomputers, and supermicro systems. The products are referenced by processor, application, and product name. Each software listing includes product description, price, availability, language in which the package was written, date of first shipment, and number of installations. The catalog goes for $3, prepaid. Contact Technical Publications, Zilog Inc., 1315 Dell Ave., Campbell, CA 95008, (408) 370-8000.

TELECONFERENCING

After more than two years of research, "The Definitive Guide to Teleconferencing Products and Services" is available from the editors of *The TeleSpan Newsletter*. The guide lists over 500 products and 250 suppliers; names, addresses, phone numbers, and prices are given, along with a listing of the various publications and consultants in this field. Product categories are divided into five sections: audio, video, computer conferencing, audiographic, and captured frame. Service sections include ad hoc teleconferencing, seminars, and consultants. The guide, and a one-year subscription to *The TeleSpan Newsletter*, are priced at $180. Contact Ferdinand Mehlinger, TeleSpan Inc., 50 West Palm St., Altadena, CA 91001, (213) 797-5482.

PERIODICALS

RADICAL INTEREST

Some people aren't too thrilled with all this information age hypery that's foisting itself upon us. They see it as perpetuating mindless, dull work, exploiting women and Third World nations, and ushering in the foundations of a "technofacist" society. To spread their message, share ideas, and raise the consciousness of office workers, a new quarterly magazine has appeared. *Processed World* attempts to address the "underside" of the information age. It's $10 for individuals and $20 for corporations. *Processed World*, 55 Sutter St. #829, San Francisco, CA 94104.

"Ms. Millmont, it is time to remove your Christmas cards."

CARTOON BY HENRY MARTIN

VENDOR LITERATURE

RETRO-GRAPHICS

A six-page brochure describing the vendor's second generation terminal enhancements is available. "Digital Engineering—A Product Perspective" also covers the company's history, product manuals, warranties, services, and I/O interfaces. Digital Engineering Inc., Sacramento, Calif.

FOR DATA CIRCLE 350 ON READER CARD

AFIPS PRESS

The American Federation of Information Processing Societies Inc. has released a 36-page "Publications Catalog" for 1983-1984. It lists and describes the organization's many reports, books, and the proceedings from NCCs, OACs, and NCC Personal Computing Festivals. All items are available from AFIPS, Arlington, Va.

FOR DATA CIRCLE 351 ON READER CARD

INSURANCE

The features and benefits of PALLM-Life's automated "life management system" are listed in this four-page, four-color brochure. The company's other products are briefly mentioned. PALLM-LIFE, Indianapolis, Ind.

FOR DATA CIRCLE 352 ON READER CARD

SMART PHONES

Two brochures are available from this vendor. The literature describes the firm's SD-192 PABX and the SD-192MX business phone. The former can be updated to the latter when the user's requirements so dictate. Features, benefits, and specifications are outlined. TELEPHONE DIVISION OF SIEMENS COMMUNICATION SYSTEMS INC., Boca Raton, Fla.

FOR DATA CIRCLE 353 ON READER CARD

COMPUTER CAMERA

The VFR 2000 is a video film recorder that produces 35mm slides or prints from computers or graphics systems. This camera and its specifications are described in a four-color, four-page brochure from CELTIC TECHNOLOGY INC., Woodland Hills, Calif.

FOR DATA CIRCLE 354 ON READER CARD

SENSIBLE

This vendor is offering a product data sheet that explains the features and benefits of its Remote Sense and Control Unit. The sheet contains specs, features, benefits, and a chart showing a typical configuration. PARADYNE CORP., Largo, Fla.

FOR DATA CIRCLE 355 ON READER CARD

"GET IBM 3270, 3780 AND HASP COMMUNICATIONS— ADDING A ONE-BOARD PROCESSOR TO MY PC?"

"YOU CAN WITH PERSYST."

The Persyst DCP/88. The only compatible front end communications processor that can support a range of IBM communications.

It's a Persyst exclusive.

The DCP/88 distributed communications processor. A one-board computer that can be configured by software to handle communications between a PC and another computer system.

In fact, the DCP/88 enables the IBM or TI PC to support a range of sophisticated IBM communications—all with just one processor.

So it gives corporate users unprecedented, low-cost flexibility to incorporate the PC into virtually any environment.

Convert any PC into an IBM 3270 terminal. An IBM 2780/3780 RJE workstation. Or a HASP/RJE workstation—instantly.

Just combine the DCP/88 with Persyst software—and you can connect your PC to any compatible host mainframe or minicomputer.

PC/3270 enables your PC to emulate an IBM 3274 Cluster control unit and 3278 terminal, supporting up to four additional devices. Including a printer and three other PCs functioning as 3278 terminals.

PC/3780 converts your PC into a 2780/3780 remote job entry terminal that can send and receive batch files to and from the host.

And with PC/HASP, your PC instantly becomes a full-function HASP/RJE workstation that can support up to seven input and seven output multi-leaved job streams concurrently.

Capability to support your communications needs now. And in the future.

Because the DCP/88 supports bisync, SDLC, HDLC and async protocols, it is the only communications processor you'll ever have to buy.

Use it to connect your PC to an expanding network of IBM communications. Configure your system to meet virtually any communications need—without adding another piece of hardware. Or expense.

All of which makes the DCP/88 as practical as it is powerful.

The Persyst Coax/3278. Still another way to expand your IBM communications.

Here's another fast way to incorporate the PC into existing SNA or bisync data processing installations.

The Coax/3278. A single-slot expansion board that converts your PC into an IBM 3278 display terminal. And with its high-speed coaxial port, you can connect the PC directly to IBM 3274 or 3276 cluster controllers.

Sophisticated communications products for the corporate user. Insist on Persyst.

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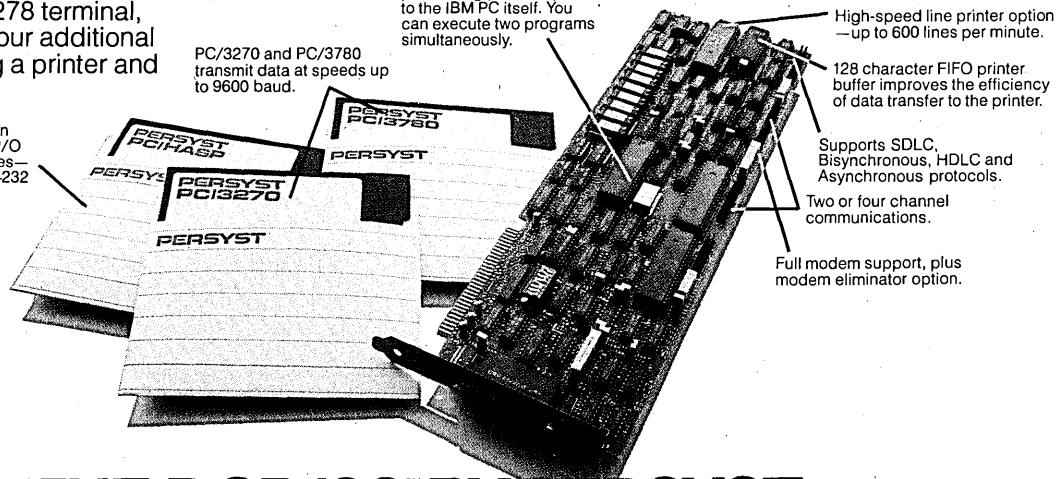

THE DCP/88™ BY PERSYST.

CIRCLE 164 ON READER CARD

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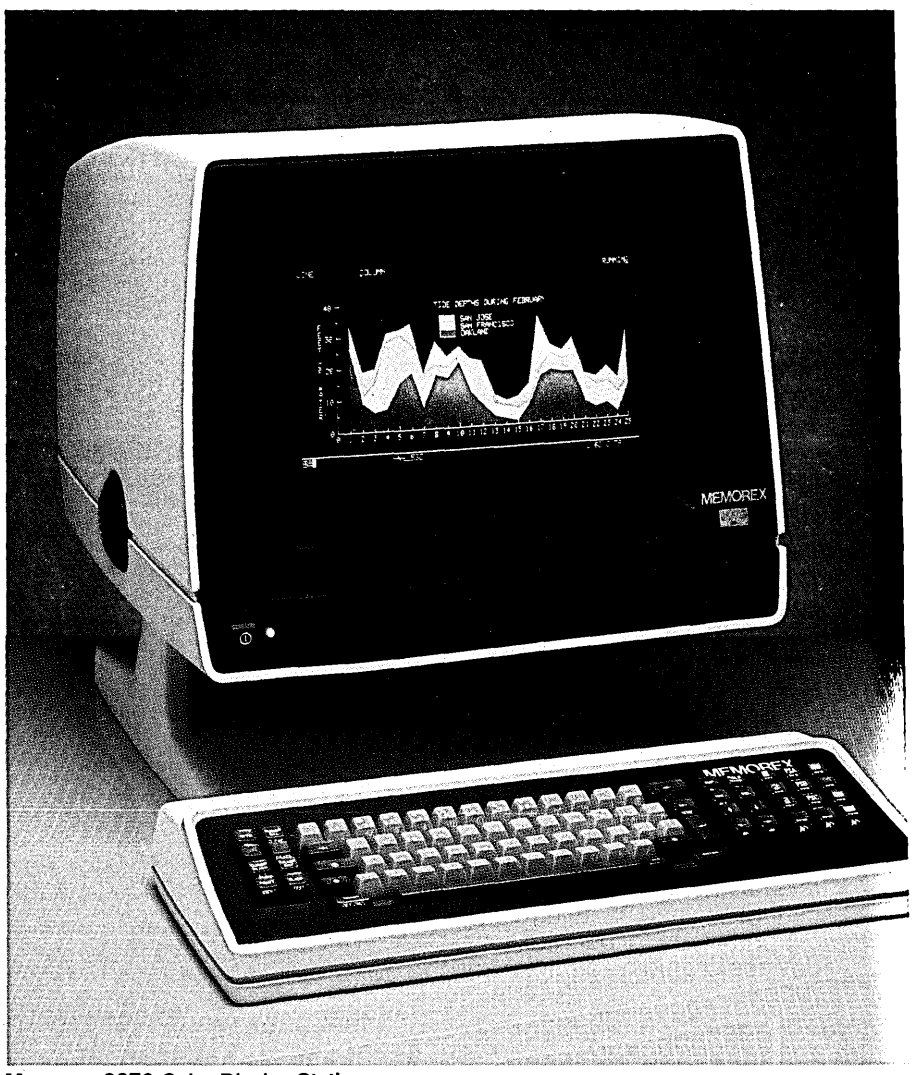

Memorex 2079 Color Display Station

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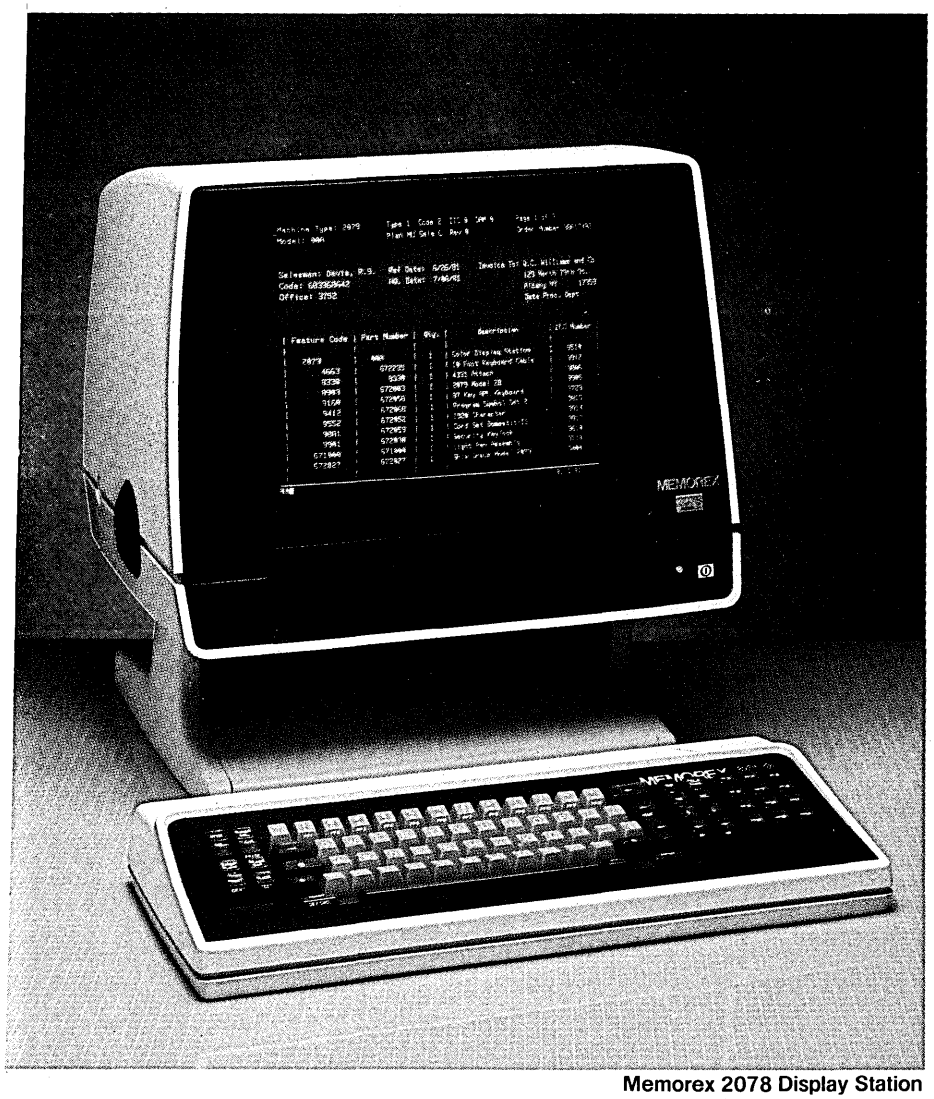

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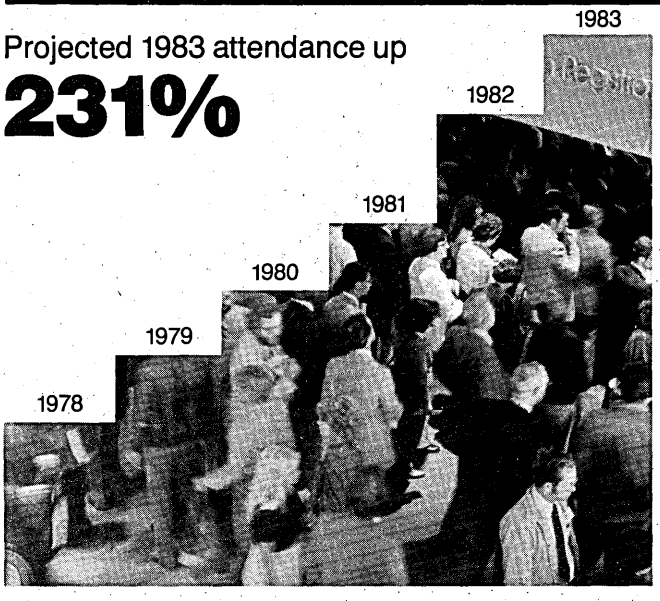

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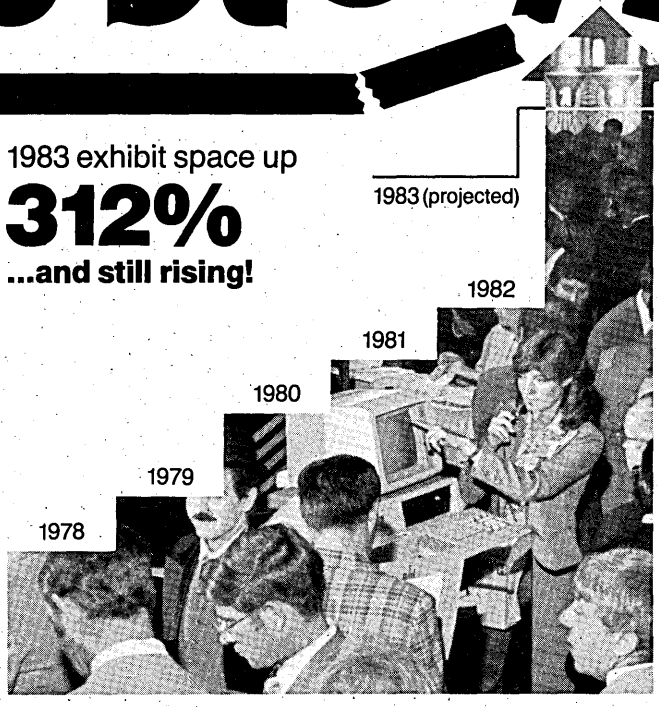

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ON THE JOB

PUBLIC EYE

According to William M. Batten, chairman and ceo of the New York Stock Exchange, "high technology, computers, and information systems are increasingly perceived as job creators rather than as job destroyers—with a growth potential that can lead the way to national economic recovery." Batten's comments are based on the results of a survey, "The Economy in Transition: A Survey of American Attitudes," coordinated by Public Policy Analysis Inc., Somers, Conn., that questioned 1,007 people across the U.S. An interesting find was that 67% of the survey's respondents believed the economy is going through a change from large-scale employment in housing, autos, and steel to new jobs in computers and telecommunications, rather than just experiencing an economic downturn or recession. What's more, 91% believed their children should study computer technology in school.

LOOKING FOR LITERACY

After analyzing the first quarter '83 financial executive job openings submitted to it, the recruiting firm of Robert Half, International Inc., New York, N.Y., learned that 85% of the job descriptions included a strong preference for candidates with dp training or experience. Nearly 50% of the positions were open only to those with some computer knowledge. Salary range examined was $35,000 to $65,000. Says Robert Half, president, "We have seen the future. It is here. And it is computerized."

SINK OR SWIM

Managers are accused of ignoring the opportunities available to them from successful management support systems (MSS). "As the wave breaks, they are either looking the wrong way so they miss it, or they are so worried that they are deliberately staying out of the water and trying to prevent others from getting in," says Gary K. Gulden, vice president, Index Systems Inc., Cambridge, Mass. By MSS Gulden means technology that allows (and in some cases even promotes) end-user computing. He says MSS is the fastest-growing segment of information systems, and that in the not too distant future, end-user computing will be responsible for most of the information systems expenditures and usage. Gulden advises information systems managers to stop looking at MSS as something to "control and worry about," but rather to see it as an opportunity ready to be exploited.

FORGET THE PHOBIA

"Though women hold 10% to 20% of the nation's managerial posts today, only a few have achieved computer literacy." Jack Nilles, director of the information technology program at the University of Southern California's Center for Futures Research, said the "ability to acquire and use information" is the most important quality for the up-and-coming manager. Nilles added that in 1978, the center surveyed 600 personal computer owners and found that 1% of them were female. He says more recent surveys have raised the figure to only about 2%. Nilles believes that women are more prone than men to "computer phobia," possibly because of sociological conditioning. For instance, little boys are supposed to be mechanically inclined and little girls are not. "Whatever the reason, too many little girls have grown up to be women who are reluctant to deal with anything mechanical—including computers." He suggests fighting this phobia as one would fight any other: do the thing that frightens you.

CPR

The Career Placement Registry, in Alexandria, Va., a division of Plenum Publishing Corp., is a computerized database containing the credentials and qualifications of recent college graduates and experienced professionals. Over 400 occupational areas are included in the database, and for $35 employers can receive the "mini-résumés" of 12 prospective employees. Graduates or professionals seeking jobs pay $8 or $15 to $40, respectively, and their information is kept in the database for six months. According to CPR Inc., the registry reaches the personnel recruiters of about 10,000 businesses, service organizations, and industrial companies in the U.S. and abroad. It is part of the Dialog network, a division of Lockheed Missiles and Space Corp., an international information retrieval service.

—Deborah Sojka

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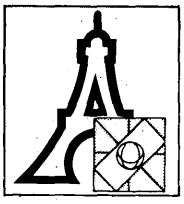

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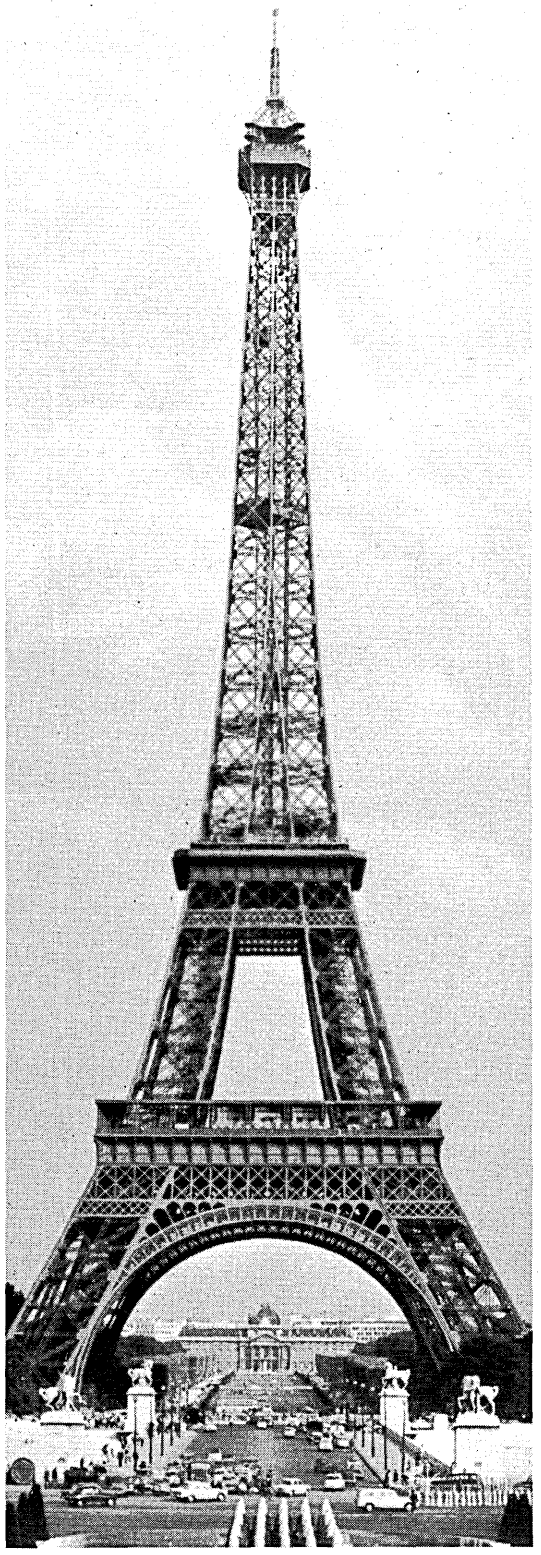

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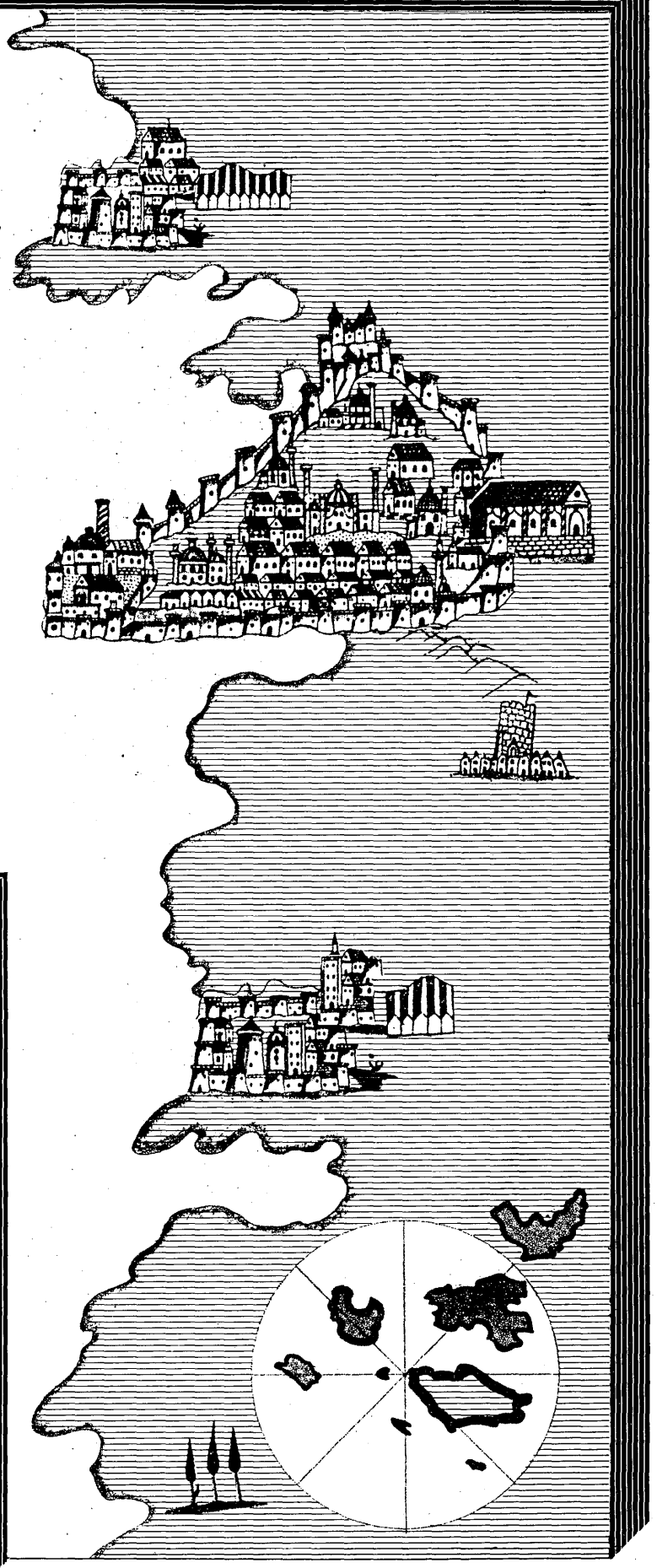

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READERS' FORUM

REAL PROGRAMMERS DON'T USE PASCAL

Back in the Golden Era of computers, it was easy to separate the men from the boys (sometimes called "Real Men" and "Quiche Eaters," respectively). During this period, the Real Men were the ones who understood computer programming, and the Quiche Eaters were the ones who didn't. A real computer programmer said things like "DO 10 I=1,10" and "ABEND," and the rest of the world said things like "computers are too complicated for me" and "I can't relate to computers—they're so impersonal." A previous work, B. Feirstein's *Real Men Don't Eat Quiche*, a 1982 Pocket Books publication, points out that Real Men don't "relate" to anything and aren't afraid of being impersonal.

But, times change. Today, we are faced with a world in which little old ladies can get computerized microwave ovens, 12-year-old kids can blow Real Men out of the water playing Asteroids and Pac-Man, and anyone can buy and understand his very own personal computer. The Real Programmer is in danger of being replaced by high school students with TRASH-80s!

There are, however, differences between the typical high school junior Pac-Man player and a Real Programmer. Knowing these differences may give kids something to aspire to—a role model, a father figure. It will also help keep Real Programmers employed.

The easiest way to determine who the Real Programmers are is by the programming language they use. Real Programmers use FORTRAN. Quiche Eaters use Pascal. Nicklaus Wirth, the designer of Pascal, was once asked, "How do you pronounce your name?" "You can either call me by name, pronouncing it 'Veert,' or call me by value, 'Worth,' " he replied. One can tell immediately from this comment that Nicklaus Wirth is a Quiche Eater. The only parameter passing mechanism endorsed by Real Programmers is call-by-value-return, as implemented in the IBM/370 FORTRAN G and H compilers. Real programmers don't need abstract concepts to get their jobs done; they are perfectly happy with a keypunch, a FORTRAN IV compiler, and a beer. Real Programmers do list processing, string manipulation, accounting (if they do it at all), and artificial intelligence programs in FORTRAN.

If you can't do it in FORTRAN, do it in assembly language. If you can't do it in assembly language, it isn't worth doing.

Computer science academicians have gotten into a structured programming rut during the past few years. They claim that programs are more easily understood if some special language constructs and techniques are used. They don't all agree on exactly which constructs, of course, and the examples they use to show their particular point of view invariably fit on a single page of some obscure journal. When I got out of school, I thought I was the best programmer in the world. I could write an unbeatable tic-tac-toe program, use five different computer languages, and create 1,000-line programs that worked. Then I got out into the real world. My first task was to read and understand a 200,000-line FORTRAN program, then speed it up by a factor of two. Any Real Programmer will tell you that all the structured coding in the world won't help you solve a problem like that—it takes actual talent. Some observations on Real Programmers and structured programming:

- Real Programmers aren't afraid to use GOTOs.
- Real Programmers can write five-page-long DO loops without getting confused.
- Real Programmers like arithmetic IF statements because they make the code more interesting.
- Real Programmers write self-modifying code, especially if it saves them 20 nanoseconds in the middle of a tight loop.
- Real Programmers don't need comments; the code is obvious.
- Since FORTRAN doesn't have a structured IF, REPEAT . . . UNTIL, or CASE statement, Real Programmers don't have to worry about not using them. Besides, they can be simulated when necessary using assigned GOTOs.

Data structures have also been in the press lately. Abstract data types, structures, pointers, lists, and strings have become popular in certain circles. Wirth, the Quiche Eater, actually wrote an entire book (*Algorithms + Data Structures = Programs*, Prentice-Hall, 1976) that said you could write a program based on data structures, instead of the other way around. As all Real Programmers know, the only useful data structure is the array. Strings, lists, structures, and sets are all special cases of arrays and can be treated as such without complicating your programming language. The worst thing about fancy data types is that you have to declare them, and real programming languages, as we all know, have implicit typing based on the first letter of the six-character-variable name.

What kind of operating system is used by a Real Programmer? CP/M? God forbid. After all, it is basically a toy operating system. Even little old ladies and grade school students can use and understand CP/M.

Unix is a lot more complicated of course—the typical Unix hacker never can remember what the PRINT command is called this week—but when it gets right down to it, Unix is a glorified video game. People don't do serious work on Unix systems; they send jokes around the world on USENET or write adventure games and research papers.

No, the Real Programmer uses OS/370. A good programmer can find and understand the description of the IJK305I error he just

got in his JCL manual. The great programmer can write JCL without referring to the manual at all. A truly outstanding programmer can find bugs buried in a six-megabyte core dump without using a hex calculator.

OS/370 is a truly remarkable operating system. It's possible to destroy several days' worth of work with a single misplaced space, so alertness in the programming staff is encouraged. The best way to approach the system is through a keypunch. Some people claim there is a timesharing system that runs on OS/370, but after careful study I have come to the conclusion that they are mistaken.

What kind of tools does a Real Programmer use? In theory, a Real Programmer could run his programs by keying them into the front panel of the computer. In the early days, when computers had front panels, this was occasionally done. Your typical Real Programmer knew the entire bootstrap loader by memory in hex, and toggled it in whenever it got destroyed by his program. Back then, memory was memory—it didn't go away when the power went off. Today, memory either forgets things when you don't want it to, or remembers things long after they should be forgotten. Legend has it that Seymour Cray, inventor of the Cray I supercomputer and most of Control Data's computers, toggled in the first operating system for the CDC 7600 on the front panel from memory when it was first powered on. Cray, of course, is a Real Programmer.

One of my favorite Real Programmers was a systems programmer for Texas Instruments. One day, he got a long distance call from a user whose system had crashed in the middle of some important work. Jim repaired the damage over the phone, getting the user to toggle in disk I/O instructions at the front panel, repairing system tables in hex, and reading register contents back over the phone. The moral of this story: while a Real Programmer usually includes a keypunch and line printer in his tool kit, he can get along with just a front panel and a telephone in emergencies.

In some companies, text editing no longer consists of 10 engineers standing in line to use an 029 keypunch. In fact, the building I work in doesn't contain a single keypunch. The Real Programmer in this situation has to do his work with a text editor program. Most systems supply several text editors to select from, and the Real Programmer must be careful to pick one that reflects his personal style. Many people believe that the best text editors in the world were written at Xerox Palo Alto Research Center for use on Alto and Dorado computers. Unfortunately, no Real Programmer would ever use a computer with an operating system called SmallTalk, and would certainly not talk to the computer with a mouse.

Some of the concepts in these Xerox editors have been incorporated into editors running on more reasonably named operating systems, such as EMACS and VI. The problem with these editors is that Real Programmers consider "what you see is what you get" a bad concept in text editors. The Real Programmer wants a "you asked for it, you got it" text editor; one that is complicated, cryptic, powerful, unforgiving, and dangerous. TECO, to be precise.

It has been observed that a TECO command sequence more closely resembles transmission line noise than readable text. One of the more entertaining games to play with TECO is to type your name in as a command line and try to guess what it does. Just about any possible typing error while communicating with TECO will probably destroy your program, or even worse, introduce subtle and mysterious bugs in a once-working subroutine.

For this reason, Real Programmers are reluctant to actually edit a program that is close to working. They find it much easier to patch the binary object code directly, using a wonderful program called SUPERZAP (or its equivalent on non-IBM machines). This works so well that many programs running on IBM systems bear no relation to the original FORTRAN code. In a number of cases, the original source code is no longer available. When it comes time to fix a program like this, no manager would even think of sending anyone less than a Real Programmer to do the job—no quiche-eating structured programmer would even know where to start. This is called job security.

Some programming tools not used by Real Programmers include:

- FORTRAN preprocessors like MORTRAN and RATFOR. These Cuisinarts of programming are great for making quiche.
- Source language debuggers. Real Programmers can read core dumps.
- Compilers with array bounds checking. They stifle creativity, destroy most of the interesting uses for EQUIVALENCE, and make it impossible to modify the operating system code with negative subscripts. Worst of all, bounds checking is inefficient.
- Source code maintenance systems. A Real Programmer keeps his code locked in a card file, because it implies that the owner cannot leave his important programs unguarded.

Where does the typical Real Programmer work? What kind of programs are worthy of such talented individuals? You can be sure that no Real Programmer would be caught dead writing accounts-receivable programs in COBOL, or sorting mailing lists for *People* magazine. A Real Programmer wants tasks of earth-shaking importance.

Real Programmers work for Los Alamos National Laboratory, writing atomic bomb simulations to run on Cray I supercomputers. They also work for the National Security Agency, decoding Russian transmissions.

It was largely due to the efforts of thousands of Real Programmers working for NASA that our boys got to the moon and back before the cosmonauts. Computers in the Space Shuttle were programmed by Real Programmers, and these true professionals are at work for Boeing, designing operating systems for cruise missiles.

Some of the most awesome Real Programmers work at the Jet Propulsion Laboratory in California. Many of them know the entire operating system of the Pioneer and Voyager spacecraft by heart. With a combination of large ground-based FORTRAN programs and small spacecraft-based assembly language programs, they can do incredible feats of navigation and improvisation—such as hitting 10-kilometer-wide windows at Saturn after six years in space, and repairing or bypassing damaged sensor platforms, radios, and batteries. Allegedly, one Real Programmer managed to tuck a

CARTOON BY HENRY MARTIN

pattern-matching program into a few hundred bytes of unused memory in a Voyager spacecraft that searched for, located, and photographed a new moon of Jupiter.

One plan for the Galileo spacecraft is to use a gravity trajectory past Mars on the way to Jupiter. This trajectory passes within 80 +/- 3 kilometers of the surface of Mars. Nobody is going to trust a Pascal program or programmer for this kind of navigation.

Many of the world's Real Programmers work for the U.S. government, mainly in the Defense Department. This is as it should be. Recently, however, a black cloud has formed on the Real Programmer horizon. It seems that some highly placed Quiche Eaters at the Defense Department decided that all Defense programs should be written in some grand unified language called Ada. For a while, it seemed that Ada was destined to become a language that went against all the precepts of Real Programming. It is a language with structure, data types, strong typing, and semicolons. In short, it's designed to cripple the creativity of the typical Real Programmer. Fortunately, the language adopted by DoD has enough interesting features to make it approachable—it's incredibly complex, includes methods for messing with the operating system and rearranging memory, and Edsgar Dijkstra doesn't like it. Dijkstra, as you should know, authored "GOTOs Considered Harmful," a landmark work in programming methodology applauded by Pascal programmers and Quiche Eaters alike. Besides, the determined Real Programmer can write FORTRAN programs in any language.

The real programmer might compromise his principles and work on something slightly more trivial than the destruction of life, providing there's enough money in it. There are several Real Programmers building video games at Atari, for example. But they don't play the games. A Real Programmer knows how to beat the machine every time and there's no challenge in that. Everyone working at LucasFilm is a Real Programmer because it would be crazy to turn down the money of 50 million *Star Wars* fans. The proportion of Real Programmers in computer graphics is somewhat lower than the norm, mostly because nobody has found a use for computer graphics yet. On the other hand, all computer graphics is done in FORTRAN, so there are some people doing graphics to avoid writing COBOL programs.

Generally, the Real Programmer plays the same way he works—with computers. He is constantly amazed that his employer actually pays him to do what he would be doing for fun anyway, although he is careful not to express this opinion out loud. Occasionally, the Real Programmer does step out of the office for a breath of fresh air and a beer or two. Here are some tips on recognizing real programmers away from the computer room:

- At a party, the Real Programmers are the ones in the corner talking about operating system security and how to get around it.
- At a football game, the Real Programmer is the one comparing the plays against his simulations printed on 11-by-14 fanfold paper.
- At the beach, the Real Programmer is the one drawing flowcharts in the sand.
- A Real Programmer goes to a disco to watch the light show.
- At a funeral, the Real Programmer is the one saying "Poor George. And he almost had the sort routine working before the coronary."
- In a grocery store, the Real Programmer is the one who insists on running the cans past the laser checkout scanner himself, because he never could trust keypunch operators to get it right the first time.

What sort of environment does the Real Programmer function best in? This is an important question for the managers of Real Programmers. Considering the amount of money it costs to keep one on the staff, it's best to put him or her in optimal environment.

The typical Real Programmer lives in front of a computer terminal. Surrounding this terminal are the listings of every program he has ever worked on. These are piled in roughly chronological order on every flat surface in the office. You will also find some half-dozen or so partly filled cups of cold coffee. Occasionally, there will be cigarette butts floating in the coffee. In some cases, the cups will contain Orange Crush. And, unless he is very good, there will be copies of the OS JCL manual and the Principles of Operation open to some particularly interesting pages. Taped to the wall is a line-printer Snoopy calendar for the year 1969. Strewn about the floor there will be several wrappers for peanut butter-filled cheese bars (the type that are made stale at the bakery so they can't get any worse while waiting in the vending machine). Finally, in the top left-hand desk drawer, underneath the box of Oreos, is a flowcharting template, left there by the previous occupant. Real Programmers write programs, not documentation, which is left to the maintenance people.

The Real Programmer is capable of working 30, 40, even 50 hours at a stretch, under intense pressure. In fact, he prefers it that way. Bad response time doesn't bother the Real Programmer; it gives him a chance to catch a little sleep between compiles. If there is not enough schedule pressure on the Real Programmer, he tends to make things more challenging by working on some small but interesting part of the problem for the first nine weeks. Then he finishes the task in the last week, in two or three 50-hour marathons. This not only impresses his manager, but creates a convenient excuse for not doing the documentation. In general: no Real Programmer works 9 to 5, except those on the night shift. Real Programmers don't wear neckties. Real Programmers don't wear high-heeled shoes. Real Programmers arrive at work in time for lunch. A Real Programmer may or may not know his spouse's name. He does, however, know the entire ASCII (or EBCDIC) code table. Real Programmers don't know how to cook. Grocery stores aren't often open at 3 a.m., so they must survive on Twinkies and coffee.

Looking to the future, some Real Programmers are concerned that the latest generation of programmers are not brought up with the same outlook on life as their elders. Many of them have never seen a computer with a front panel. Hardly anyone graduating from school these days can do hex arithmetic without a calculator. Today's college graduates are soft—protected from the realities of programming by source level debuggers, text editors that count parentheses, and user-friendly operating systems. Worst of all, some of these alleged computer scientists manage to get degrees without ever learning FORTRAN! Are we destined to become an industry of Unix hackers and Pascal programmers?

From my experience, I think it's safe to report that the future is bright for Real Programmers. Neither OS/370 nor FORTRAN shows any signs of dying out, despite the efforts of Pascal programmers. Even more subtle tricks, like adding structured coding constructs to FORTRAN, have failed. Oh sure, some computer vendors have come out with FORTRAN 77 compilers, but every one of them has a way of converting itself back into a FORTRAN 66 compiler at the drop of an option card—to compile DO loops as God intended.

Even Unix might not be as bad on Real Programmers as it once was. The latest release of Unix has the potential of an operating system worthy of any Real Programmer. It has two different and subtly incompatible user interfaces, an arcane and complicated teletype driver, and virtual memory. If you ignore the fact that it's structured, even C programming can be appreciated by the Real Programmer. After all, there's no type checking, variable names are seven (10? Eight?) characters long, and the added bonus of the Pointer data type is thrown in. That's like having the best parts of FORTRAN and assembly language in one place, not to mention some of the more creative uses for #define.

No, the future isn't all that bad. Why, in the past few years, the popular press has even commented on the bright new crop of computer nerds and hackers leaving places like Stanford and MIT for the real world. From all evidence, the spirit of real programming lives on in these young men and women. As long as there are ill-defined goals, bizarre bugs, and unrealistic schedules, there will be Real Programmers willing to jump in and solve the problem, saving the documentation for later. Long live FORTRAN!

—Ed Post
Wilsonville, Oregon

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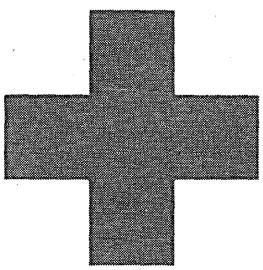

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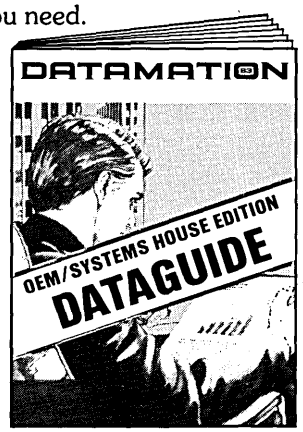

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SIZING UP SOFTWARE TRAINING

In "Beyond Folk Wisdom" (Readers' Forum, Nov.), I described the difficulties in applying engineering disciplines to the computer software development process. The article's primary points were the mismatch between current academic computer training curricula and corporate needs, and the lack of ready reference material for elementary software engineering primitives. Since writing that article, I have continued my informal observations of corporate software engineering education with the intent to understand why, at least for my company, change comes so slowly to software technology and the software development process.

First, some qualifications are in order. My company is a large firm employing thousands of people. Several thousand of them are serious computer users, and many hundreds of these are actually developing software end products in one form or another (either officially or otherwise). Typical staff sizes on official projects range from 10 to over 150 engineering (i.e., programming) personnel. Thus, the comments that follow were derived from observations of medium and large software development projects.

There are generally two methods for increasing a firm's software technology level: advanced training for existing personnel or addition of new personnel who possess the desired advanced knowledge. In the first instance, two criteria must generally be satisfied; appropriate courses and available training time.

Fig. 1 is an extract of my company's current computer training catalog. Impressive as it is, a cursory review of the courses listed reveals that the curriculum doesn't lead to knowledge of new technologies. In fact, the primary orientation of these courses is to train our personnel in established company technologies with which they lack sufficient facility. Very few deal with theoretical issues. Missing entirely are courses in current software concepts such as parallel processors, relational databases, Unix, Ada, and the Ada programming support environment.

Even if appropriate new concept training were available, finding time to send key employees to these courses is difficult. Most software projects are, at best, barely meeting schedule deadlines. The people who could most benefit from advanced training always seem to be the ones most critical to project completion. Since timely (or any) project completion is what earns us our paychecks, it becomes essentially impossible to release key individuals for a few weeks to learn and begin mastery of new concepts or technology. Even if employees could be released, their return to the project environment, which is not in a state to switch to the new technology, would quickly cause their newly acquired knowledge to atrophy.

A similar situation occurs when hiring personnel who already possess the desired advanced knowledge, particularly new college computer science graduates. Before this knowledge can be put to use, the new employees must spend some time learning the company's current engineering practices and procedures (e.g., programming standards, software quality control). This is usually accomplished by assigning them to an existing project for several weeks or months. Once they have adapted to the company's procedures, they must then convince the managers who hired them that changing from current technologies to newer approaches is desirable; this is a most formidable task.

In many cases, even if such an effort is successful, an appropriate new project must be located in order to apply the new techniques. No manager in his right mind will allow (except, perhaps, in a crisis situation) a change of technology to occur in the

FIG. 1

TRAINING CATALOG EXTRACT

Introductory Computing	Introduction to Data Processing Introduction to Programming Concepts Minicomputer Fundamentals
Management	Management Computer Concepts Project Management
System Design & Programming	Structured Design Structured Program Development—COBOL Structured Program Development—FORTRAN Systems Analysis
Programming Languages	APL COBOL COBOL—Accelerated COBOL Optimization COBOL Workshop FORTRAN IBM Assembler I IBM Assembler II Pascal—Accelerated PL/I
Operating System Facilities	Computer Networks Introduction to Virtual Storage Job Control Language—Basic Job Control Language—Advanced MVS Debugging—Advanced MVS Debugging—COBOL OS/MFT/MVT Workshop OS Utilities VSAM for COBOL Programmers
Database/ Data Communications	Introduction to Databases IMS Introduction IMS/VS Physical Database Design IMS/VS Teleprocessing Programming IMS/VS 3270 Message Format Overview IMS/VS 3270 Message Programming
File Management Systems	EASYTRIEVE MARK IV Basic and Extended Systems MARK IV Retrieval—Introduction Nonprogrammers Programmers
Timesharing	Mini-Max Timesharing TSO—Basic TSO—Advanced TSO—CLIST
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middle of an ongoing software development project.

Consequently, we are faced with a dilemma. It takes both employee training time and managerial scheduling to bring software engineering techniques up to more efficient, cost-effective levels. These investments can only be made at some expense (opportunity cost) to current committed projects. Since we are always under pressure to meet or better these commitments, it is virtually impossible to make the necessary investments. Thus, the adoption of improved software technology comes far too slowly to the corporate environment where it is most urgently needed.

Once again, the solution is corporate software engineering training. Unlike what I suggested in my November article, this training should be a bit more theoretical, emphasizing newer technologies to working software engineers rather than engineering practices to computer science graduates. Perhaps we could also take advantage of the many continuing education courses already available from the academic community.

Each company should plan to send its key personnel (e.g., first level supervisors, senior/lead engineers, requirements analysts, system designers) to advanced training following the completion of major projects. At the current development rate for software systems at my company, this would provide a technology update once every two to three years. Such ongoing training allows these individuals to advance the corporate state of the art on a project by project basis with minimum disruption to work in progress and at modest company expense. In addition, employees will be more motivated by such a policy, which may enhance project performance and reduce current high turnover rates. Still another advantage of this type of training is the positive feedback that corporate students at continuing education programs could provide to the academic community, helping to bridge the gap between computer science education and the daily practice of software engineering.

—David A. Feinberg
Seattle, Washington

THOSE WASCALLY WABBITS

I first heard of rabbits, or rather "wabbits," from a friend who told me a story about an IBM system at a U.S. university that got jammed up every so often. To begin with, a new system start was used to resolve the problem, but the system kept jamming. The systems programmers then looked into the problem and found, to their amazement, a countless number of tasks called wabbits running in the system. These wabbits were multiplying by themselves. The problem could only be solved by removing the guilty user.

Another task, or trick, is the virus that runs in a network, sending itself to all the nodes, starting itself, and running. This trick is harmless but annoying, because it runs with a low priority, yet whenever a task list is carried out the virus will be there. Even if it is deleted it will be re-sent to the node by another node, because the task always checks to make sure that all other nodes have the virus. The task must be systematically wiped out.

What happens if one creates a wabbit virus? This is a task that creates other tasks that are copies of itself, and then starts them. The task can also keep other nodes supplied with itself. You can even make it send the source files over, as well as routines, to compile and start the wabbit virus. This type of trick will kill a network, but again, once the problem is seen, it can be systematically wiped out.

The trickster can then say, ah yes, I need a shifting wabbit virus. This task is of the same nature as the wabbit virus but has an extra twist to it. The twist is that when it runs for the first time it will write a copy of itself with a randomly generated name. This copy, or son, will start, but immediately go into the wait state. It waits for its "father" to be killed. After waiting a random amount of time, it comes out of the wait state, writes itself again with a random name, and becomes a wabbit virus. In a network that starts with one father, a father will be created in every node, and in every node a shifted version will be in a wait state. Each of these shifted versions will have different names. When the fathers have been killed in all nodes, the sons will become fathers in their own right. In this way the shifting wabbits will exponentially breed themselves. Seeing the source will not help the debugger, or rather the de-wabbiter, because all the names after the original fathers have been randomly generated.

To further complicate the problem, the trickster can set the random wait time in years, so that at each de-wabbiting, the original debuggers may no longer work there.

The systems programmers and de-wabbiters need a counter-task, let's say the "hunter," that looks for running tasks with the above-mentioned attributes. The hunter task will run at a very high priority and be able to generate itself faster than any rabbit—or wabbit. Maybe then we would have a computer-ecosystem or the beginnings of one.

—Danny Weil
Munich, Germany

THE ROYAL PREROGATIVE

"You dunderhead!"

"Yes, Your Majesty."

"This appropriation request for the kingdomwide transportation system is ridiculous. How can you consider yourself a responsible minister of this court and forward such a request to me?"

"I am terribly sorry Your Majesty is offended. Perhaps you could help me understand which parts of the request are troublesome, so I might avoid such error in the future."

"Well, it's obvious enough; you've asked for too many people and too much money. I don't see any reason to spend another million pteradactyls on this program. We're in the kingdom business, not the transportation business. For instance, why do you need so many people for Transportation System Support?"

"I'm sure Your Majesty remembers that the initial transportation program involved giving automobiles to many of the kingdom's people. . . ."

"Of course I remember, you oaf. Each of our cities gave cars to its people according to the local perception of need. We spent a bundle on that one! It wasn't a bad idea, you understand, but I don't see that we got our money's worth. The cars we gave to court members have certainly been worthwhile, but I'm not so sure each of the cities has been as careful about justifying cars for its people."

"Your program has been very successful in giving cars to the people, Your Majesty. In fact, nearly a third of the cars our Seers foretell we will eventually need are already in the kingdom. The concept of modern transportation has truly taken hold in the kingdom and your wisdom has once again been demonstrated. You have, indeed, been successful."

"I am not sure we can conclude that the program has been successful just because the people like it. After all, where are the economic improvements to the kingdom that you said would 'follow as the night the day' from a modern transportation plan? And, by the way, why, if I—er—the program is so successful, should we need so many people to support it?"

"Your Majesty, let me explain what tasks are required of our transportation support group. Their most important activities are helping new drivers, supplying gas, oil, and tires, and making sure each of the kingdom's cars is properly maintained."

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"Now I've got you, fool! You say you need additional staff to help new drivers, but we are giving out cars at a slower pace this year, so you need *fewer* driver trainers, not more!"

"In your wisdom, Sire, perhaps you have overlooked the fact that some of your subjects move each year to the Duchy of Turnover and many others move from Turnover into your kingdom. A number of the newcomers must be trained to drive the cars left behind by the confused souls who moved away. In addition, governors of the kingdom's cities frequently reassign cars from one person to another or ask several people to share a car. These things plus the normal increase of cars in the kingdom add to the driving trainers' workload. We will certainly always need such support people, even after we stop adding new cars."

"You may have a point on training but certainly maintenance is the responsibility of those Zomex Corp. buffoons who sold us the cars; why should we pay for people in that area?"

"We must, Your Majesty, coordinate the maintenance activities of the Zomex buffoons, er, support personnel. For instance, Zomex has no way of establishing priorities among service requirements. If we didn't oversee the maintenance activities we'd have no way of knowing if we were getting the support Zomex promised to supply. As the size and complexity of our transportation system grows, Sire, we will need to modestly increase this activity because maintenance issues become progressively more important as a result of our growing dependence on the transportation network."

"Supplies, then. Certainly each driver could be responsible for his own gas and oil! Even you are probably smart enough to know which goes in which orifice."

"Each driver might well buy his own gas, oil, and tires, Sire, but the benefits of volume purchasing and modest stockpiling of items suggest that this too should be a centralized function."

"Grumble."

"Your Majesty, you have frequently told the court that the modern kingdomwide transportation system is important to the health of our kingdom. You have generously supported this program. Is it not as important to protect our investment as it was to make the investment in the first place?"

"You are sly and wily and generally not to be trusted, but in this one thing you may be right. It isn't wise to let our fleet of cars decay or go into disuse after such heavy investment. So, the portion of your request for Transportation System Support is approved. The rest of this nonsense, however, is another thing altogether."

"The Transportation System Development request, Sire?"

"Exactly. Everyone talks about the magical, wonderful benefits from modern transportation. We've put in our share of this modern transportation; now, where are these magical-wonderfuls? Not another pteradactyl for transportation until you can show me the payback. Helping housewives get back and forth to the supermarket in a car instead of by shank's mare may be very popular with the housewife but it hasn't put another centi-dactyl in my exchequer. Now you want more capital and more people to spend on transportation. Explain yourself, if you can!"

"My poor explanation, Sire, will require your well-known patience and wisdom—the importance of modern transportation systems is just beginning to be understood."

"How complicated can it be? We give cars to the people, gas them up, and reap the rewards. All the things they used to do by walking, they can do 10 times faster in a car. What's so hard about that? I suspect that the Ministerial Mind is the source of the difficulty. Kings learn to deal with the big picture, a skill you might do well to acquire, dolt, if you value your position."

"Thank you, Your Majesty, for your patience. I will try not to test it further."

"Humph!"

"As you say, Sire, we have given the people cars and gassed them up. In the cities they drive back and forth to market and here and there to visit neighbors. The benefits to your subjects are clear, and if we were to expand the number of people who have cars, more would benefit. . . ."

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Proverbs 14:6

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READERS' FORUM

"Can't they share? We could call them Car Pools. Catchy, eh?"

"Some do share, Your Majesty. For many, however, sharing is very difficult because of individual needs. . . ."

"Indeed! Well, they'll have to cope with the difficulty until you can prove to me that there is something more in it for the kingdom than making a few lazy subjects more comfortable."

"Sire, there is just a bit more to a modern transportation system than the cars and the gas. The most important benefits of transportation won't become clear until we have gone farther. Consider, if you will, the matter of roads and bridges.

"What about them?"

"Today the people's cars are used only within their own city because there are no roads that connect cities. Imagine what might happen if people could actually drive from one city to another. . . ."

"Fool! There is no need for people to travel from city to city—hardly anyone ever does and we are getting on splendidly. Your imagination on how to spend the kingdom's money is magnificent, but you haven't the common sense of a hedgehog."

"Your Majesty, the Seers all agree that many material benefits would result to a kingdom in which people could move themselves and the products of their commerce easily from place to place. They argue that the benefit of a universal network of roads and bridges for one subject would be too small to justifiy the cost, but if the benefit for all a kingdom's subjects were to be measured, an enormous payoff would be discovered. Unfortunately, they do not agree on how to quantify this benefit."

"If this is such a great idea, why haven't other kingdoms built extensive transportation systems with, say, cars for families, trucks for tradesmen, and roads connecting every town?"

"But, Sire, they have. The Kingdoms of Electronica, Aviopolis, and Petroleum have done most of these things and they have prospered mightily."

"But we are different. Our people are different and the enterprises within our kingdom are different."

"To my poor eyes, Sire, they appear to be no more different from us than they are from each other and they have all prospered. Academics have studied many kingdoms and conclude that in most cases larger investment in high technology and wizards will produce a greater return on equity for the kingdom."

"Minister, you try my patience beyond endurance. This vision of yours with vast investments in roads and bridges and vehicles, with people and goods moving from the place to place, with universal access to cars, with trucks and buses and heaven only knows what else—it's all poppycock! Your request for additional staff and capital to implement more transportation is denied and don't ask me again until you can prove, without the slightest shivering sliver of a doubt, that there is something in it for us. This is a bottom-line kingdom; pioneers are those guys with arrows in their backs. We will distribute cars to subjects where a proven need exists. That's it and that's all!"

"Your Majesty is most gracious. Thank you."

"Don't grovel; kings are people too, you know. Someday you may have to make the hard decisions and you'll be grateful for these lessons in reality."

"Yes, Sire, thank you, Sire, I beg my leave now, Your Majesty."

"One more thing before you go. . ."

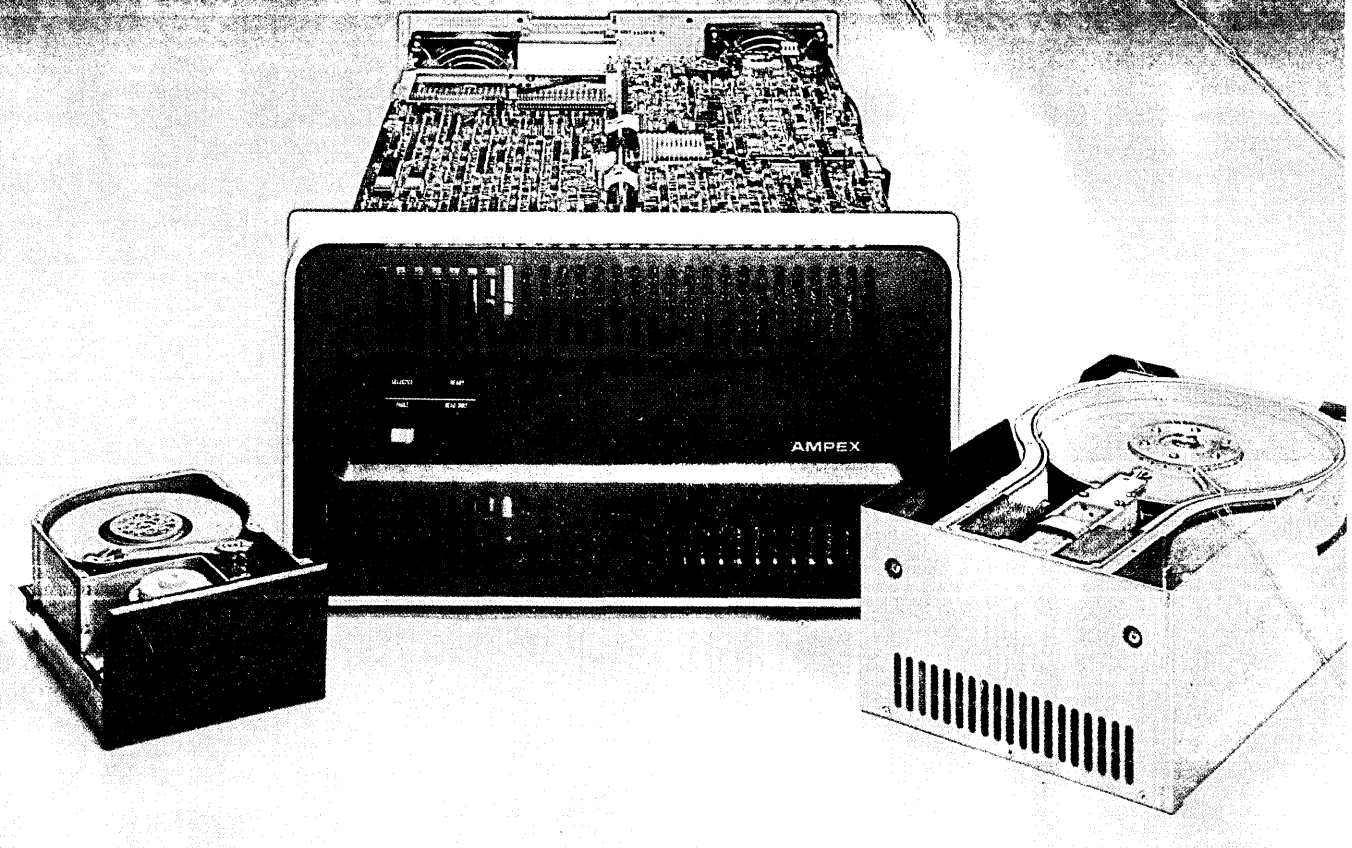
"Yes, Sire?"

"It's about this office automation proposal. . . ."

—Bruce W. Hasenyager
New York, New York

If you'd like to share your opinions, gripes, or experiences with other readers, send them to the Forum Editor, DATAMATION, 875 Third Ave., New York, NY 10022. We welcome essays, poems, humorous pieces, or short stories.

WE'VE GOT IT ALL



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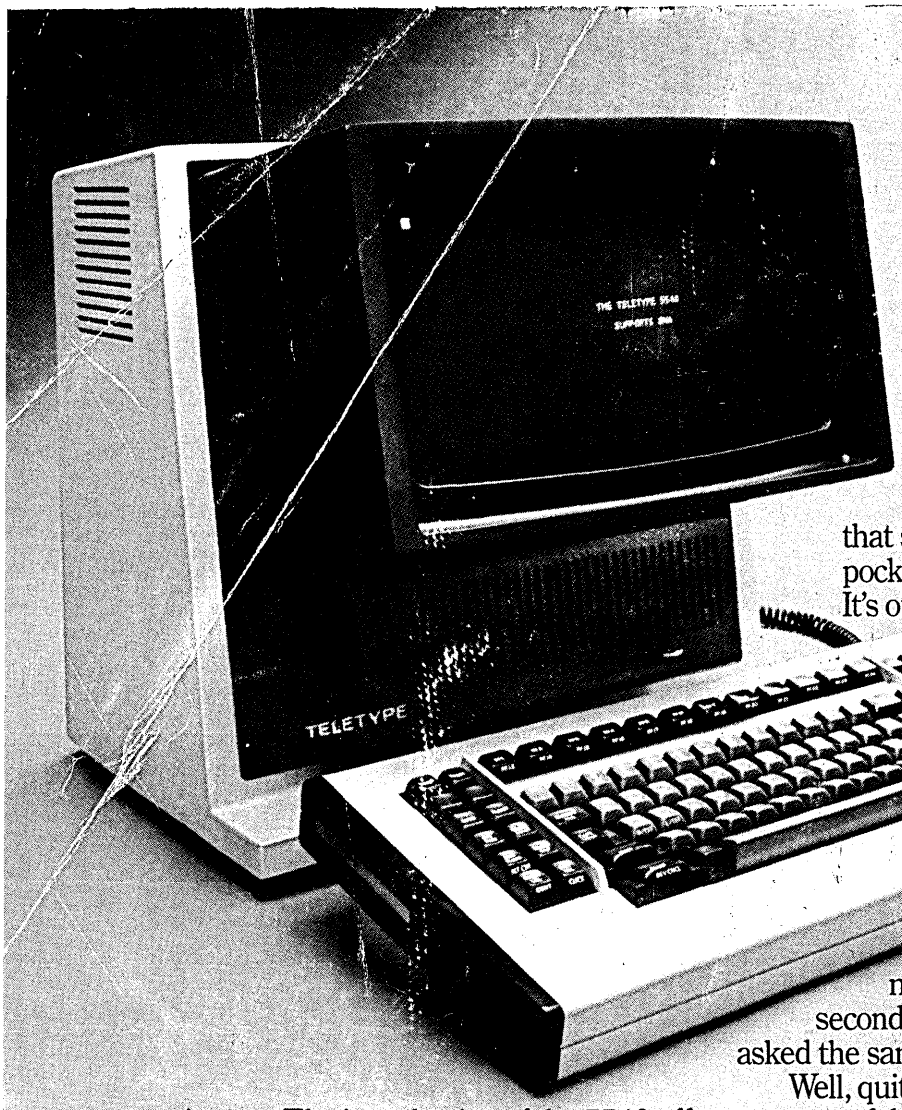

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When Teletype Corporation unveiled its first 3270-compatible terminal some 10 years ago, people asked if we were committed to this business. And when we introduced our second terminal, the 4540, we still got asked the same question.

Well, quite frankly, there's no doubt about our commitment. The introduction of the 5540 offers more proof that we're in the 3270-business to stay.

But the best thing about the 5540 is that it represents an even better value than its predecessors. Because besides being competitively priced, the 5540 supports 3270 SNA/SDLC in addition to 3270 BSC line protocols. And there's full SNA character string support. It can also replace existing SNA terminals without host software modifications. And you can upgrade from BSC to SNA simply by changing diskettes.

We've also given the 5540 a more powerful microprocessor-based controller that will cluster up to 32 devices. Or you can choose a compact tabletop controller. You also get a choice of reduced size or standard displays, and 80 or 132 column data formats.

To improve operator productivity, the 5540 features a detachable keyboard with 3270-like layouts; 24 program function keys; a non-glare, high resolution tilt screen; plus a status line that includes a row and column counter.

Another nice thing about the 5540 is that it supports our existing 4540 displays and printer devices. Thus, you can mix and match existing and new terminals while holding down the cost of upgrading your system.

Backed by Teletype's experience in building over 200,000 3270-compatible terminals, the 5540 will certainly enhance our proven record for reliability. In the unlikely event of problems, self-diagnostics help pinpoint them. Modular design simplifies repairs. And with an established nationwide service organization, we're able to respond quickly when you need us. That includes delivering and installing terminals like the 5540.

Get to know our 5540 a little better. You'll find it's very easy to like.

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CIRCLE 3 ON READER CARD