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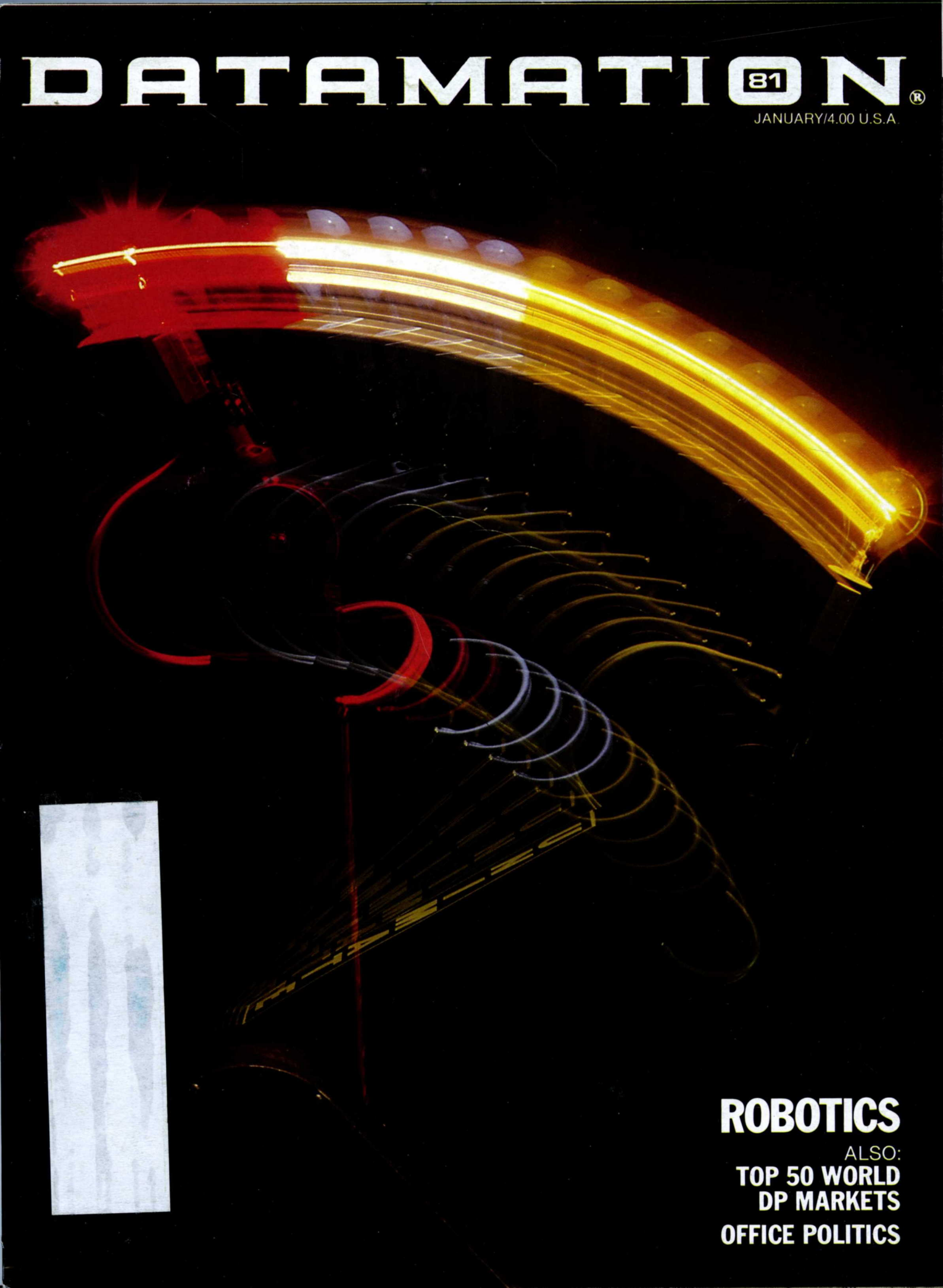

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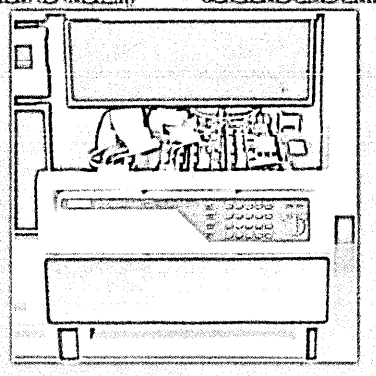

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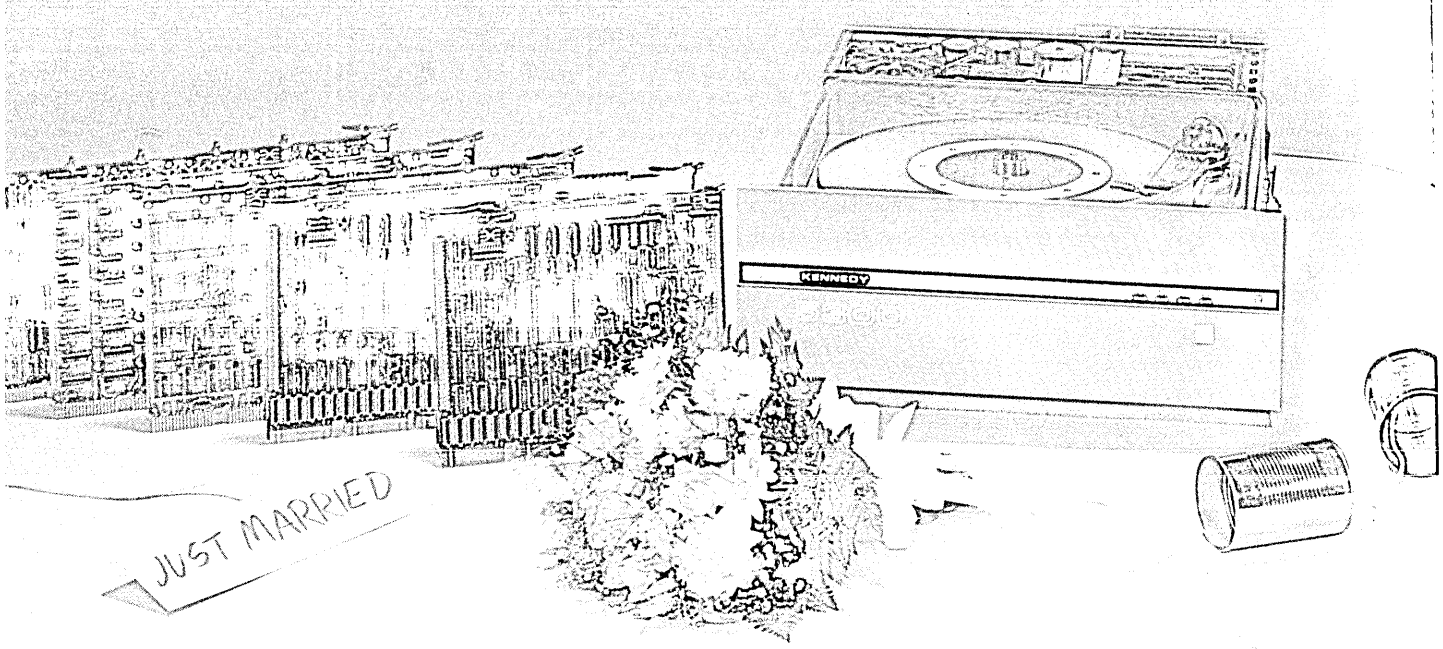

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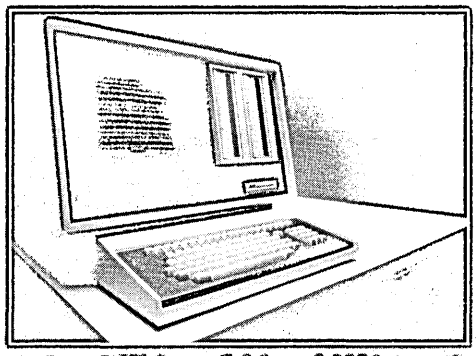

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VOLUME 27 NUMBER 1
This issue, 158, 230 copies.

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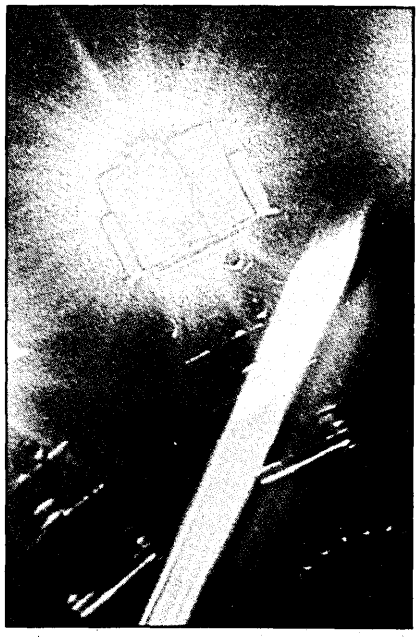

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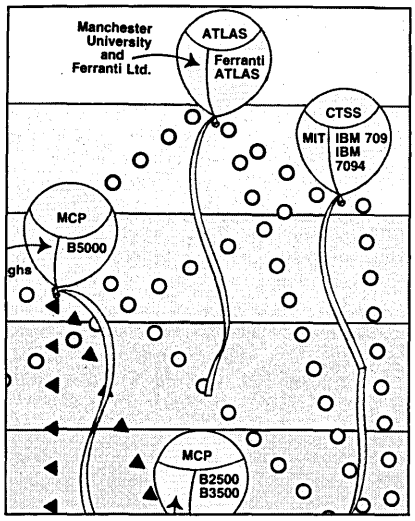
Users will be politely prevented from incorrect actions and never made to feel abandoned, lost, or disliked with these new programs.



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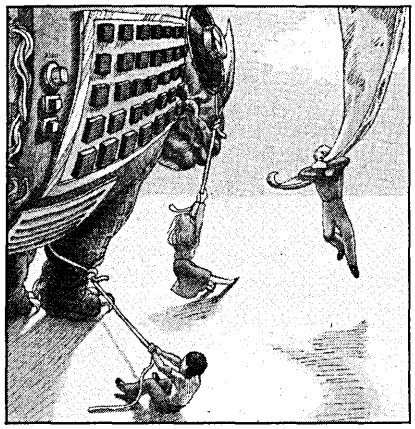

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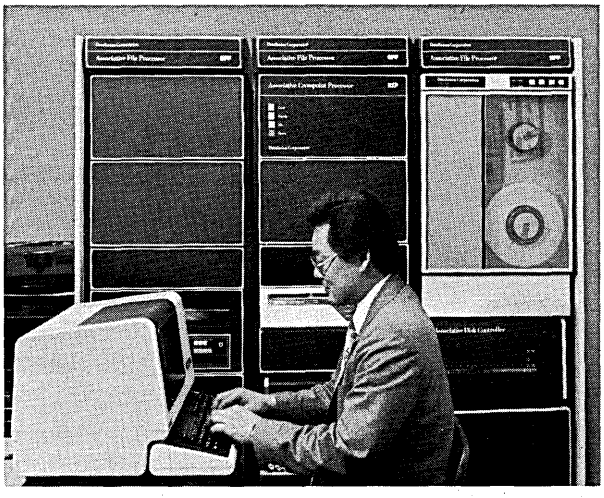
COVER PHOTOGRAPH BY AL SATTERWHITE

The Associative File Processor. AFP.



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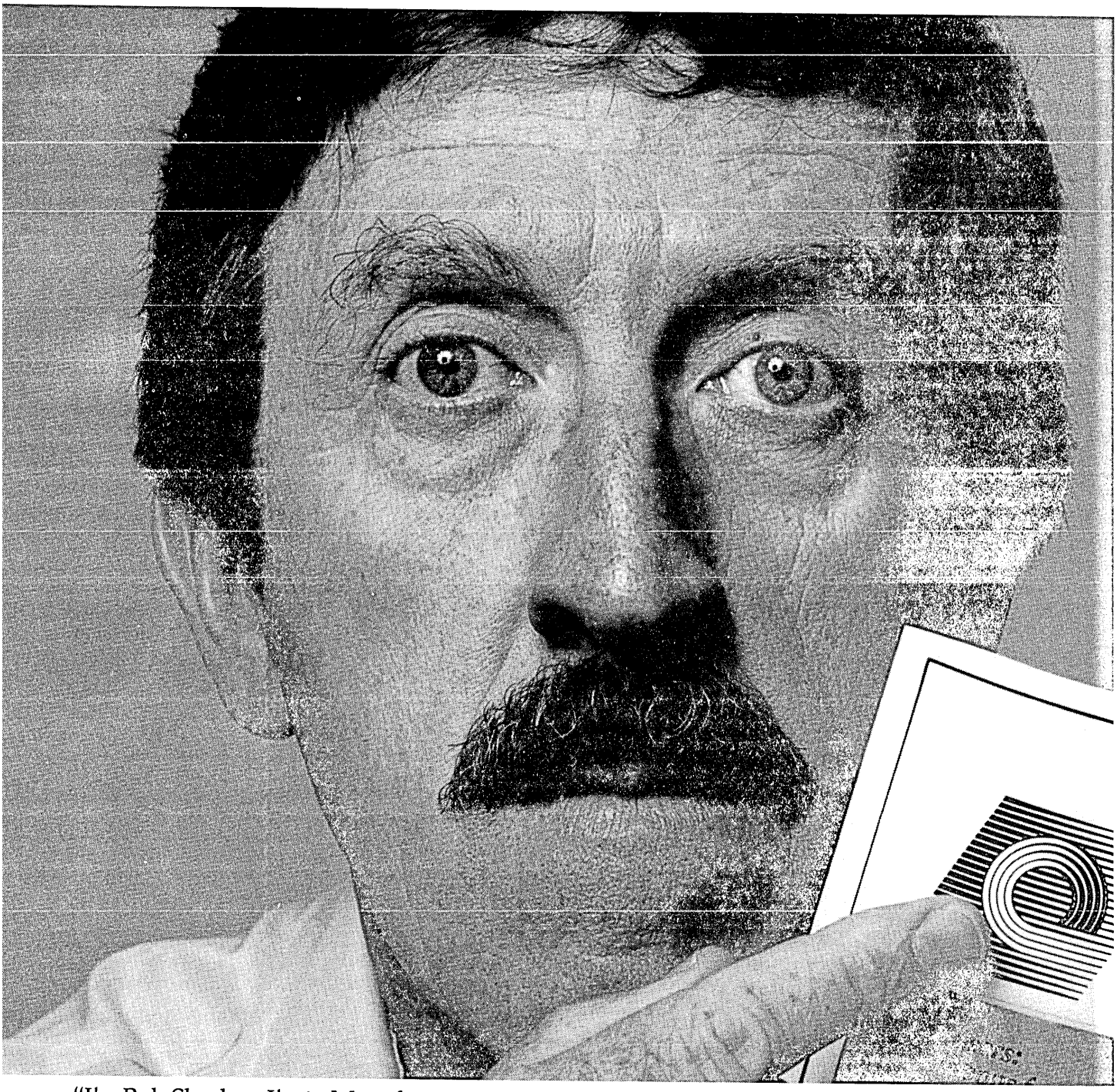

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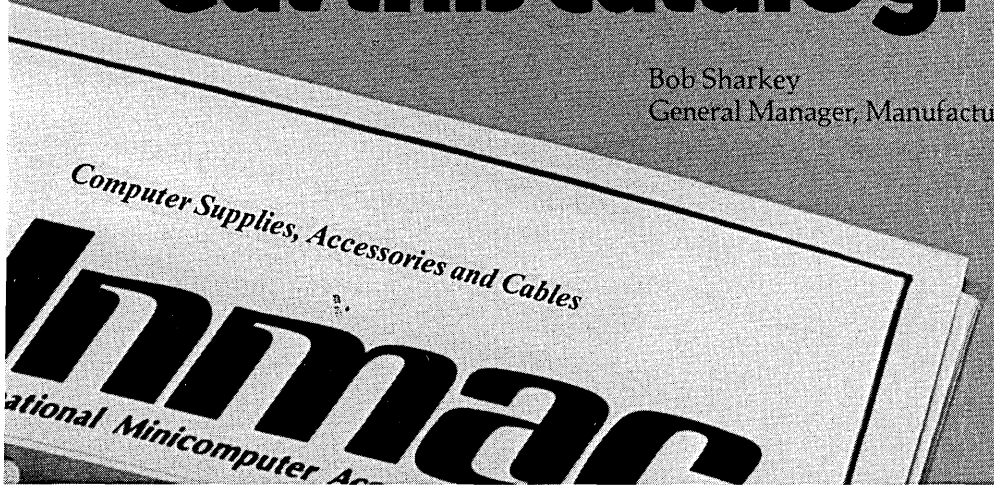

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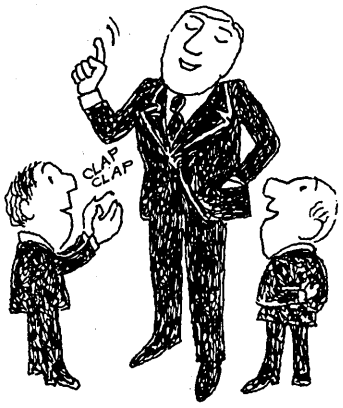

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LOOKING BACK

JANUARY 1961

With each new year, people tend to pause, reflect on the past, and speculate about the future. The computer industry is no different; the January 1961 issue of DATAMATION carried four opinions on "The Path Ahead for Computing," by well-known industry pundits.

The first selection, by Daniel D. McCracken, was "The Human Side of Computing." The most obvious trend here, of course, was the explosive number of humans entering computer professions. The problems these people encountered were poor training at entry-level and inadequate training in advanced concepts at the senior level. Another obstacle—still present today, although to a lesser degree—was the lack of education of the public. Both training and education are forms of communication. McCracken believed that poor communication was the root of these problems.

According to Graham Jones, the most significant trends in computer hardware were reliability, lower cost, and greater speed. These three improvements, coinciding with the development of large-volume stores and communication networks, was equipping the industry with the necessary technology to effect real-time applications.

Ascher Opler examined the "Trends in Programming Concepts" and arrived at three major roadblocks in the programming path: first, qualified programmers were difficult to find, and the gap was not likely to ever be filled; second, those acquiring their second or third successor computers were realizing there would be seventh and eighth successors as well as modular improvements on each computer; and third, programmers found themselves heavily involved with operations and had to adapt these programs for the common good of the installation. Programming language standardization was a partial solution offered, as were assembly systems, debugging systems, operating systems, simulators, and translators.

In the last section, "On New Areas of Application," Allen Newell commented on the unlimited possibilities for the future. One direction stressed was the possibility of handling raw language (English, German, Italian, etc.), thereby removing the difficulties involved in coding. A real-time executive decision would then be easier to achieve. Newell predicted that through the continuing stages of technological evolution, such an application could occur.

JANUARY 1971

"IBM came out with all legal cannons firing in its trade secrets suit against the beleaguered Memorex." The object of this feud was production or use of 3330-like components based on trade secret data. However, the real issue was IBM's attempt to discourage further defection of key employees and to slow the leak of information on such IBM products as the 3330 and 2319 control units, and the "iceberg" Integrated File Adaptor. These were breakthrough developments in 1971, and the competition scrambled desperately in an effort to learn enough about the products to be able to create their own versions.

IBM, notorious for secrecy, had (and still does have) a nondisclosure clause in its employee contracts. In relation to the Memorex suit, IBM zeroed in on employee Richard Stock with a trade secret, breach of contract charge. IBM said, in essence, that Stock worked on the 3330 disk development, told his supervisor he was going over to Information Storage Systems, Inc., Cupertino, Calif., to help them with their 3330 disks—and then left with trade secrets and confidential documents. Besides proving document theft, how enforceable was IBM's nondisclosure clause over the former employee's knowledge when he moved to another job in the same product area?

—Deborah Sojka

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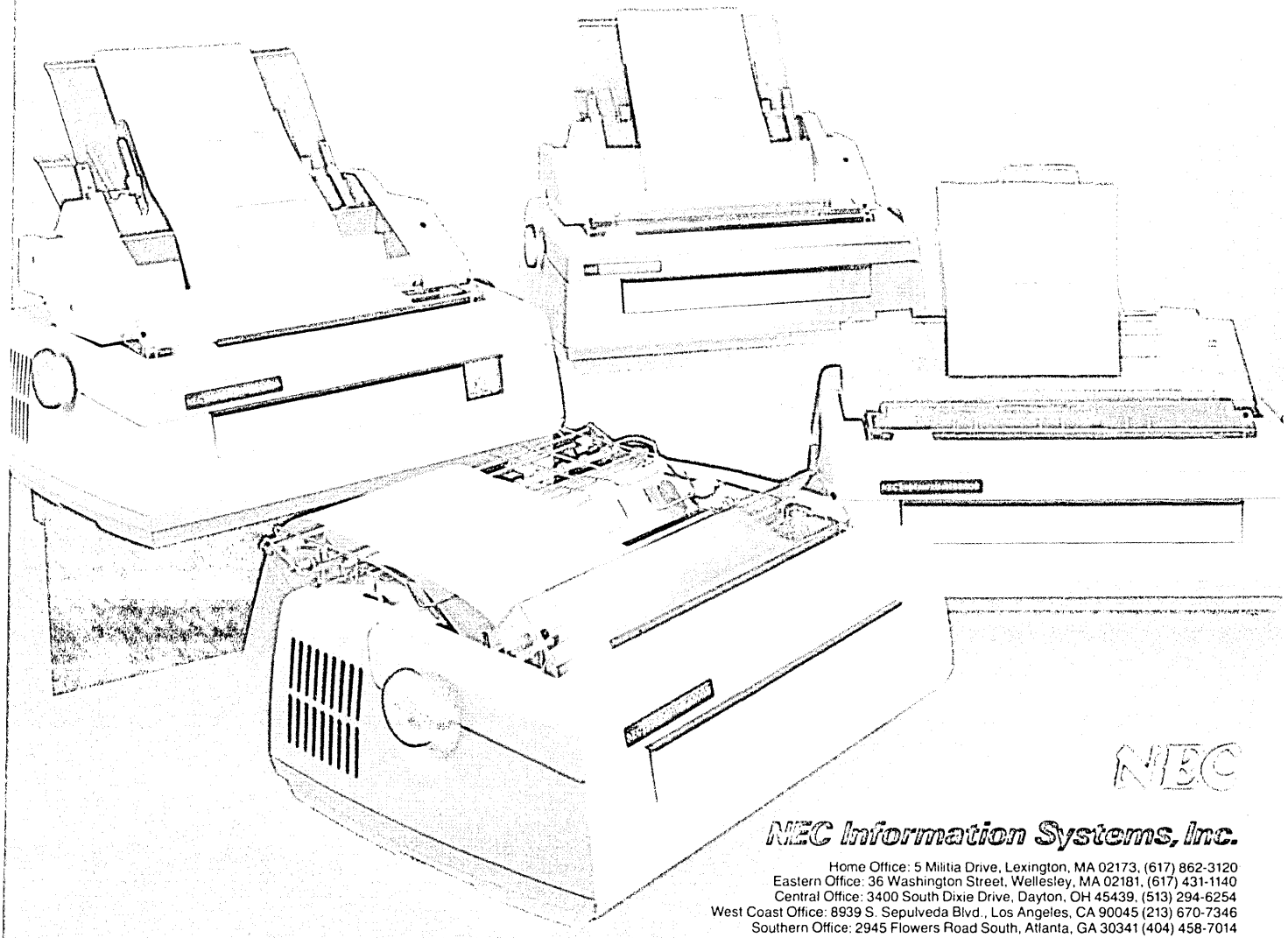

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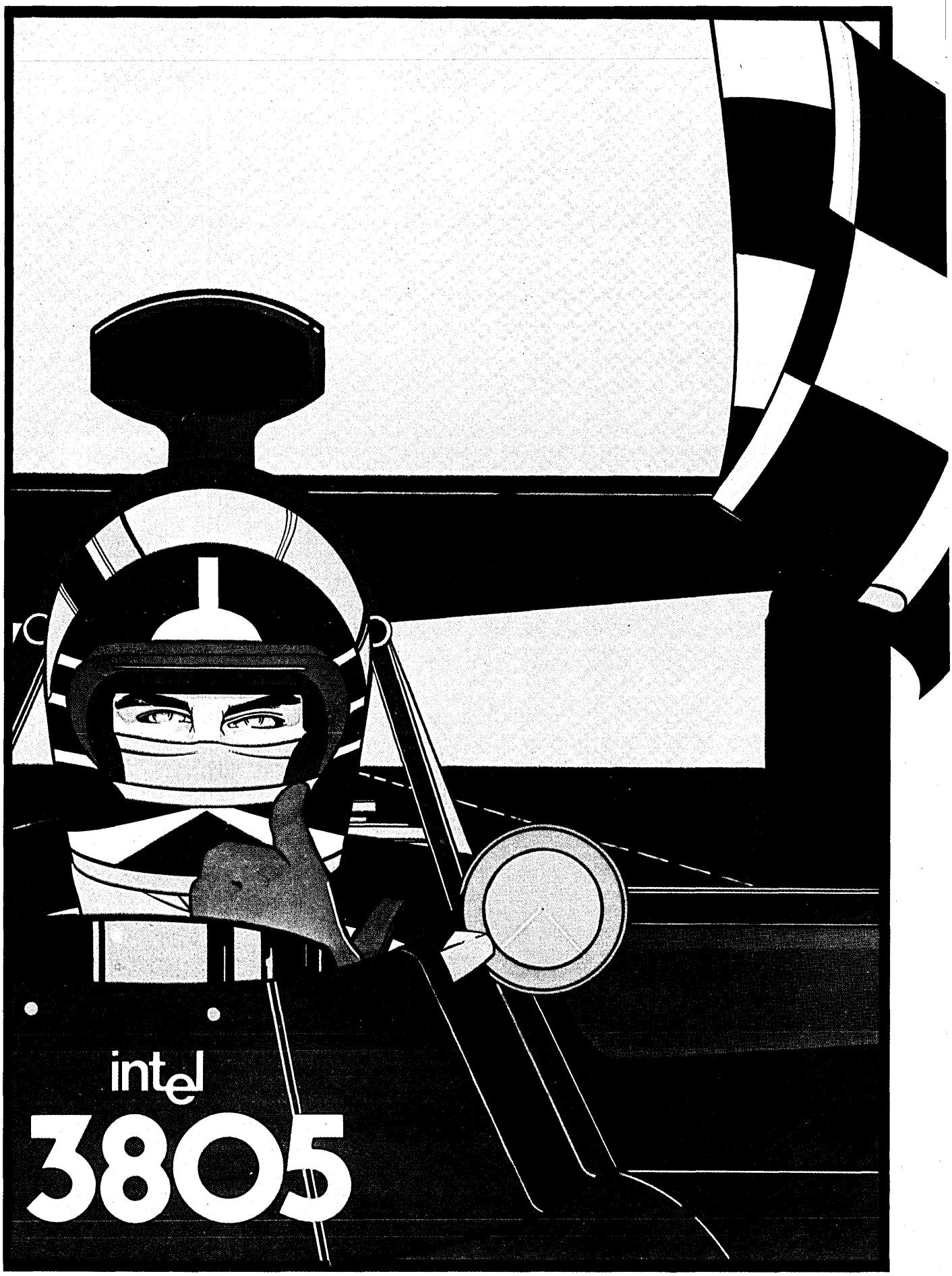
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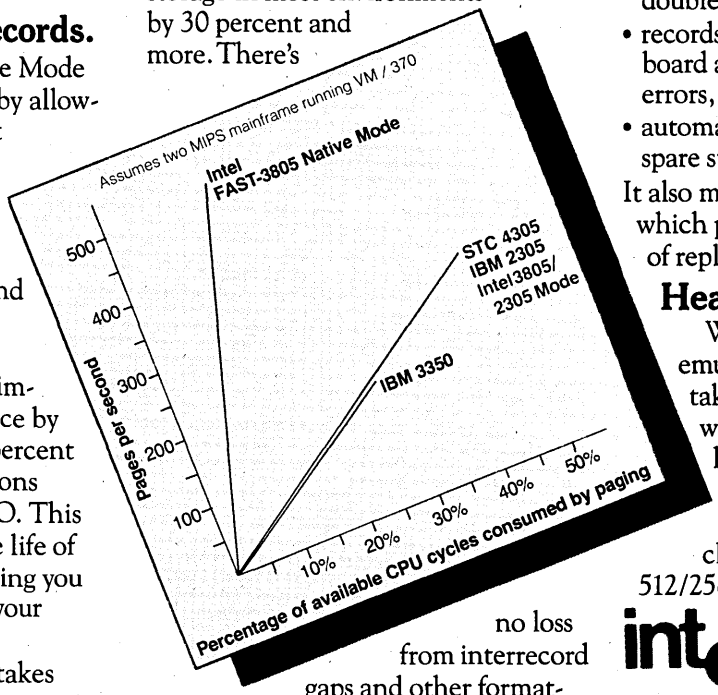

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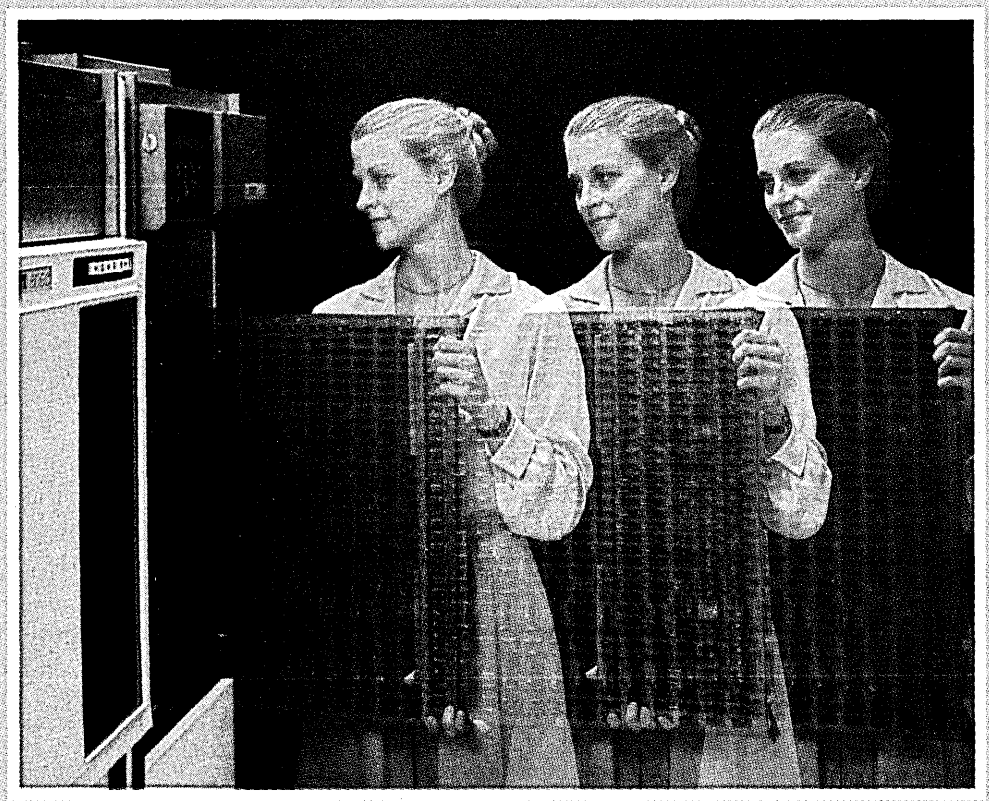
CIRCLE 11 ON READER CARD

BTI 8000 32-bit multiprocessor system

Now you can grow by plugging in resources instead of changing computers



Finally, there's a computer system that lets you grow by plugging in resources, instead of by changing models — the BTI 8000.

The secret is Variable Resource Architecture (VRA): a flexible mix of hardware resources controlled by a single, self-regulating operating system.

Hardware resources consist of multiple processors, memories, and input-output channels operating in parallel without the complex internal networking normally associated with such arrangements. The result is mainframe performance at substantially lower costs, plus unequalled flexibility.

You can tailor the BTI 8000 to serve over 200 on-line, interactive users. Or to handle large batch loads. Or to do a lot of each.

Furthermore, you can vary processing capability over a *tenfold range* by merely adding or deleting hardware modules. Differences in configuration are invisible to user software, and no reprogramming or recompilation is required.

Key features of each BTI 8000 system include:

- From one to eight 32-bit CPUs controlled and coordinated by one shared operating system.
- Up to 16 megabytes of main memory.
- Fail soft architecture.
- Secure multi-user operations.
- Demand-paged virtual memory.
- Simultaneous use of ANS COBOL 74, ANS FORTRAN 77, PASCAL/8000, and BASIC/8000.

As for reliability and support, they're established BTI traditions, proven by over 2,500 other BTI computers operating in the U.S., Canada and Europe. For full details about the BTI 8000, contact the BTI office nearest you.

BTI
COMPUTER SYSTEMS

Corporate Offices: 870 West Maude Avenue, Sunnyvale, CA (408) 733-1122 Regional Offices: Piscataway, NJ (201) 457-0600; Palatine, IL (312) 397-9190; Dallas, TX (214) 630-2431; Sunnyvale, CA (408) 733-1122. Sales Offices in major U.S. cities.
In the United Kingdom: Birmingham (021)-477-3846

BTI is a registered trademark of BTI Computer Systems

CIRCLE 12 ON READER CARD

LOOK AHEAD

DON'T LEAVE HOME WITHOUT THEM

MCI and American Express have joined forces to offer customized services to businessmen. Already approved by the FCC is an Amex discount to cardholders who charge their calls on MCI's long distance Execunet service. Under consideration is a voice/mail service that would provide a national MCI mailbox for businessmen on the road to collect phone messages. Also in the planning stage is a document distribution service which would make it possible for cardholders to use facsimile machines at Amex offices in downtown city locations to transmit business documents. Distribution of documents could include direct transmission to a fax machine at a cardholder's office or a next day Mailgram-type delivery to other locations.

Amex reportedly has eight million business cardholders who frequent cities served by the MCI net. The combination of MCI communications and Amex research and billing may lead to additional innovative services in the future.

TRIMMED, TRANSFERRED, OR TERMINATED

Wired-in Washington sources report that Reagan's policy aides have targeted the NTIA in Commerce as an organization that could be vastly trimmed, perhaps even eliminated. "Look for a small senior staff group in the White House," said one prominent Capitol Hill Republican. "Not another OTP -- that was an experiment that failed."

NCR WEIGHS ADDS' OPTIONS

Reports are circulating that NCR is going to try to use the distributor network it picked up with ADDS, the terminal vendor, to move into the small business systems/personal computer niche where Apple, Tandy, and Ohio Scientific have been flourishing.

CTI READIES NEW GEAR

Custom Terminals Inc. (CTI), a small Raleigh, N.C. terminal vendor, has targeted the IBM 3767 keyboard/printer market with its CTI 1000 crt display, reportedly the first crt offered for the KSR users on async 3767 protocols. Next month, CTI will complement the crt with a "translator module" that will give 2740/3767 KSR users access to 3270-type programs at a remote data center.

BP IN DP?

Oil giant British Petroleum may come to the rescue of the U.K.'s ailing dp industry. London policy-makers suggest that if BP spent just a part of its $5 billion a year investment program on dp activities, it would be a big boon. High-placed sources say this would let the Brits firm up their U.S. connections, perhaps take over some of the star

LOOK AHEAD

names (Intel, Wang and Apple are cited and secretly coveted), and maybe tempt back some of the thousands of brighter U.K. dpers now resident in Silicon Valley. Ominously poor results from ICL and out-of-touch management in other companies mean that U.K. strategists are now more desperate than ever to build a viable dp industry, and are casting anxious eyes across the English Channel at companies like St. Gobain and Matra.

WANG EYES OIS ENHANCEMENTS

Wang Labs previewed some advanced and experimental OIS software enhancements at the recent Wang Users Group meeting in Boston, specifically office automation options that could make access to a terminal attractive to people other than Wang's traditional wp operator. Among the more interesting was a tiny "VM System" for storing and indexing, as in a personal Roladex file, allowing the user to develop a data base management application without knowing anything about DBMS. The same package supported a preformatted calendar and an intrasite electronic message system on OIS. Among the wp wonders displayed were a new simplified menu option; a "proportional spaced workstation" which allows display of text as it will actually appear when printed; and a box-graphics option that will allow word wrap-around within an organizational-chart-type display.

THE WORD IN WASHINGTON

For an incoming administration that has been leery about establishing policy in the telecommunications arena, the Reagan team will have to make major decisions quickly -- just in their appointments to the FCC. Reagan may well appoint four commissioners this year -- replacements for chairman Charles Ferris, and commissioners James Quello, Tyrone Brown, and Robert Lee, according to D.C. insiders.

A HOME FOR VIEWDATA?

If GTE's ultimate thrust with its Viewdata connection and its license to produce personal computer type terminals is to bring data base services to the home, the company won't say so yet. When pressed, George Conner, vice president, Business/Residence Sector, GTE Service Corp., admitted that home service is a far off consideration. But he emphasized: "It's the offices first. When that curve reaches a point where it reduces terminal costs, the residential market will begin to develop."

SLOT SCANNING SIMPLIFIED

Slot scanning of retailers' OCR A tags soon should be easier in the U.S. We hear that Scantron Inc.,

(continued on page 45)

How can a Programming Manager go home at 5 o'clock?

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There's a new version of MARK IV, our famous application development system, designed to get your applications up and running quickly.

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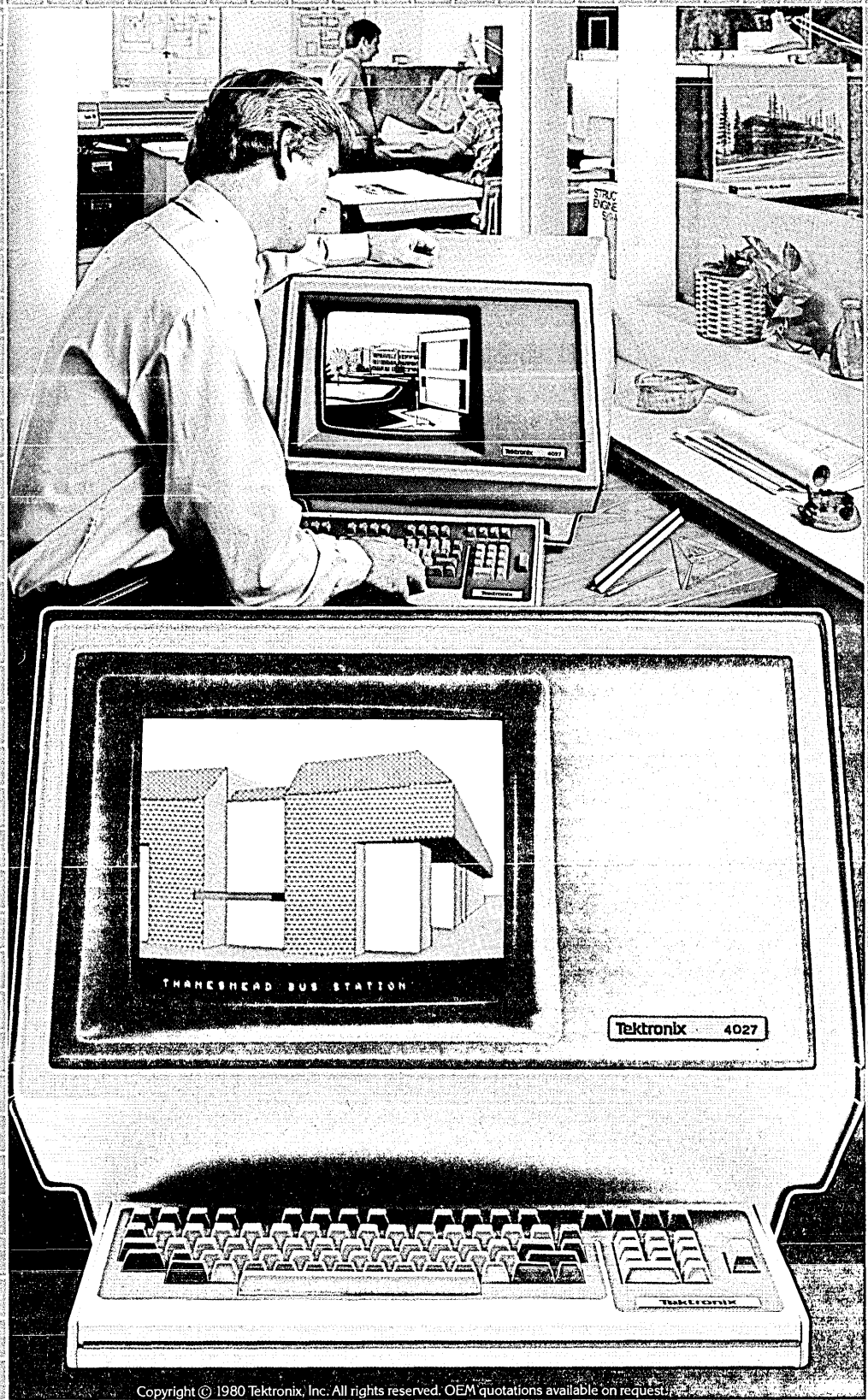

"With the Tektronix 4027 and ICL software, we've only begun to tap the potential of color in improving man/machine interaction."

Bill Gardner
Research Fellow
Architecture and Building Unit
Computer Unit
Strathclyde University
Glasgow, Scotland

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The clearest architectural perspective? With help from Tektronix, ABACUS comes through with flying colors!

Delays, drudgery and guesswork have been all but eliminated from design projects by researchers at Strathclyde University's Architecture and Building Aids Computer Unit.
At ABACUS, the aim is to instantly appraise the spatial, functional, environmental and economic impact of any architectural alternative. What could be tedious is swift, participatory and colorful.

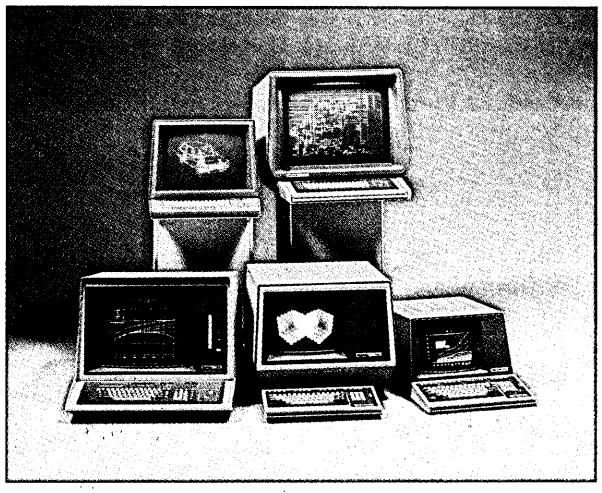
The reason: ABACUS is exploiting the interpretative capabilities of color-coding via the Tektronix 4027 color graphics terminal. Programming is built on Tektronix' modular, device independent Interactive Graphics Library (IGL).

"Thanks to the clarity of color," says Research Fellow Bill Gardner, "building users themselves can join in the actual design process."

By hooking IGL's 3-D option into their energy prediction programs, for example, ABACUS can indicate factors such as heat loss or available sunlight for an entire building or cluster of buildings. Not by mathematics, but by color gradations.

With IGL's modularity, ABACUS can add new equipment, and even emulate color on its monochrome terminals, without rewriting code. And with the Library's acclaimed HLS color selection system, the techniques of designing with color are easier to learn and remember than ever before.

"We now have the tools," says Gardner, "for integrated computer design of everything from carpets to working conditions, with a continual grasp on running costs."
Whatever you design, Tektronix can show you a graphic contrast between delays and frustrations and the pleasures of working with the world's leading graphics. Contact your local Tektronix sales engineer, or call toll-free, 1-800-547-1512 (in Oregon, 644-9051 collect).



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Information Display Division
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CALENDAR

JANUARY

Telecommunications/China '81, January 17-25, Peking.

The second of its kind, this exhibition is limited entirely to U.S. companies; it introduces American products in China and explains the products' uses. Contact Expoconsul, a Division of Clapp & Poliak, Inc., Princeton-Windsor Office Park, P.O. Box 277, Princeton Junction, NJ 08550, (609) 448-3200.

P.A.T.H. Conference, January 19-22, Dallas.

The Bank Administration Institute sponsors this conference on Productivity through Automation, Technology, and Human Resources. Contact Alice M. Moore, P.O. Box 500, 303 S. Northwest Highway, Park Ridge, IL 60068, (312) 693-7300.

HISSG Winter Seminar, January 20-23, Long Beach, California.

The theme for the Hospital Information Systems Sharing Groups seminar is "Cost Containment—The Legislative and Voluntary Aspects and Their Effect on Hospital Information Systems." Contact W.V. Rosqvist, Hospital Information Systems Sharing Group, 2415 South 2300 West, Salt Lake City, UT 84119, (801) 972-6099.

FEBRUARY

Financial Information Systems Conference, February 9-11, San Francisco.

Presented by the National Institute of Management Research, this three-day conference has various sessions and workshops concentrating on financial systems. Contact NIMR Seminars, PR Dept., P.O. Box 3727, Santa Monica, CA 90403, (213) 450-0500.

International Solid State Circuit Conference, February 18-20, New York City.

The ISSCC is sponsored by the IEEE and is currently running in its 28th year. Contact Lewis Winner, 201 Almeria Ave., Box 343788, Coral Gables, FL 33134, (305) 446-8193-4.

COMPCON Spring '81, February 23-26, San Francisco.

The theme for the spring conference is VSLI and its future effects on design systems. Contact Harry Hayman, IEEE, P.O. Box 639, Silver Spring, MD 20901, (301) 589-3386.

CSC '81, February 23-26, St. Louis.

The ACM sponsors this computer science conference. Contact John W. Hamblen, University of Missouri-Rolla, Computer Science Dept., Rolla, MO 65401, (314) 341-4491.

NEPCON West '81, February 24-26, Anaheim.

The conference is directed toward all persons involved in manufacturing and testing printed circuits, multilayers, microelectronic circuitry, semiconductors, and other devices. Contact Industrial & Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

MARCH

Fifth International Conference on Software Engineering, March 9-12, San Diego.

The ACM sponsors this one. Contact Seymour Jeffrey, Director, Center for Programming Sciences & Technology, National Bureau of Standards, Washington, DC 20234, (301) 921-3531.

PRODUX 2000, March 11-13, New York City.

PRODUX consists of two separate shows—Business & Personal Computer Sales—Expo '81, and the 1981 New York Business Show. Contact George Pachter, PRODUX 2000, Inc., Roosevelt Blvd. & Mascher St., Philadelphia, PA 19102.

Fourteenth Annual Simulation Symposium, March 18-20, Tampa, Florida.

Part of Simulation Week, March 16-20, the symposium is sponsored by the IEEE, ACM, SCS, and IMAC. Contact Alexander Kran, IBM, B/300-40E, East Fishkill Facility, Hopewell Junction, NY 12533, (914) 897-2121 X 7142.

Office Automation Conference, March 23-25, Houston.

The major conference for users and designers of electronic office equipment, the OAC is produced yearly by AFIPS. Contact AFIPS, 1815 North Lynn St., Arlington, VA 22209, (703) 558-3620.

Interface '81, March 30-April 2, Las Vegas.

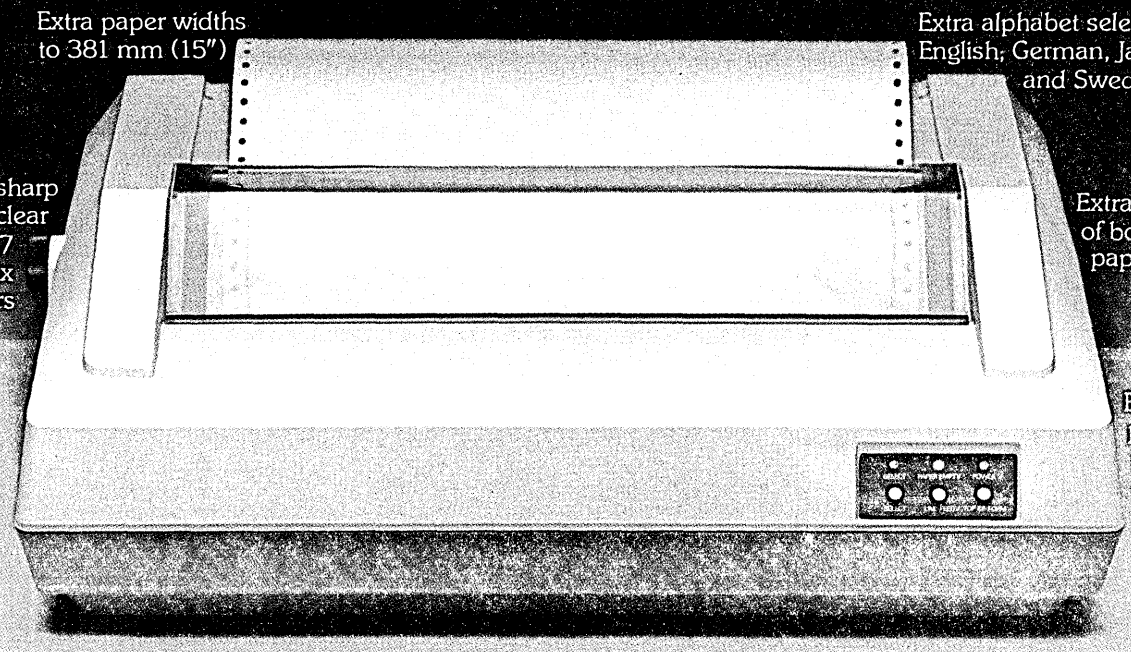
This is the second largest U.S. computer show and exposition devoted to data communications, distributed data processing, and networking. Contact The Interface Group, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

APRIL

Ninth Annual Telecommunications Policy Research Conference, April 26-29, Anapolis, Maryland.

The object of this conference is to provide a forum for the analysis and discussion of telecommunications policy issues. Contact William E. Taylor, Bell Laboratories 2C-258, 600 Mountain Ave., Murray Hill, NJ 07974, (201) 582-2108.

EXTRA. EXTRA.

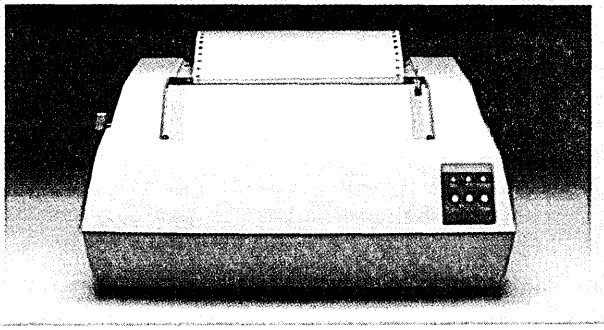


Now you get more extras when you pick the new dot matrix printers by C. Itoh. Choose the Comet 80-column printer and get the extra benefits of four character sizes and paper-saving print compression. Choose the Comet II 136-column printer and receive the added extra of a full-width computer size printer that accommodates paper widths to 381 mm (15").

Both the Comet and Comet II also offer the rare combination of low cost and high performance. Both models operate at an efficient 125 cps bidirectional print speed and in a 9 x 7 dot matrix.

C. Itoh's Comet series has the extra advantage of a unique multilingual capability with a selection of four different alphabets: English, German, Japanese and Swedish. Other special characteristics include a programmable VFU (Vertical Format Unit) plus self-test diagnostics. For your operator's convenience, there's easy bottom or back paper loading, and both Comets use a standard low-cost nylon ribbon. Plus our printers already meet 1981 Class A FCC, UL, and fire safety requirements.

If all that wasn't enough, Comet and Comet II are plug-compatible with all major printers in the industry, meeting standard parallel serial interface specifications. Our printers are backed by C. Itoh's warranty and a nationwide field service organization.



And as a final, all important extra, when you choose either printer from C. Itoh you get immediate off-the-shelf delivery.

So if you want the highest quality at the best price, look into the extras the C. Itoh Comet and Comet II printers offer. You'll get a lot more than you bargained for. For more information, contact C. Itoh Electronics, Inc., 5301 Beethoven Street, Los Angeles, CA 90066; Tel. (213) 390-7778. Chicago Office: 240 E. Lake Street, Suite 301-A, Addison, IL 60101; Tel. (312) 941-1310. New York Office: 666 Third Ave., New York, NY 10017; Tel. (212) 682-0420. Dallas Office: 17060 Dallas Pkwy., No. 108, TX 75248; Tel. (214) 596-2974.

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One World of Quality

CIRCLE 13 ON READER CARD

"How many 31-year-old engineers do you know who have saved $100,000 in salary?"

A very successful young engineer tells how he accumulated a fat bankroll and took a career shortcut that put him miles ahead of people he graduated with.

At 31 years of age, Mike Erspamer, an electrical engineer with Aramco in Saudi Arabia, has saved $100,000.

Think of it. Thirty-one years old, six years out of college, lives in a well-furnished townhouse, drives a nice car, no big bills hanging over his head, and a hundred thousand saved.

How on earth has he done it?

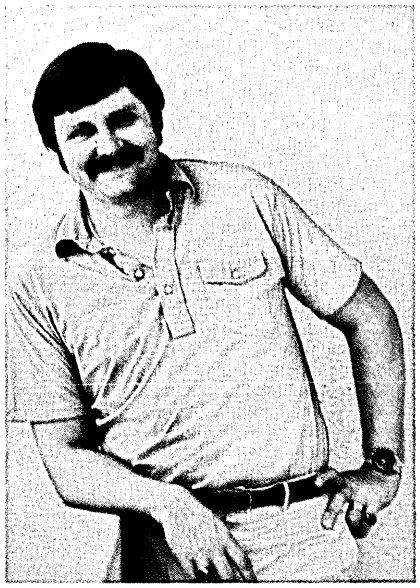
And Mike is not alone. Many of the young Aramco engineers he works with are doing as well.

How Mike saved $100,000

"Aramco pays me a base salary that's competitive with what I could expect in the States. But Aramco also pays employees in Saudi Arabia a *40 percent premium* on the first $30,000 of base pay and 20 percent premium on the next $20,000. That amounts to quite a chunk. And the clincher is this: The whole premium is tax-protected. If I want to, I can save it *all*."

Mike's saving will be even more productive now. After 60 months of service he became vested in Aramco's Savings Plan. Aramco adds 50 percent to the first 6 percent of salary saved. The contribution increases to 100 percent after 10 years of service.

And now new hires make even more. Today, newly hired employees for Aramco in Saudi Arabia receive a lump-sum, fully tax-protected Overseas Employment Bonus of as much as $5,000. A flying start on an already lucrative compensation plan.



Mike Erspamer is one of many young engineers working for Aramco in Saudi Arabia who have saved a sizable chunk of money in a very few years; and taken big strides in their careers at the same time.

Came for a tryout, decided to stay

"Obviously, Aramco's compensation package was excellent. Still, I wondered if it was really worth it," says Erspamer. "I had no idea what Saudi Arabia would be like.

"But there was no contract, no long-term commitment. So my wife and I decided to try it. If the life there wasn't to our liking, I could always quit and go home.

"We're still here after six years and planning to stay."

Today it's even easier for families to find out if they'll like Aramco in Saudi Arabia. There's a one-year tryout plan.

If you don't want to move your whole family over at once, come and work for us on "bachelor status" for one year. We'll fly you home three times so you can keep the family informed about your adjustment to life in Saudi Arabia. Then at year's end or sooner all of you can decide whether the life is for you or not.

It's a way to get firsthand experience of life in Saudi Arabia without committing the whole family to a move.

"Aramco put me in the spotlight right away"

When Mike Erspamer landed in Saudi Arabia, he got in on the ground floor of a multi*billion*-dollar gas gathering project. "The scope of the activity and the expenditures were incredible. Aramco immediately gave me more responsibilities than someone my age would be likely to get in the States."

Aramco has projects that are mind-boggling in size, complexity and cost, ranging from development of the world's largest onshore and offshore oilfields to construction of a vast electrical power system, and to the building of entire communities.

Aramco is simply too busy to waste young talent and give all the important projects to older hands. If you have skill and commitment,

Aramco has assignments to challenge that skill and commitment.

"I'm only 31, and I'm far ahead of my classmates," Erspamer says. "Maybe not in job title, but certainly in terms of professional growth. And financially, I'm well ahead of the game."

Vacations that most people can only daydream

Are the Erspamers living a Spartan life so they can pinch pennies? Hardly.

Like all Americans in Saudi Arabia, they get *40 days' paid vacation* every year. Plus about 12 paid holidays.

Vacation trips have taken Mike and his wife, Patti, to 15 different countries during their six years with the company. England, most of Europe, Turkey, Greece, including the fabulous Greek islands, and more.

They even get home to the States often. Aramco pays air fare for annual "repatriation" trips. And from Saudi Arabia, Aramco people travel easily to places they used to think of as "halfway around the world." Their idea of an outing for a long weekend is a trip to Egypt.

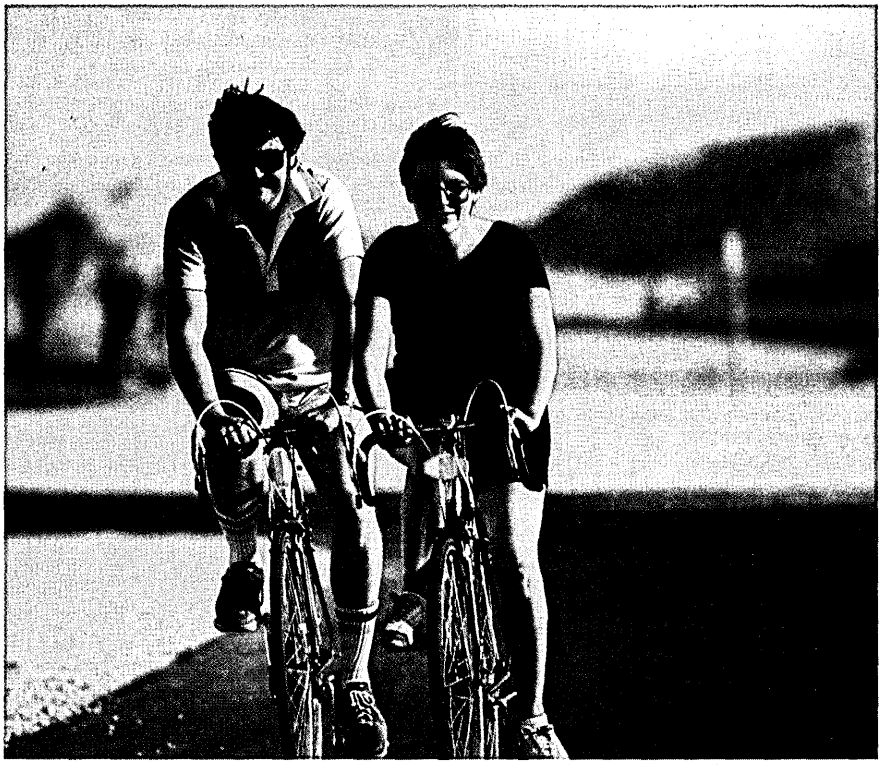
It's like a small American town in Saudi Arabia

The Erspamers live in Dhahran, an Aramco community. At first glance

The Erspamers live a comfortable, casual lifestyle. Their well-furnished townhouse is a carbon copy of a house in Arizona, Texas or California.

you could mistake the place for a small town in the U.S. Their townhouse is a carbon copy of a home in Texas or Southern California. On his way to work, Mike drives along treelined streets, past people tending their lawns and gardens (artificial irrigation, of course). A yellow school bus stops and picks up kids at the corner. It's hardly the picture many Americans see when they hear "Arabia."

In their free time, the Erspamers have an active social life with Aramco people from a dozen countries. There's plenty of golf, tennis, riding, every kind of water sport. There's even delayed NFL Football on TV.



There's an abundance of recreation for Aramco employees in Saudi Arabia: golf, tennis, water sports, bowling, jogging, camping, riding, and more.

First-rate schools and medical facilities

Mike and Patti don't have children. But for those who do, Aramco has an excellent school system in Saudi Arabia. Three-quarters of the teachers hold master's degrees. When our SAT scores were compared with a group of U.S. schools, we ranked with the top 25 percent.

The Aramco schools go through ninth grade. For older children, Aramco pays 80 percent of expenses for boarding schools in Europe or the U.S., up to $4,900 per student per year, and pays for trips to visit parents.

If somebody gets sick while in Saudi Arabia, the individual is covered by Aramco for *all* medical expenses, even prescriptions, which are incurred while in Aramco medical facilities. Our Dhahran hospital is one of only three hospitals outside the U.S. to be accredited by the Joint Commission on Accreditation of Hospitals.

Dental care is excellent but, unlike medical care, it is not free for Aramco employees.

Find out more about the Aramco head start

If you think you might be interested in following Mike Erspamer's example, give us a call. It's confidential and there's no commitment. We have openings for engineers in just about every discipline. Call (713) 750-6965 anytime. Or call toll-free, (800) 231-7577, Ext. 6965, Monday through Friday between 7 AM and 5 PM Central Time.

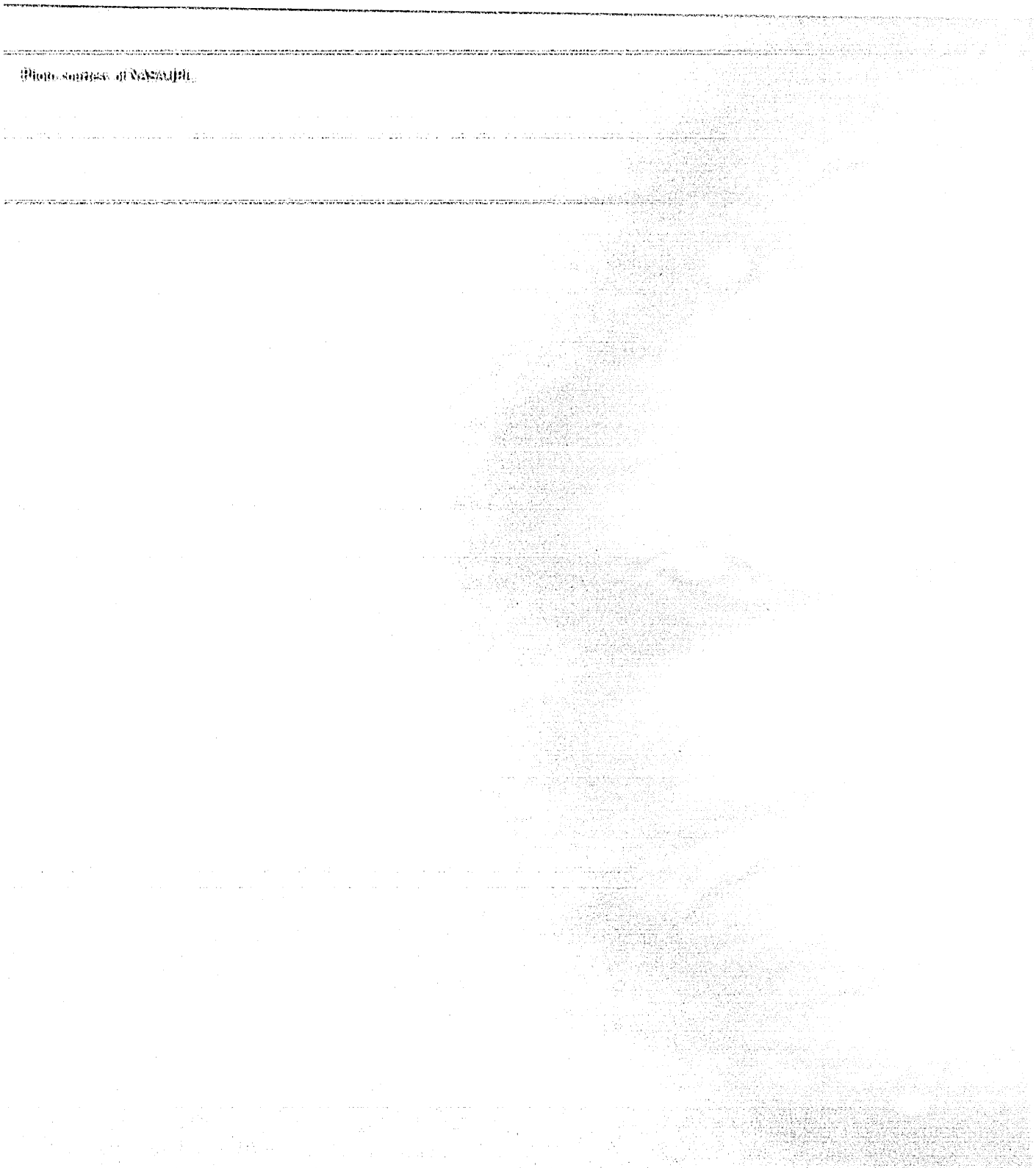
If you prefer, send your résumé or write for more information to: Aramco Services Company, Department DM0101MLO4A, 1100 Milam Building, Houston, Texas 77002.

Watch this publication for stories about other engineers who have taken a career shortcut with Aramco in Saudi Arabia.

ARAMCO
SERVICES COMPANY

CIRCLE 15 ON READER CARD

Photo courtesy of NASA/JPL



The only limitations a

Computer Sciences Corporation believes that [illegible] of, they can even [illegible] solve. The only limitation is the sophistica- [illegible] That belief has involved us in [illegible] of the world's most difficult problems and [illegible] of its most astonishing accomplishments.

It has also made CSC the world's largest information services company. [illegible] hardly anyone knows [illegible]

As NASA's computing partner, CSC has [illegible] oped programs and [illegible] processing for the missions [illegible] earth and explored the solar system.

he ones you bring with you.

By integrating the technologies of software, communications and hardware, we are continuously advancing the techniques of problem solving.

CSC is developing the capacity of history's most profound tool, the computer, to change man's relationship with everything he has ever known.

We're looking for challenge. Maybe you'd like to help us. If you think you're good, and you're not afraid to find out how good you really are, you should be in touch with Computer Sciences Corporation. We're looking for people who are not afraid to try anything.

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Meet the first family of compatible computers.

The Prime 50 Series is the first family of 32-bit computers to feature total compatibility. It's a unique feature. And if you intend to grow, you won't want to be without it.

No growing pains. Compatibility is a word we don't use loosely. It applies across the line to every computer system we make.

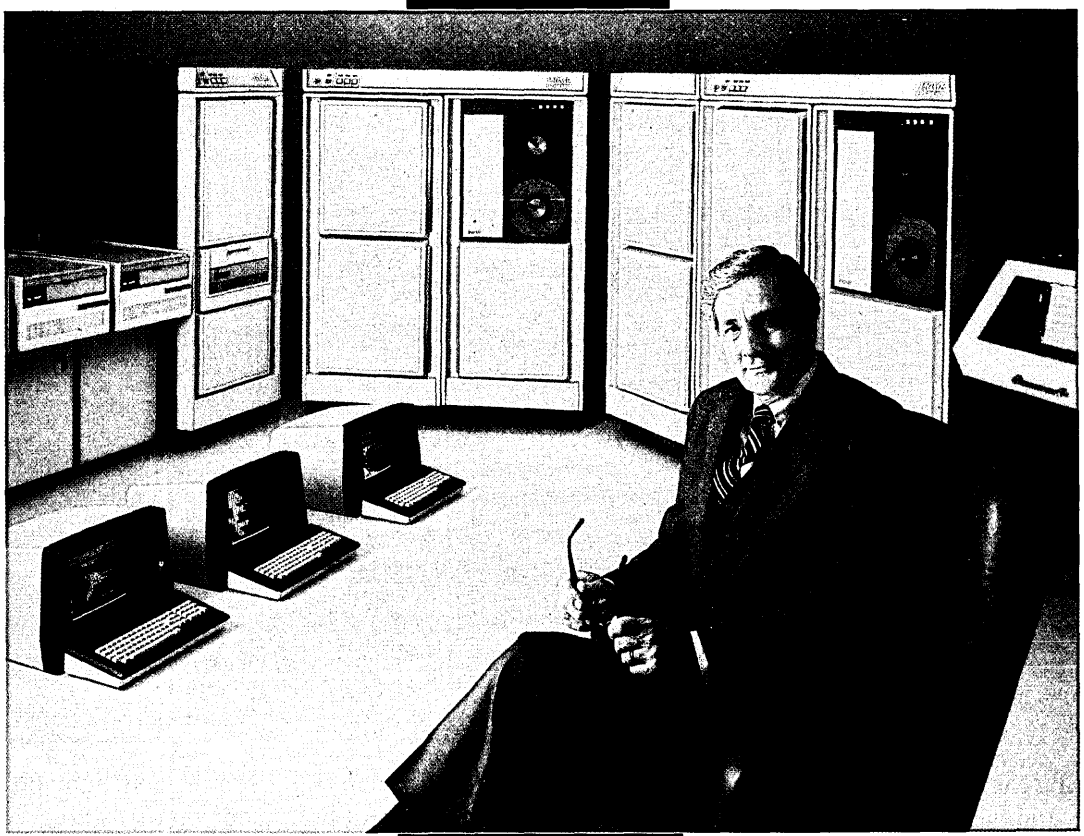
In fact, all Prime computers use the same operating system, the same file structure, and the same communication system. So no matter what level system you start with, you can easily and economically expand capacity by upgrading your current system or adding another member of the family.

First and foremost. Prime means first. And we've had a lot of them. We were first with a family of compatible 32-bit computers. First to put mainframe capabilities – like large on-line disk storage and DBMS – on a mini. First with a single operating system and a common file structure across an entire product line. First with virtual memory on a mini. And first to open an X.25 transatlantic communications link.

At Prime, being first has become a habit.

Meet the family. In a time when the relationship between price and performance has become vitally important, you should make it a point to meet our family. In the U.S., write Prime Park, MS 15-60, Natick, Massachusetts 01760. In Europe, write Prime Europe, 6 Lampton Road, Hounslow, Middlesex, TW3 1JL, England, Tel: 01-570-8555.

PRIME
Computer



CIRCLE 17 ON READER CARD

LETTERS

RELATIONAL DBMS

Re: "Implementing Relational Data Bases" (Oct., p.161), Major Barnhardt's article was informative and his explanation of relational terminology is basically correct. However, a column down a table cannot be an attribute or a domain as he infers. Rather, it can only be a domain.

An attribute is equivalent to a field or data-item; it can be a column of information. In relational mathematics, a domain is a set of values; for example, an attribute will be the state of residence. The domain then would be the names of the 50 states.

I was also surprised by his erroneous statement about the current lack of commercial DBMS that implement the relational model. Some current relational database systems are Honeywell's MULTICS, which has been used since mid-1970s and supports MIDS (Multics Integrated Data Store), a network database using a subset of the CODASYL standard and MRDS (Multics Relational Data Store); Relational Software, Inc.'s ORACLE; National CSS' NOMAD; Condor Computer Corp's. Relational Data Base Management for Z80 microcomputers; and System R, IBM's relational database system not yet been released as a product.

THOMAS W. BILODEAU
Programmer Analyst
P.R.C.
McLean, Virginia

AND/ORR

Re: "Systems Analysis: Key to the Future" (Oct., p.145), although an interesting comparison of systems analysis techniques, Mr. Townsend's article completely misses what some consider the critical methodology for the '80s, that of data structured analysis. Possibly this assumption that "we will address here only the most popular techniques" leads him to leave out the work of Warnier, Orr, and Jackson. But popular where? Warnier's "logical construction of systems" may not be "popular" (yet) in the U.S., but his work is a major force in France, Italy, Spain, French-speaking Africa, portions of South America, Japan, and other portions of Asia. Possibly more analysts worldwide have been trained in this methodology than any other. Some of the basic problems with the data flow techniques mentioned in the article (i.e., control decisions) are explicitly addressed by Ken Orr's recent work. One *real* problem, from a practitioner's viewpoint, is that with most data flow approaches, the objectives or "output" from the analysis effort is unspecific. One cannot answer the question "when are we through?" Here again, Warnier and Orr seem to have better answers—not all the answers of course, but better answers.

JIM HIGHSMITH
Systems and Programming Manager
Oglethorpe Power Corp.
Atlanta, Georgia

Dwight Townsend replies: According to the criteria published on p. 148, col. 3, you qualify as a "well-read systems analyst" since you are familiar with the work of Warnier, Orr, and Jackson. I appreciate your letter since it gives me the opportunity to comment once again on the state of systems analysis techniques. Some concentrate on the process to the exclusion of data. Others concentrate on data almost to the exclusion of process. None of them adequately treat the externals to the automated processes such as organization, controls, decision making, and cost accounting. The purpose of the article was to indicate this unbalance. I have the names of about 100 authors in systems analysis, all of whom are unbalanced in one way or another.

MAKING PAYMENTS

Re: "Going Global"(Sept., p. 130), I believe there was an error in the short discussion of the Foreign Corrupt Practices Act. This act does not prohibit "facilitating" payments. These are payments which, in effect, expedite execution of an already approved action by the foreign government. In the example of the customs clearance cited in the article, a payment to the official to speed the removal of a cargo from a port would be a facilitating payment.

The act is aimed at preventing illegal payments to government officials in order to influence their decisions, in the payer's favor, concerning the allocation of national resources. Clearly facilitating payments which have only the effects of causing low ranking employees to do their appointed duties do not meet the criteria of the act; they do not cause the allocation of budgetary or other resources.

The other area of concern in illegal payments situations are the requirements of the Securities and Exchange Commission for disclosure. In cases similar to that cited, it is highly improbable that such a "bribe" would be sufficiently material as to warrant disclosure in a publicly held firm's financial statements. On the other hand, failure to make a facilitating payment could result in a material loss to the firm.

RICHARD G. ROBINSON
International Management Consultants
Colorado Springs, Colorado

We were correct in saying that payoffs, *that is* bribes, *are illegal under the Foreign Corrupt Practices Act (FCPA). We were not talking about "facilitating payments" referred to by Mr. Robinson.—Ed.*

CLARIFICATION

Re: "Amdahl Plus Amdahl," (News in Perspective, Oct., p.67), the headline and important omissions have caused readers to think that I am an employee of ACSYS.

The fact is that I am an executive vice president of Advanced Technology and Development, a member of the board of directors, and one of the founders of Magnuson Computer Systems.

Furthermore, I have recently renewed my employment contract, reaffirming my commitment to Magnuson. My association with ACSYS is as a director and consultant with Magnuson's approval.

I was part of the team which devised our strategic architecture concept, a unique, modular computer technology that enabled Magnuson Systems to be fully hardware and software compatible with IBM, field upgradable, and the leading competitor in the 4300 marketplace.

CARL AMDAHL
Magnuson Computer Systems
San Jose, California

BOTTOMS UP

Re: "The Architects of Systems Design" and "Probing Productivity" (Sept., pp. 201,207), Dr. Tsichritzis makes a start in the right direction, but he doesn't go far enough. He's certainly correct about taking an architectural view, but it still comes out

more of a bottoms-up technologist's approach. You can look at systems either with a top-down architectural view or a bottoms-up technologist's view. Our educational systems, unfortunately, concentrate on the bottoms-up approach because it makes teaching easier. Also, unfortunately, it leads to ineffective, unnecessarily complex kludges called systems. It leads to statements like Dr. Tsichritzis made, "One of the first steps the architect has to consider is the acquisition of the basic hardware. . . ." Too few comprehend how this premature look at hardware unnecessarily constrains effective systems designs. A great deal of homework must be completed before any types of hardware or software alternatives are considered.

All systems are comprised of two basic elements: functions and structure. Functions are basically what must be accomplished and structure is how the functions will be carried out. Hardware (or software) technologists emerging from our educational systems with the typical bottoms-up orientation have never been taught the difference, cannot believe that a whole system can be designed end-to-end without ever once considering the structure (hardware or software), and are so impatient to get on to the physical system aspects that they gloss over the front-end system analysis where the die is really cast.

Robert L. Patrick is definitely on the right track. Any organization is fundamentally as much of a system as a computer system when both are viewed as totally integrated systems. Both contain the same basic elements; only the emphasis shifts, depending on the system under scrutiny. When you really dig into any ongoing organization, you find it is characteristically a bottoms-up implementation that has grown like Topsy through a series of patch jobs, add-ons, reorganizations, etc. I have yet to see one organization that has purposely set forth a set of social objectives which greatly influence organizational system design.

Raising productivity is simple if the management and organizational design support it. As Alvin Toffler said, in the same issue, you won't achieve it with "more of the same" of the second wave philosophies. The means are readily available now, but require a change in attitude and an objective look at the ineffective outcome of today's vested interests.

WARREN EBERSPACHER
Von Eberspach Associates
Durango, Colorado

ARWRITERSGOOF

Re: "No Clean Desks" (Sept., p. 224), a small point of correction is necessary in the interpretation of the term "Witwatersrand". As explained by a local geologist, the term means the "white watershed" in Afrikaans, and is derived from the whiteness lent to the ridge by the white quartzite rocks. Far from being a gold reef off South Africa's shores, the Witwatersrand is several hundred miles from the sea and several thousand feet above sea level.

CLAIRE M. WALKER
Librarian
Gold Fields of South Africa, Ltd.
Johannesburg, Republic of South Africa

DISTRIBUTED PAYOFFS

Re: "Does Distributed Processing Pay Off?" (Sept., p. 192), the article is of service in that it points out the necessity for clear and comprehensive planning and cost benefit analysis; however, it is extremely skewed against a distributed processing alternative both in tone and content. It is not surprising that representatives of service bureaus and others who are shackled with extremely large, complex, and costly computer systems must overstate their case against "mini" or distributed solutions. Certainly an analysis which compares the sum of purchase price and hardware maintenance to the fully burdened cost of a central computer facility is ridiculously inadequate; however, the scenario and the cost outlined in the article paint a most dismal picture. Some examples:

1. The costing is for a relatively expensive IBM 4331 with "some" 3370 disks. Talk follows of a programmer who is inexperienced with minis--"hasn't had much experience at anything." You get what you pay for! A large central computer facility must also pay for inexperienced staff, the continuous training of its staff, and those costs related to turnover. Also, is the 4331 a "mini"—I am managing a client engagement which included the installation of a 4331 as a central solution. Staff retraining was not a significant cost. Applications programmers needed virtually no retraining.

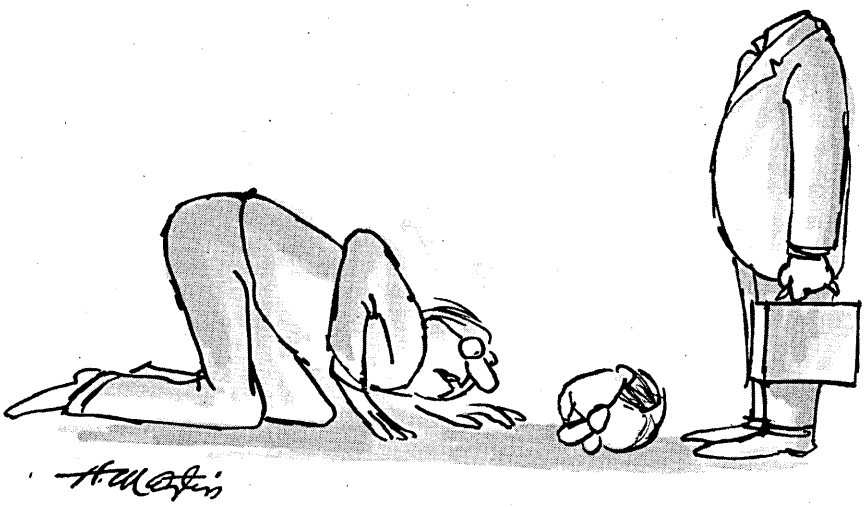
2. "The central facility has absolutely no interest in the project's success." A data processing or information resources department manager who cannot fully support (on a reimbursed basis) both central solutions and individual or distributed solutions should keep a fresh resume handy lest his boss uncover this gross inadequacy. Local management should be able to turn to the dp department and "buy" whatever project management and programming talents it needs. If the dp department is at capacity, experienced consultants abound.

3. "No operators?" It is rather extreme to assume that the need for operators, if any, would go unnoticed until installation. Certainly the cost of required operators is part of the analysis, but to burden "local highly salaried personnel" is hardly justified.

4. No properly managed project and no adequate manager will desperately elect to order "a hodgepodge of additional equipment." Cost is *always* an object.

5. The numbers used in the complete analysis tend toward the high side. Rather than dwell on their accuracy let us look at other specifics: (A) What of the tax benefit from investment tax credit and depreciation? (B) Is a five-year useful life accurate in general, and specifically for modifications to building? (C) What of other applications taking advantage of this significant computer resource?

6. In the block labeled "Counting the cost," an open-ended question is raised: what size for the "typical business application"? That is like asking how long should a ladder be; it depends on the application(s). The sort of limitations of certain configurations are well taken, but then this, too, becomes a selection and design criterion. Are we trying to combine the capabilities of the TRS-80 with the costs of a 4331?



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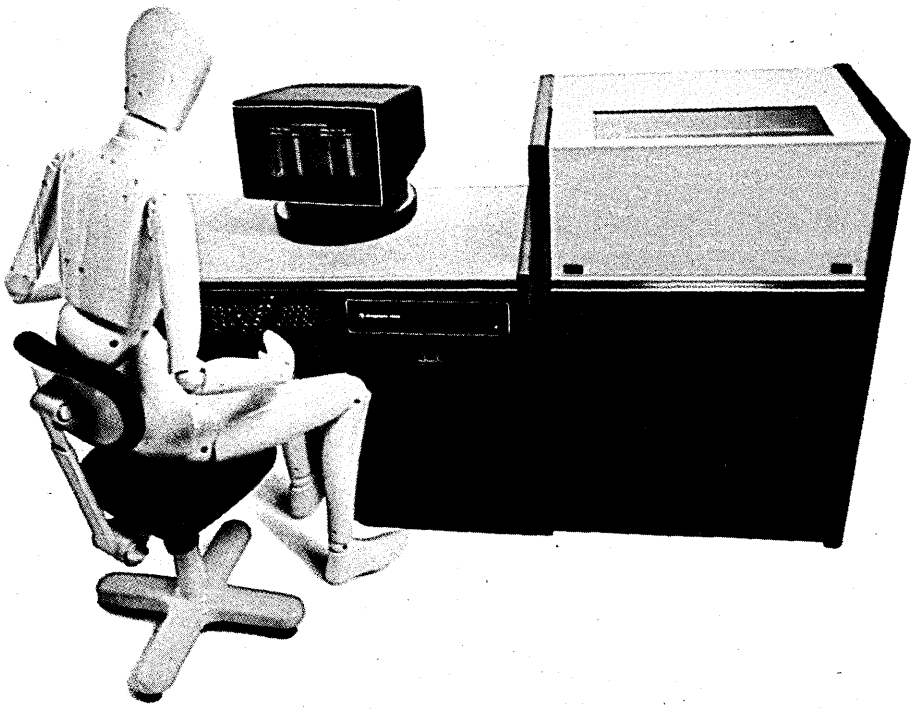

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LETTERS

Centralized solutions, service bureaus, time-sharing, distributed processing, and minicomputers all have their place for various applications. The point is well taken that proper costs benefit analysis is required and sound project management is necessary. Mr. Sullivan seems to overstate his case, detailing the dreariest of scenarios with inexperienced, perhaps comically inadequate, management.

CARL A. SINGER
Senior Associate
Kroll Management, Inc.
Radnor, Pennsylvania

CORRECTIONS

Re: "How SBS Service Stacks Up," (News in Perspective, Oct., p.54), the factual errors are numerous:

- Access lines to SBS earth stations can be any length but generally will be shorter than 100 miles because this permits SBS to provide the most economic network solution for its customers.
- Both of SBS's network offerings have off-net extensions, but with CNS-A the off-net lines are dedicated, while with CNS-B they are shared.
- SBS offers optional features and equipment to improve standard service availability and BERs. The article compared SBS's basic service to a competitor's optional service.
- SBS offers larger antennas as well as alternate routing as solutions to rain attenuation in the 12/14 gHz bands, not just diverse-site earth stations.
- Freeze-frame video, not just full-motion, is in SBS's offering and was publicly demonstrated by SBS as long as three years ago.
- SBS does not require customers "to switch totally" to SBS services.
- SBS users can obtain overseas extensions from other carriers.

And so on. In addition to quoting Mr. Engel out of context, the article misspelled his name. Further, for something to compare SBS to, the author arbitrarily picked a carrier offering point-to-point data while SBS offers integrated service including switched voice. It's an apples-to-oranges comparison.

LAWRENCE A. WEEKLEY
Manager of Public Affairs
Satellite Business Systems
McLean, Virginia

We intended to delineate an alternative to SBS-type services. The SBS features discussed were based on those stressed in the company's documents and mentioned in the on-site interview. Figures such as the SBS bit error rate were taken from SBS documents and then verified with the company. The service comparison was written from the user's perspective, was carefully researched, and did not distort the data released by each carrier.—Ed.

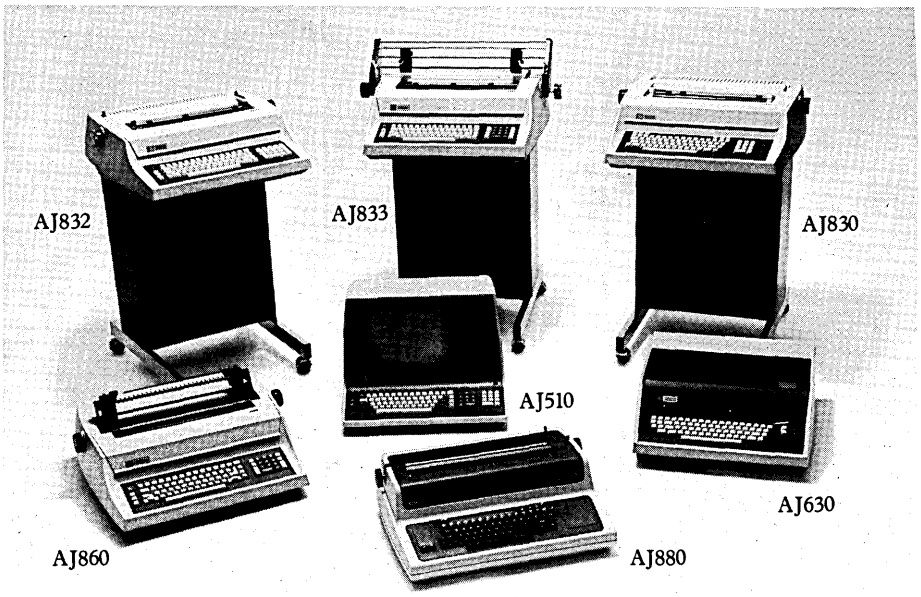
Re: Manufacturing Survey (Oct., p.125), on FORMAN, our manufacturing resource planning system, the software cost is $30K, not $130K as shown in the table. A typical FORMAN system would cost $30,000 for software and $100,000 for hardware.

GEORGE KOLESAR
Product Manager
Formation, Inc.
Mt. Laurel, New Jersey

The article omitted our net change accounting and manufacturing system, MAP/3000. The accounting and manufacturing modules are priced at $56,000 in source code. The system was designed to use the architecture and design of the HP-3000 and was introduced in February 1980. We now have 27 international users.

J.A. LAZZARRO
Vice President
Intertec Diversified Systems, Inc.
Palo Alto, California

We erred in identifying the executives of Apollo Computer in the photo that accompanied the story "Apollo Is Launched" (News In Perspective, Nov., p. 44). From left to right, the gentlemen are Gerald Stanley, Bill Poduska, and David Nelson.—Ed.



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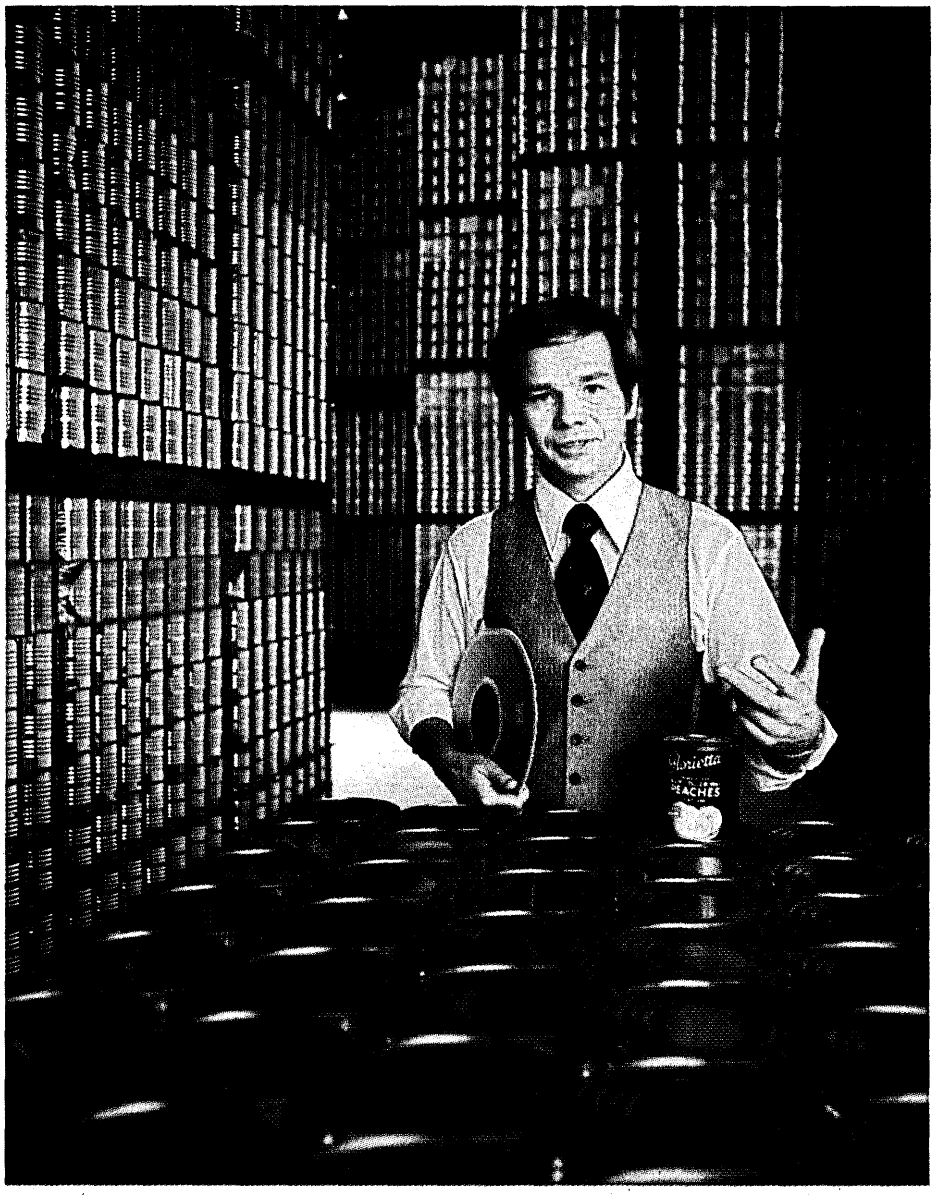

Bob Scully, Marketing Manager
Glorietta Foods, San Jose, CA

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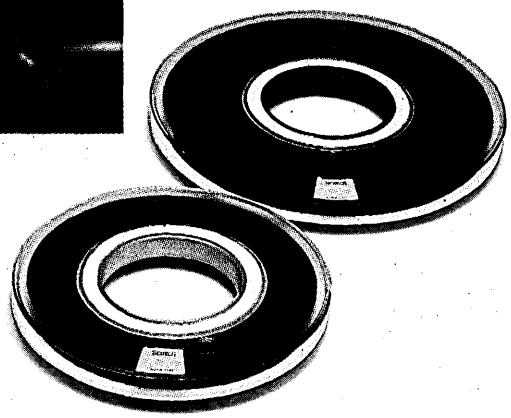

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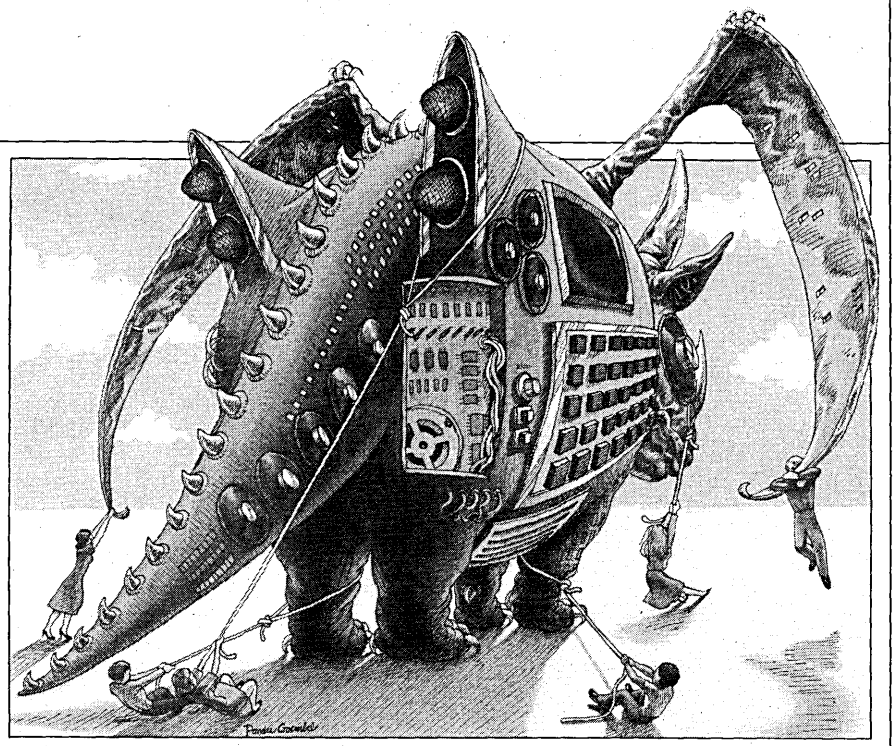
John L. Kirkley, Editor

EDITOR'S READOUT



THE LONG GOODBYE

Like the man who came to dinner, IBM's operating systems have been with us far too long.

When OS/360 and DOS/360 were introduced nearly two decades ago, they were well-intentioned and relatively simple chunks of software that ran the machines and left a modicum of memory for an application or two.

But as the years went by and the programmers worked their perverse magic, the systems began to accrete layers like a coral reef. Unlike the reef, the systems did not become things of beauty, but rather, in the words of one of our advisors, they turned into "a bloated monster." In fact, we are reaching the point where the cost of renting various pieces of unbundled systems software designed to make the machine run faster can exceed the machine rental itself.

The keepers of this beast, the collective siblings of OS/360, are the systems programmers, a separate elite anointed with higher pay scales than applications programmers and possessing an arcane knowledge bordering on the metaphysical.

As these keepers of the flame added each new bell and whistle to the operating systems, we began to see a curious and deadening phenomenon that has afflicted other industries in this country. Take the automobile industry, for example. Early on we opted for the internal combustion engine, and not long afterward for the chromed, overweight gas guzzler that reached its apogee of dubious splendor in the early '60s, when fins sprouted like pterodactyl wings and ornamentation bloomed like metal fungus over every available inch. Today we are living to rue those decisions.

The Germans and the Japanese had the good fortune to lose the war and relaunch many of their industries stripped clean of the ancient structures that plague our auto and steel factories. But neither they nor any other country involved in using or building computers has escaped the dinosaurian evolution of the operating system.

Billions of dollars are invested in these systems by corporations all over the world. The idea of a massive conversion—traumatic enough in the simpler days when the 360 was introduced—is viewed by users with the same fondness they reserve for the bubonic plague or Con Edison brownouts. Superficially, it would appear that we are forever stuck with OS/360 as it wends its bloated way, trailing initials in its path.

But, not so. We have, as one of our advisors so ebulliently put it, "the chance of the century" to fix this mess.

He postulates that there is a trend among IBM and other major vendors toward finding ways to decompose these convoluted operating systems and to put the liberated chunks into microcode. This conversion, this taming of the monster by creative dismemberment, will be happening over the next five to eight years.

During this time, those of us in the computer industry will have the opportunity, if we act in a concerted way, to standardize these modules . . . the COBOL, FORTRAN, and back-end processors, the various security levels, operator interface languages, and the like. And, in fact, the Bureau of Standards is already investigating this possibility.

To help matters along, in the near future we plan to assemble a panel of experts from our executive user panel and have them chew mightily on this issue. We'll publish the results of their discussions and invite comment from all our readers.

We also propose that a national conference be called to thoroughly air the topic in papers and panel discussions. Although it is outside our purview to organize such a conference, we would certainly support it in the pages of this magazine.

A conference such as this could provide the impetus to lead us out of a 16-year rut. It could be a first step, a call to action.

For after all, antiquated operating systems, like house guests that have worn out their welcome, must eventually pack their bags and be on their way. Or to quote a bit of early 20th century doggerel, "Thrice blessed are our friends: they come, they stay,/ And presently they go away." It is time for OS/360, and all its kith and kin, to be gone. ✻

ILLUSTRATION BY PONDER GOEMBEL

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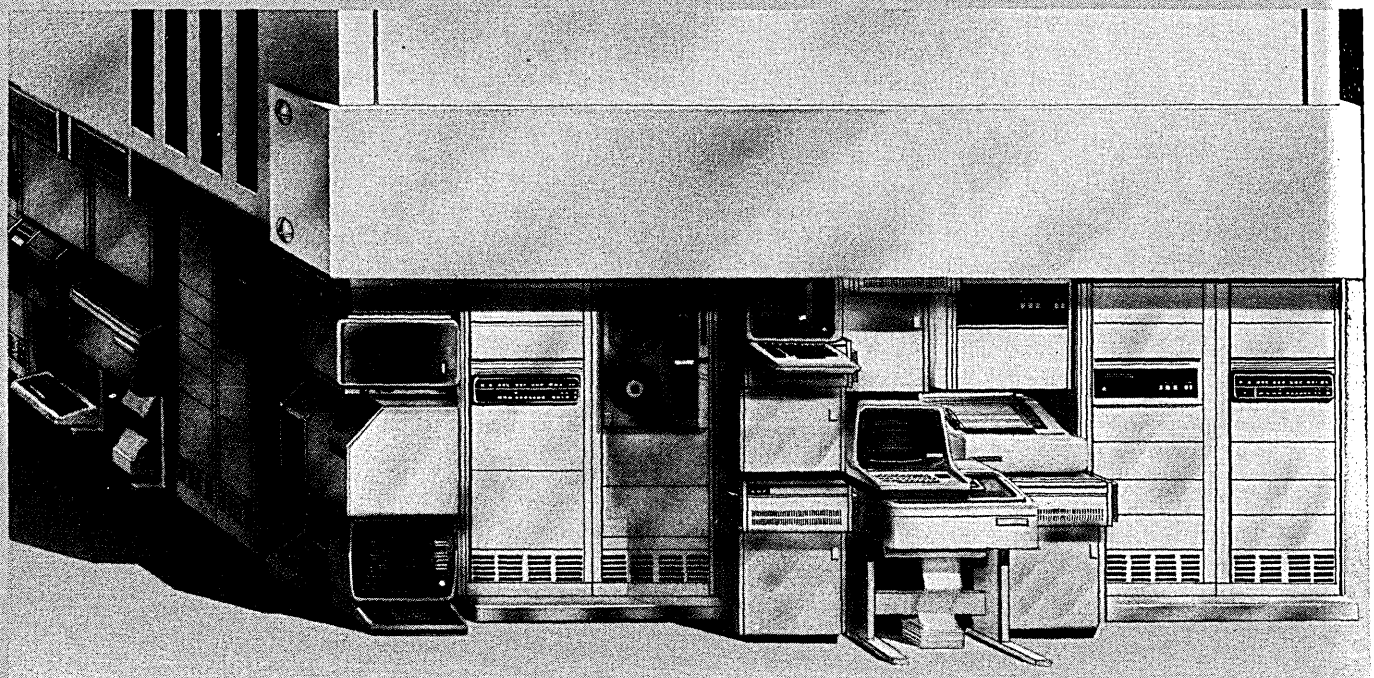

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CIRCLE 26 ON READER CARD

IN FOCUS

OFFICE POLITICS

Paying attention to gossip and trivia can help people in the career climb.

Bitch, bitch, bitch. That's one of the major activities of people who work.

Complaints range from the question of who gets to sit near a window to who gets the most creative assignments. Some grievances are justifiable, and involve things over which the staff has no control. Some are the grumblings of envy over the perceived favoritism bestowed upon others. Most situations combine a bit of both.

Hal, who runs a West Coast systems software house that does "dp programming, consulting, and occasionally, floors and windows," says, "Who gets assigned to maintenance jobs versus who gets to do new development work is a hot, touchy question. Also, what happens when management brings in contract programmers and they get the plum assignments, while the regular staff gets the crud jobs? That also involves the pay scale. When they hear that the contractors are getting $30 an hour, which is over $60,000 a year, what happens to the organization's morale?"

A disgruntled programmer says, "There's a sharp division between programmers using the application languages, like COBOL, versus systems programmers. The systems programmers think of themselves as being on a higher level. Their title sounds better, and they get to do more interesting work. As a result, there's often a polarization within the installation, where these two groups don't really talk to each other."

The effect a company decision might have on staffers' careers is also a pertinent consideration. For example, as Hal says, "The choice of equipment is important when what most of the people are looking at is their career paths. Often that path doesn't necessarily involve the current employer.

"What the programming staff looks at is how marketable they're going to be as a result of the work they're currently doing. So if management decides they're going to bring in non-IBM, strange-manufactured compatible minis and put them in every user department—as happened at the Bank of America out here, when it brought in Computer Automation minis in little clusters—people get uptight because they think they're losing their marketability. They feel that their career paths are shortened significantly because nobody in the real world will give a damn that they were using a peculiar little machine.

"Or for that matter, an internal language. Standard Oil of California has developed its own PL/1 derivative. As a result of that management decision, while the productivity of the individual is significantly enhanced, they have about 200 man-years of work that they can't get to because they have no additional source they can call upon. The programmers don't flock there because they have to learn a specialized approach to a not-too-widely-used language. They feel, 'Gee, so what—now that I have that and I'm not going to become president of Standard Oil, what am I going to do?' In that sense, there's a direct effect on the staff, based upon what management chooses for language, technique, and machine selection."

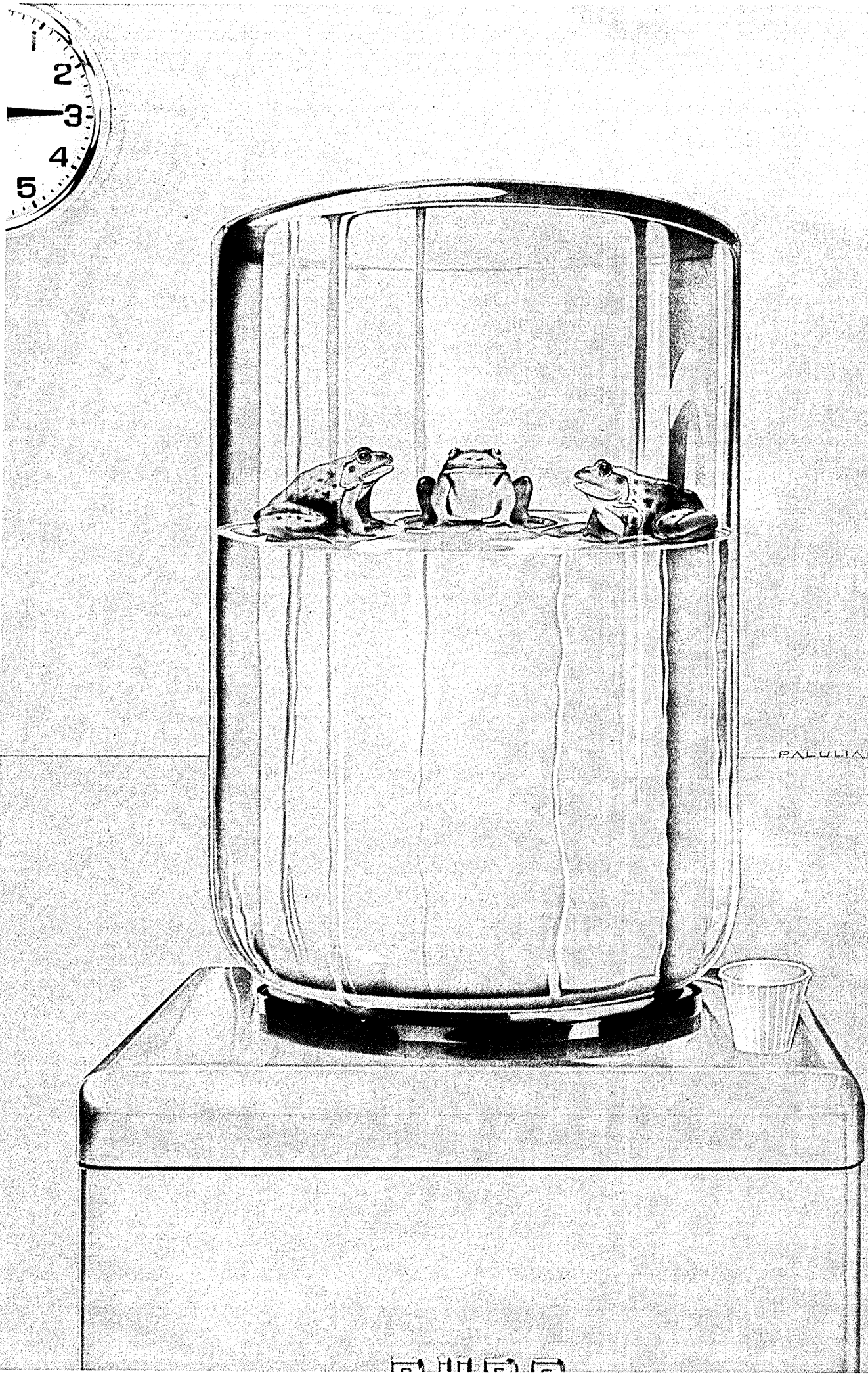
A manager at a Midwest insurance dp installation brings up another upsetting career hurdle for programmers, saying, "Programmers sometimes feel frustrated when they're looked upon as coders or computer experts when often they have a much broader range of skills than that. They might consider themselves professional business problem-solvers, able to apply technology or a systems solution to a systems problem. But if you ask users what a programmer is, they'll say, 'The person that codes instructions to make the computer work.' There's a tremendous difference between those two things. That's a problem.

"The result of that distinction is that the job opportunities programmers want might not be open to them. Very often, I think, they would like to get experience in other parts of the company and then get back into the systems function or perhaps move up in the operational areas of the company. But they're never considered for opportunities outside of systems. They usually have a unique view of how the systems and functions of a company all fit together, because often they're responsible for integrating those functions. But that's not capitalized on."

Everyone has his own bit of turf, and heaven help those who try to take it away.

A rather frightening source of trouble to a person's future, usually a person in management, comes from vendor influence in companies that use their equipment. Though sources fell all over themselves ascertaining anonymity for their comments on this subject, they stated firmly that it happens. One independent consultant says, "It goes without saying that vendor influence exists on a very high level. It depends upon how strong the dp person is in that organization. Traditionally, he hasn't been all that strong. If the dp person is high placed in the organization, I think he can dismiss vendor interference with a wave of his hand. If not, it can be a nightmare. IBM has a track record of being ruthless. I think you'll see Univac acting that way—it doesn't lobby

ILLUSTRATION BY DICKRAN PALULIAN


PALULIAN

behind the scenes, but it spends a lot of time and money in it . . . account purchasers, if you will. IBM is the one that's famous for interference because its corporate philosophy is to deal with the top echelons of the corporation. Most of the scare stories are, for example, when some vp decides IBM isn't quite the right machine for them and unhooks it. We've seen IBM go to work and displace people."

Perhaps the one area that's most sensitive to installation politics is territory. Everyone has his own bit of turf and heaven help those who try to take it away. Bob, a consultant who's come through the ranks of large installations around the country, says, "When I worked at General Motors 25 years ago, I had more vigor than I had things to keep me busy. So I frequently did things that needed to be done—and found myself in trouble because I'd violated some territorial imperative that I was insensitive to, and in so doing, had embarrassed the owner of the territory. Here I'd discovered a latent job and I had inadvertently shown him up."

An observer of the computer industry in the Pacific Northwest tells about another violation of territory. "What I've seen consistently in the larger dp environments is a trend toward having minis come in for discrete applications—a lot of dp people are really fighting that tooth and nail, and doing some hard lobbying to keep requests for any kind of dp equipment coming through their department so they can kill this sort of thing. They're against it because it's harmful to their own budgets. If they can keep all that stuff coming through them, then they have budget clout.

"Typically, this goes on around here in banks. A mini guy comes in and says, 'Oh, you can do this task for oh, God, some ridiculously low number of dollars.' So the exec says it sounds like a great idea and he approaches somebody to get authorization. The dp guy gets wind of it and jumps on it like a ton of bricks and wants it to come through his office. At which point it does, and he says, 'No, that's gonna require three or four or five man-months of programming time; therefore, I need to allocate this many funds to get this job done.' He just doesn't want any dp activity going on outside his purview. It's a pain in the neck.

Office politics has its seamy, deleterious side, where no-talent people are vying for position or favor.

"The bigger and more enlightened companies have been buying minis for their various departments just like a smaller company would buy adding machines. The politics the top dp people are trying to slap on it has been a setback; a lot of tasks that have been put on a 370 are very cost-ineffective—they don't require interfacing to the central database—but the dp guys are putting the kibosh on the minis."

Another manager agrees with this assessment, saying, "Often, minis come into a company because users are frustrated with waiting for the corporate group to act. So minis are brought in to accomplish a specific function, although it might not fit in the long-term goals of the information systems group's strategic plan. Someone mentioned to me the other day that his company got 50 minis and he didn't even know about it until after they were installed. He went nuts."

He also deplores a related problem: "Another explosive issue in most large companies right now is, 'Who is responsible for the word/text processing function?' Historically, there's been a word processing center, but all of a sudden the office of the future arrives and everyone wants to get in on the act. The administrative people who were responsible for word processing want to retain that responsibility. The dp function now wants it as it goes into areas of systems processing."

A systems programmer feels that people own bits of territory for a reason, and hates to see what happens once one of his projects gets out of his hands. "It gets blown up all out of proportion in committee," he claims. "What happens is a few other company people throw in their requests and you get some huge COBOL program that writes the same report six times because nobody wants to get a second copy. There's inevitably a distortion if you put things in a committee and take responsibility away from the people who really know how to do the job. Computers are very sensitive to that process." Not to mention systems programmers.

It's also clear that the top dp person really sets the tone for the whole installation. A vp of MIS says, "The guy at the vp level decides upon the computer's direction: is it simply going to be a financial machine or are we going to try to do some other things? If the chief dp guy is a financial officer, usually it's not a terribly aggressive organization.

"Generally speaking, at the lower levels they're all having their little plots and wondering how much they're gonna get paid, but what really matters in that environment is who that vice president is dealing with and what kind of clout he has in the company. If he's kind of a chief petty officer type, there's gonna be trouble. A lot of politicking, polarization, not much freedom or flexibility. He'll try to run too tight a ship. If he came out of operations, has a lot of respect, was a lineman for years, or whatever, chances are it'll be a good installation."

Getting to the meaty stuff, the carping over who gets treated better than whom, what you think Joe Blow meant by that look he gave you, and what conversation fragment you overheard as you walked by the manager's office and did he mean *you*? . . . well, that can be unsettling, to say the least.

The head of dp for a large aircraft manufacturer says, "Everybody figures out things about his situation which justify an assessment of his own worth as higher than someone else's. There are many people who spend a lot of time wondering and trying to account for perceived motivation,

"Sir, I don't think I can take much more of this interoffice rivalry."

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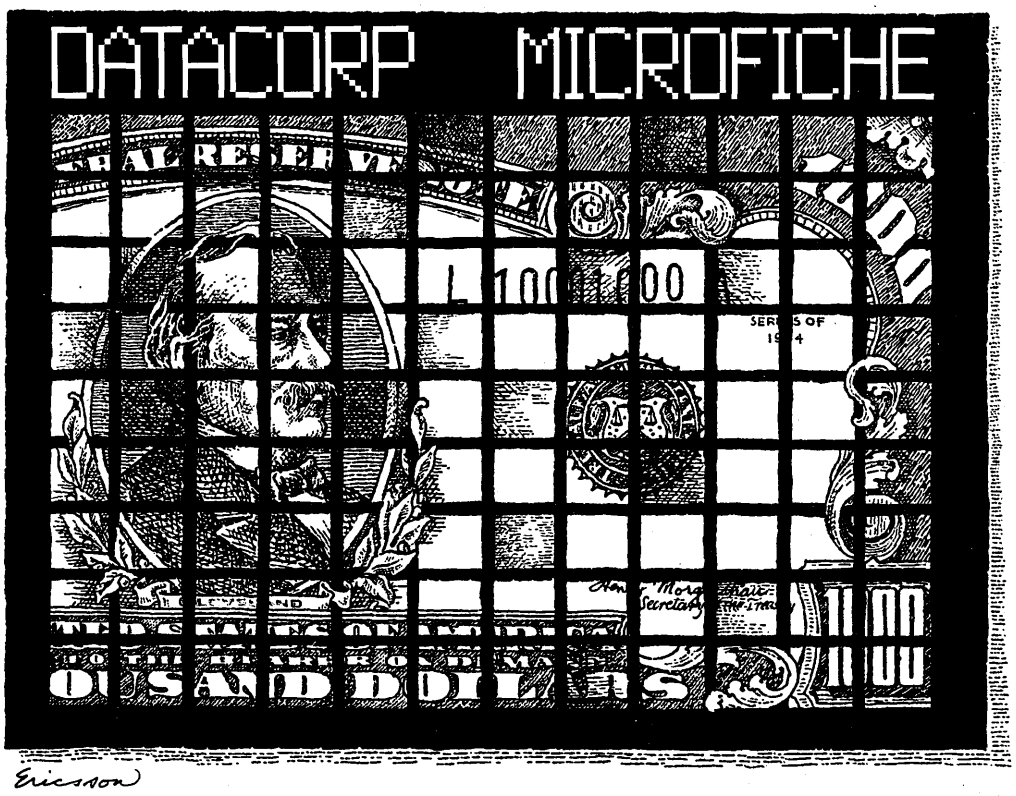

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CIRCLE 27 ON READER CARD

and it's a waste of time. There are people who do or don't do things because of something they *think* I said or *think* I thought. People take dimly seen actions, and develop an elaborate motivational theory to account for that action, and then apply that theory to a new event—and they almost always miss."

Some managers put down the petty jealousies over who gets the best parking space and the sharpest pencils. One says, "It's like a hangnail. It's really trivial in the overall scheme of things. You ought to be driving a car and not worrying about your hangnail, but once you discover it, you're obsessed, and you don't see someone cross the street in front of your car. You slam your brakes and someone hits your car in the rear, all because you could not separate the trivial from the important. That happens in office politics all the time."

Another manager says disdainfully, "There's a certain sort of person who reads a tremendous amount of significance into superficial things. The people who get things done don't pay any attention to all that baloney. Those that do, don't deserve to be listened to."

Wrong! First, the above person could not have risen to his current position without engaging in quite a bit of politicking himself. Second, paying attention to all that baloney, and baloney of greater import, actually helps you in the career climb, if you know how to use your observations constructively. A sage dper we know explains: "There are stages of growth in every organism. The world is as complex today as it will be in 25 years.

"At first, a kid out of college goes to work in industry and is a babe in the woods as far as office politics go. You've got good health, you don't care about retirement plans or pensions. You go to work to get the bread to support your lifestyle.

The carping over who gets treated better than whom can be unsettling, to say the least.

"Sometime after you've worked maybe seven or eight years, you observe that two people who seem to be evenly matched in most of the important job characteristics are unevenly promoted—one tends to pull ahead of the other one. He gets promotions or better assignments or goes on company trips or whatever. That's your awakening to office politics.

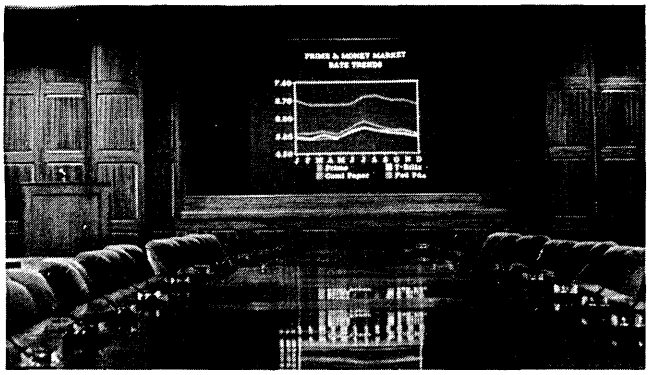
"At that time you discover you can't just *do* good work, you have to present it well. Or you've got to find a mentor above you to help you over the rapids and the rough spots because you blunder from time to time. Or you alienate somebody by accident. And you start to learn that there's something more than your technical contribution that's important to your progress.

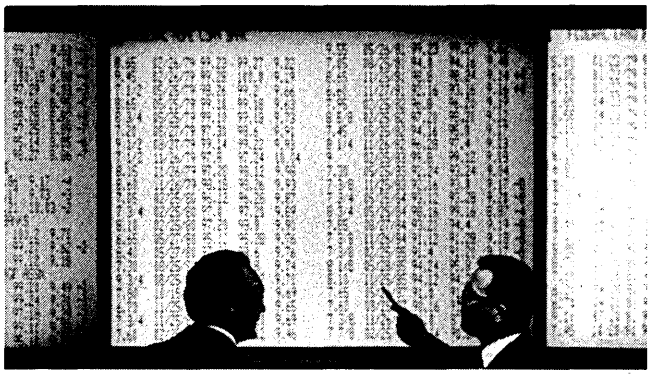
"There are people who never achieve that state of awareness and these people blunder through life. They're called technicians. And we call them technicians disparagingly. Especially if they're 40 rather than 20.

"The second thing you do is turn yourself into an observer. You don't do anything, you watch. After you watch, you find that the guys who dress in three-piece suits and act conservatively may get the breaks. After these superficialities, you find the more in-depth causes. You find that some people can write differently or express themselves differently or handle themselves differently in group sessions. Or at a department meeting you'll see that some people never speak and others always speak even if they have nothing to say.

"The third level is where you start trying to condition your own behavior to achieve. What you would not achieve as a technician but as a political animal is within your grasp. You actually start trying to react to the environment. You intelligently adapt to the environment.

"Finally, you become skilled at it. That's the age of the mature manager. You can assess office politics, you do your homework to find out what a senior manager's natural position is on a given subject.





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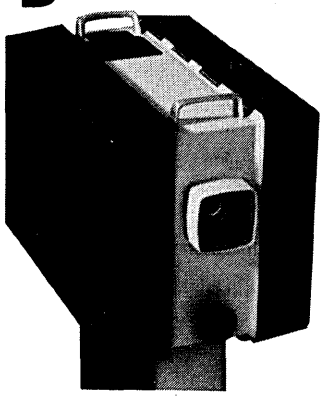

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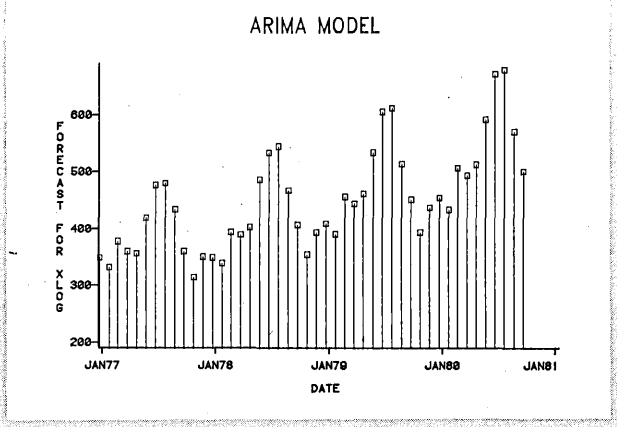

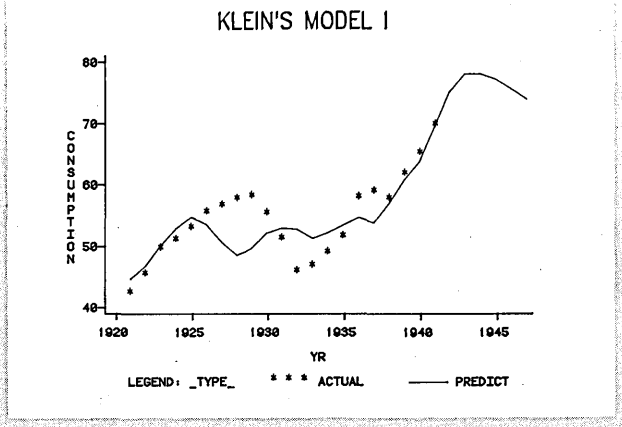

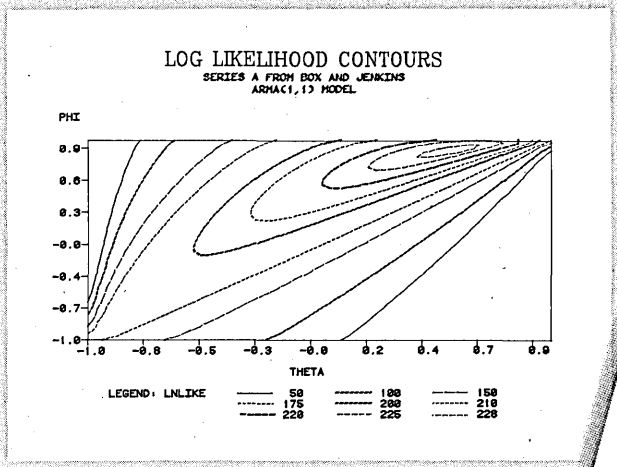

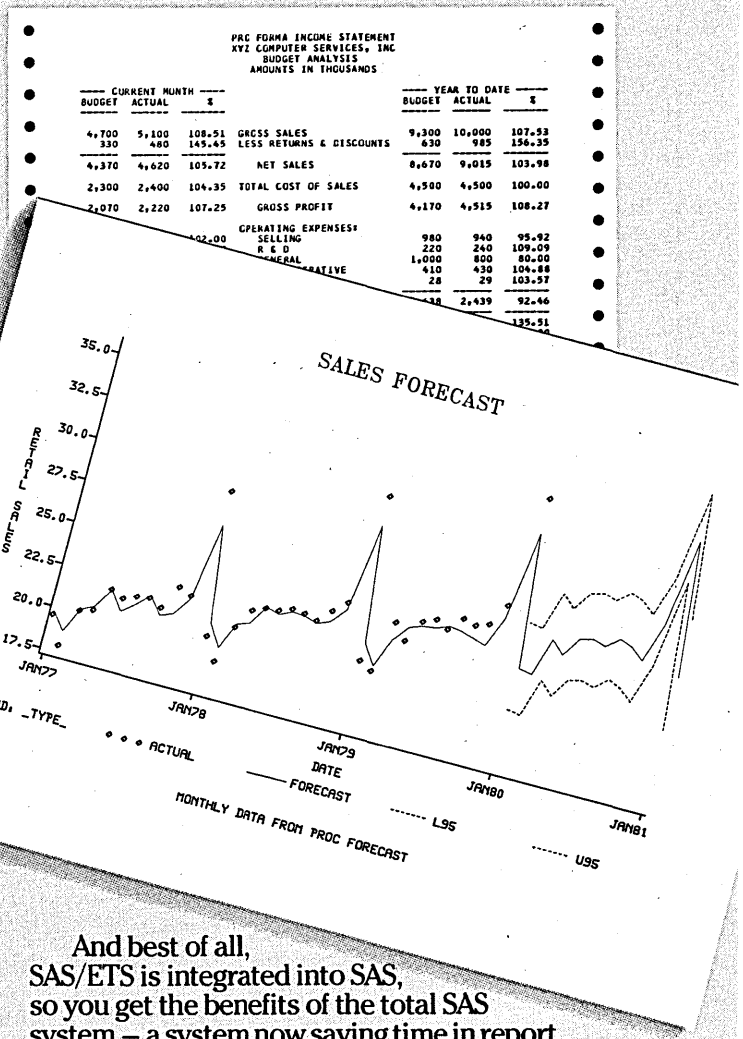

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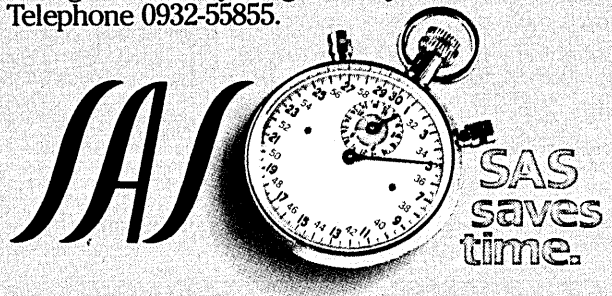

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"Office politics has its seamy, seedy, deleterious side, where people of no talent are vying for position or favor. But you just don't go in to a comptroller at month-end, when he's trying to find out the status of the books, with some great idea and insist that he drop what he's doing right now and listen to it. Comptrollers don't listen to great ideas the first 10 days of the month because they're closing the previous month's books. That's more important than any great idea, and if you're insensitive to that, I guarantee you'll never sell an idea to a comptroller. That's an example of the fourth stage of awareness.

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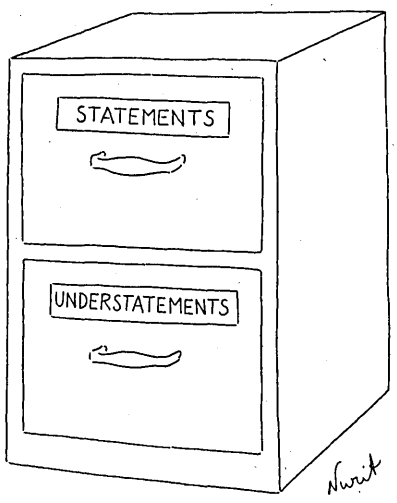
"They've got to change the gripes from petty complaints into constructive tools."

—Merrill Cherlin



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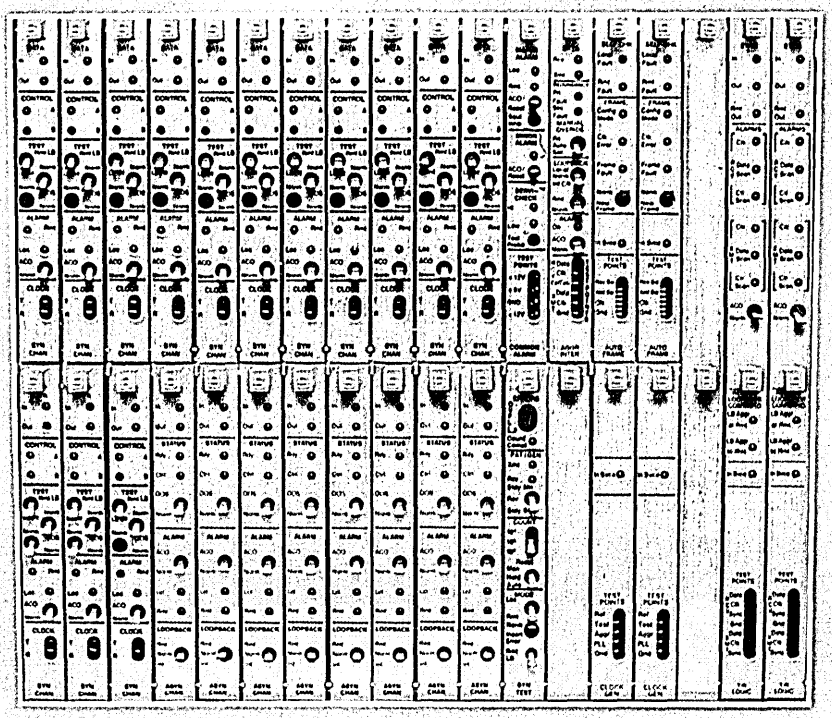

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(continued from page 14)

which has been offering an omni-directional OCR A slot scanner for up to 42 characters in Europe, will bring the product to this country.

ERGONOMICALLY YOURS

Government studies linking CRTs to eyestrain, migraine headaches, nausea and back pain have produced the new buzzword "ergonomics," meaning "work economics," or "biotechnology."

"The 1980s will see important advances in the human factors aspects of working with computers," says Matthew Sanders, manager of product design with Convergent Technologies, Santa Clara, Calif. Lear Siegler observed a 15% increase in sales of a terminal whose crt could be tilted forward and backward 12 degrees to adapt to glare. Other "ergonomic" advances: crts with amber-colored characters to reduce eyestrain; detachable keyboards that allow users to change positions while working at a crt all day; and glare reduction devices.

One supplier of glare reduction devices that can be placed on the screen of an IBM 5251 terminal, Cass Marketing Services of Glendale, Calif., offers a free lapel button with its devices that reads, "Cass Can When IBM Won't."

EIGHTEEN MONTHS AWAY

IBM will introduce two new H processors in 18 months, says a soon-to-be-released report from Strategic Business Services. The new machines, predicts SBS, are the H-2 uniprocessor at about 8 MIPS and the H-4 dyadic processor based on the H-2 with a performance of 14 to 16 MIPS. According to the report, the H-1 uniprocessor at 5.6 MIPS will also be introduced. IBM's new 3081, the H-3, is composed of two H-1s. SBS further expects MVS/SP to be expanded through Release 4 to begin to use the H functions in particular. "These announcements will signal the end of the 303X series," the report proclaims.

ON THE ROAD TO RECOVERY

David Brown isn't telling us exactly how he's doing it, but for three years he's been actually recovering data from badly damaged disk packs. He can't talk about his customers either, but claims big names among them. He started development of his recovery procedure while he was chief field engineer for Memorex. Brown said "peer pressure" has made him decide to tell the world what he has done -- 66 out of 67 data recovery attempts were successful -- and to make his services available through Data Maintenance, Inc. He's also acting as a consultant to companies who would like to call him in early enough to make his recovery services unnecessary.

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MAINFRAMES

HAMMERED IN HARDWARE

Sources claim IBM pitched its 3081 processor too low.

IBM's newly announced 3081, dubbed the first H Series machine by many analysts, is the legacy of a major strategic error that the company made four years ago.

Sources close to IBM reveal that the 3081's processor, a 5.5 MIP configuration (variously called Lookout 1 or Catalin within IBM) was conceived as the heart of a new series after the company's ill-fated Future System was killed off six years ago.

When plans were given more substance in 1976, the processor was designed for use with six or seven new models, and development began in earnest, sources explain. "But by 1978, one glance at the growing PCM competition convinced IBM that it had pitched its original processor ceiling way too low," said one source.

IBM immediately switched its focus for the H family to a bigger processor, this time 8 MIPS (Lookout 2), and decided that the smaller processor—now operational—should more properly be used as a bridge to the bigger models.

Information from within IBM suggests that its attempts to complete the 8 MIP processor are constantly being frustrated. Yields from the advanced semiconductor process that the company is using are still far too low. Talk also centers on the amount of heat generated by the new chips—believed by some to be as high as 3 to 4 watts per chip, compared to about 1.5 watts on the 3081's processor. Experts describe 3 to 4 watts as very high indeed.

Because of these problems, IBM manufacturing is thought to be refusing to sign off on the processors. Rumors from within IBM's competition are that IBM won't achieve any great volume until the end of 1982.

A snap poll of leading IBM users in Europe suggests that many of them are "on hold" for a larger processor than the 3081, and that they were expecting IBM to announce a more powerful system. A clue to just when this system might have been available can probably be gauged by the new moves by IBM's major PCM competitor at the high end, Amdahl. That company has revealed that it will deliver in the spring of 1982 an even more powerful machine than IBM is developing. The new machine is a 12.5 MIP uniprocessor, the 580. It will be

It is clear from sources that IBM intends to sell off its new 3033s as soon as possible.

followed by a dual version (23 MIPS) in 1983, the company says.

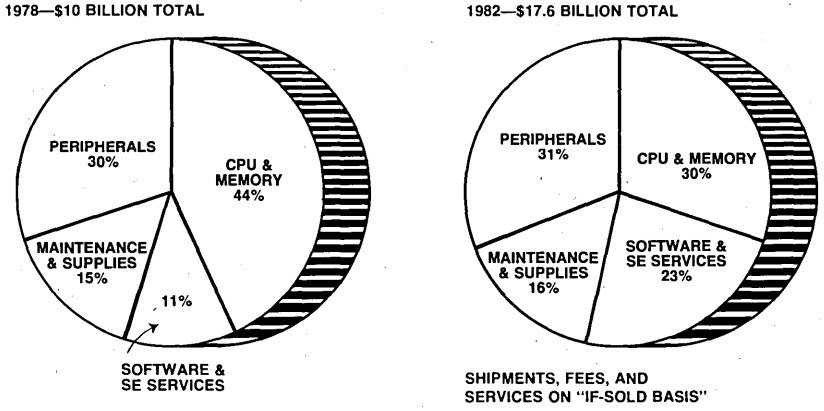
The 580, in two models, ranges in price from $3.8 million (the 5860) to $7.5 million (the 5880). The 580 offers up to 34 channels and 32 megabytes of main storage, the company says.

Amdahl insiders have said they were expecting a big uniprocessor and a dual version of it from IBM by now. Is the 3081 it? "No," said the company. "But it's the best they can do right now."

So why has Amdahl fired this bullet when it seemingly didn't need to? "Because our customers need to be able to plan ahead," said Amdahl's head of corporate policy, David Anderson. "Our users, like IBM's, can't just be led by the nose. They've become more experienced and know what they're looking for."

One of the latest to join the Amdahl

IBM'S SHIFTING REVENUE SOURCES



Source: Strategic Business Services, Inc.

fold by taking a machine is one of IBM's most important customers, Barclays international banking group. Observers say that this trend will continue as long as IBM holds back on revealing its H series hand and continues to offer its big users only a fuzzy future scenario.

"IBM simply can't use preselling and emotional blackmail as a tactic anymore," said one top industry consultant. "Users have wised up."

But according to one large industrial European user, there are signs that IBM is being as devious as ever with the new 3081. "You never know what IBM hasn't told you," said the user. "They're playing a very devious game." The source added that half the things under the covers of the 3081 haven't been announced. "They'll all be brought to life with new releases of software."

A snap poll of leading IBM users in Europe suggests that many of them were expecting IBM to announce a more powerful system.

It is clear from sources that IBM intends to sell off its new 3033s as soon as possible. More price cuts are expected from the company within the next six months, they say. "With purchase to lease ratios ranging from 17:1 to 25:1, IBM is hoping to get lessors of its machines to buy them outright within the next year, said one user. Until they do, IBM can do little to enhance its 3081 and will go into overdrive to finish the new processor.

Sources predict that perhaps nine to 12 months from now, IBM will announce its 8 MIP uniprocessor and a 14 MIP dual-processor version (known internally as Marcy). Late 1982 and 1983 are the probable first delivery dates.

At the time of this announcement, IBM is expected to reveal to the world that latent within the 3081 is a 31-bit addressing capability, sources say. This will effectively sever the machine from IBM's 370 and 303X lines (25-bit addressing and below), at the same time crushing residual values on these machines. For example, a top-end 3033 now worth $3.5 million could be worth as little as $800,000 in two years, according to one forecaster.

This 31-bit capability is perhaps the most awesome of the "goodies" that one U.K. insurance user says will make many big IBM users order the 3081 "almost as a reflex."

When asked to comment, one expert said that if IBM does this, "the 3081's 'real' memory will soar from 32 megabytes to 64 megabytes." But sources explain that IBM is also intent on off-loading more functions to the I/O processors with the move.

IBM is also expected to announce the Lookout 1 (Catalin) uniprocessor on its own with that capability, but with 3 to 5 MPS power and costing as low as $1 million in smaller configurations.

What will Amdahl do? According to policy planner Anderson, the company has prepared for even this eventuality. "We have the 31-bit capability in our 34-channel 580," he said. "But unlike IBM with its 370 architecture, we can go back in the field and retrofit our 470s as well," he claimed.

The expert opinion is that IBM's 370 and 303X users cannot be retrofitted in this way.

An Amdahl spokesman reminded everyone that that company, and other PCMs, have proved in the past that they could rebound from tough IBM actions notably with the 4300 series. He said that the competition used to shudder when IBM announced a new mainframe. "But on the day the 3081 was announced, Amdahl's stock rose about 15%," said the spokesman.

Other PCMs have pointed out that since IBM guaranteed software compatibility up into H Series (to protect its users' software investment), there was little that IBM could do to "surprise" the competition. But IBM's attempts to disguise its handiwork by shifting more of its operating system into microcode has at least kept the PCMs wary, and has been used by IBM as a potent preselling weapon.

"There are two good reasons for using microcode," said Amdahl's Anderson. "One is to build high-speed instruction sets for controlling the dataflow of the machine. The other is to move software behind a hardware interface, where it is less accessible to the user—and to the PCMs."

For this reason, Amdahl is now taking its first steps into microcoding after decrying its need for many years. The company has announced the concept of Macrocode on the 580. "It's a kind of microcode that cuts out the element of surprise when IBM buries and disguises its interfaces."

This level of preparedness, and the ease with which Amdahl and others can anticipate IBM's moves, has led many experts to now believe that IBM is in a no-win situation in a hardware race.

Said one source: "From a lower processor base [8 MIPS], IBM can go up through a sequence: 8 MIPS (Lookout 2), 14 MIPS (Marcy), 21 MIPS [known within IBM as Baldwin and comprising the former two systems coupled], and 28 MIPS [Sentinel, or two dual systems coupled]." Amdahl's sequence, on the other hand, would appear to run: 12.5 MIPS, 23 MIPS, 31 MIPS and, if necessary, 40 MIPS, he pointed out.

"For this reason, H stands only for 'headache' within IBM," explained one consultant. "And the company has decided that it better change the nature of the game."

According to some experts, IBM has decided that if it can't crush the opposition with mainframe technology, it will use its power in some other way. They explain that the key to this move is to be found in its users' buying patterns and in the particulars of the 3081 announcement.

Many analysts have said that if the 3081 configuration (as announced) was predictable, IBM's decision to make trend-setting cuts in the cost of software and maintenance to its users was anything but predictable.

One company, Strategic Business Services, has estimated that IBM's revenues from software and services will shift from 11% of dp revenues in 1978 to 23% in 1982. By 1988-89, the California consultants claim, IBM's hardware and software revenues will be about equal.

Such a comparable shift must also take place in the buying patterns of PCM users as well, experts stress. The question of whether Amdahl and the others—essentially PCM companies—can channel their hard-earned profits into a big push in the field will become uppermost in the minds of users and IBM watchers alike as the decade progresses.

But many observers are beginning to think that IBM, as slippery as ever, will be able to cover its strategic blunders in hardware with an alluring veil of bargain-priced support.

If that comes to pass, then "Lookout 3!" could, instead, be something that we all begin to shout at IBM's competition.

—Ralph Emmett

LOCAL NETWORKS

STRATEGY BEHIND 'WANGNET'

Wang has made a quiet promise to confront Xerox's baseband Ethernet with a broadband local area network within two years.

Wang's recent commitment to SNA and X.25 support—and the flashy announcement of a $7,500 Wangwriter wp system—were obviously parry and riposte to IBM's more aggressive challenges in the office automation system: The Displaywriter, OS/6, System 38, et al.

But for all the smoke, sparks, and swordplay in that quarter, there may be considerably more import to Wang's quiet promise to confront Xerox's baseband Ethernet with a broadband local area network within the next two years.

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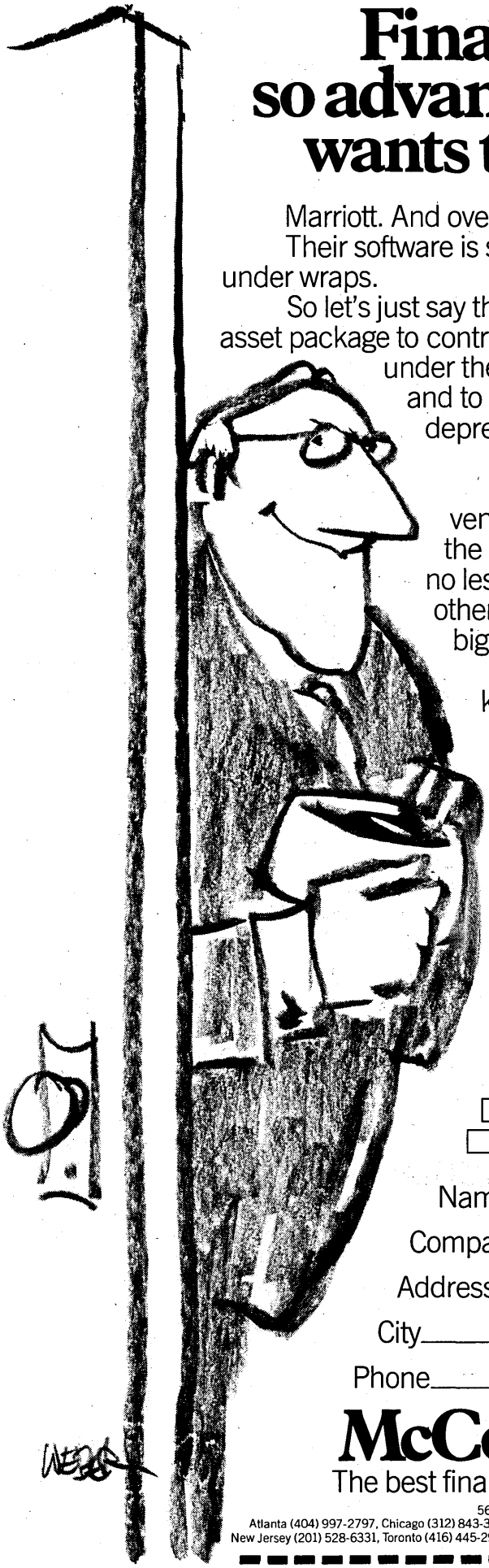

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An Wang, president of the Lowell, Mass., minicomputer vendor, has been all but publicly scornful of the passive Ethernet construct—despite its splash in the trade press and Xerox's market ties with Intel and Digital Equipment—and has himself become directly involved in Wang's network development, according to company sources. A sketchy outline of the broadband network approach was offered as a "statement of direction"—and independence—when Wang officials last month announced their plan to support IBM's SNA protocols.

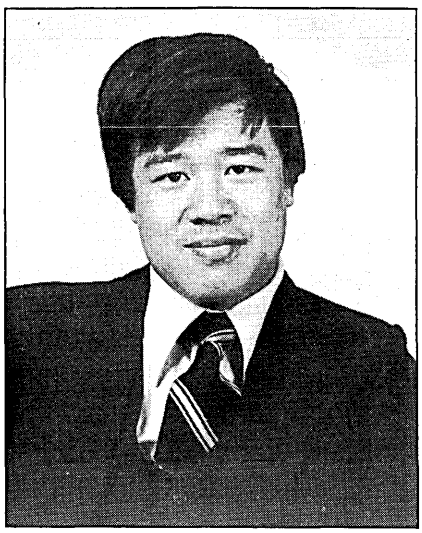
Wang executives claimed their design, predictably dubbed "Wangnet" inside the company, would be able to handle as many as 5,000 interconnected devices over a high-speed, high-volume CATV broadband cable link that would carry data, text, voice, and video images for processing. Design details were simply not available, said company spokesmen; this was a declaration of intent, not an invoice.

Reportedly, a major contribution to the Wangnet design effort came from an unexpected source. "When we acquired Graphic System's Typesetting Division two years ago, we picked up a brand-new technology and expertise that we didn't even realize we were getting," explained a Wang executive. "They had a voice-box communications group there that was doing lots of interesting things with broadband communications . . . and that's where most of this is being driven from." Last year, Wang integrated the GS division into the general corporation.

Wang's previous networking product, the Wang Inter-System Exchange (WISE), only now being shipped a year and a half after announcement, was once the focus of Wang's local network plans, Today, WISE is described as nothing more than an inexpensive box for managing shared peripherals—for Wang, a learning experience in networking. "It was a stab in the dark based on certain requirements as we saw them a year or so ago," wryly explained Fred Wang, the company's vice president for market planning and development. "Producing it, we learned a lot about the basic concepts of linking together various systems—and the interactions of various users on different systems."

Wang's previous networking product, WISE, was a learning experience in local networks.

For the WISE development, "the original plan was that we would be able to put together a chain of OIS systems, and then hang one image printer off of one of them and have all the other OIS systems access it," said Wang. "And I guess we threw a few assumptions up into the wind in developing the device, and . . . some of them have been confirmed, and some of them have been found wrong." (OIS is Wang Laboratories' designation for the family of processors they call the Office Information System.) "It was a learning experience," he added ruefully.



FREDERICK A. WANG: "The difficult thing in a fast-moving industry is that you always tend to just slightly lead what a customer really wants and needs."

Wang said his firm would be committing major resources to local network design and development because local networks had become the "key skeletal element" in system design for the next decade. Today users are being vendor-guided in their preliminary choices of network designs (PBX vs. cable, loop vs. databus, broadband vs. baseband), but he said no clear trends will develop in the market until there is some significant user experience and feedback.

"The difficult thing in a fast-moving industry is that you always tend to just slightly lead what a customer really wants and needs," said Wang, 30, son of the firm's founder and an increasingly important decision-maker within the corporation. "Your systems people can design up a storm, but there is always the fear that you've designed something that's very practical for the people who designed it—but not too practical for the rest of the world. Or, worse, you designed something that is impractical for everyone—but is a real piece of art!

"That's where the necessity of getting the customers, the users, to try things out develops," he said. "Until people really start getting some usage on these things, all you'll see is a lot of different experiments, all with these really good logical assumptions behind them. . . .

"But you give each design a year with people using it and seeing what they *really* want—and then you'll probably find the following generation being much more specific as to what the real world's needs are."

(The Wangnet prototypes will go into test sites in 1982, according to other corporate officials.)

Although the network planners at Wang, as elsewhere, have developed their own working list of "logical assumptions," he added, Wang's approach will be "to try a few things," invest, "but don't make any commitments until you find out what is going to be most amenable to the structure of the system and the applications it is going to be used for." It is too early for any vendor to lock itself in, he said; the market is just developing. "It's too early to extrapolate out any trend other than to say that if you don't have some really useful networking capability on a system you announce in, say, 1985, then I don't see how it will be useful except as a onesy system."

Today, he said, all the options, all the design choices, have their trade-offs. PBXs are cheap, but being low bandwidth can restrict data transfer. "When you get into high-speed, high-volume data transfers, your standard voice grade lines tend not to be able to handle the traffic. So you end up having to batch things, and that brings in high overhead to control who gets the line and how long they have it." The proper design choice, he declared, "really depends on what you plan to do with it!

Wang considers local networks the "key skeletal element" in system design for the next decade.

"Whether you want a loop or a straight line system, or a contention system like the Ethernet, really depends on how much volume you have and how much expense you want to put into controlling the system," he explained. "On an Ethernet system, you have no controller in the system so you have no expense there—but your expenses now get passed through in terms of the time spent handling the contention system. There are always efficiency trade-offs, and you have to play those trade-offs. "There is no single good answer!"

The application will define the proper design eventually, he said. "Let's look at the integrated system approach," he explained. "If we have just two of these systems on different floors and I want to ship something between them, do I take my document and ship the whole document to the other system and process it there, or do I just take the processor capability on the other system and ship pieces of the document as I need it?

"What do you say? You say, well, that depends on what it does and how fast I can get across between them. If I have a very fast, high-speed cable, wide bandpath, it might be easier to keep the document here and ship over portions as I need them. Or, if that would really slow down everybody else on the system, you'll ship the document

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over once and process it and have it come back."

Rhetoric aside, the lesson is clear, he said. "You simply can't model everyone after one thing." A variety of options will be offered from a number of vendors, said Wang; but remember, "a lot of these entries are just shots in the dark. . . . It's a trial and error approach. The users don't really know what they want. Some people have some ideas and so you design around those ideas —but when you actually get into implementation, the idea is changing or the workflow changes or whatever."

Wang does not seem too concerned with Xerox's push to establish an industry standard around Ethernet.

Admitting that all you have is "a shot in the dark" might be the respectful way to approach the market, he said. "I mean, we'll do it ourselves. Try something new. Put a little feature on a product and then find out. Do people like it? Do they not like it? And if they like it, what are they doing with it? And are they doing what we thought they'd do with it, or are they doing something entirely different that they figure they can do with it? . . . And where do we go with that?"

In this dynamic market context, Wang does not seem too concerned with Xerox's push to establish an industry standard around Ethernet. "I really don't know," ventured Fred Wang. "In the past, it was very difficult to get vendors to champion any standard like this—because it's obviously written around a particular vendor. Standards committees have a tendency to make a standard written either around everybody or nobody, so that everybody starts out, at least, on an equal footing."

In his personal view, said Wang, the importance of the Ethernet announcement —and the flurry of politics that followed— is that it brought a lot of attention to a subject that had previously only been looked at by a handful of customers. Ethernet was important because it "drew attention to the importance of local networks," he said, rather than because it identified the contention or any other single system design "as *the* local network."

Yet, he said, the importance of local networking is undeniable—not only in terms of allowing users to leverage their system investment by sharing devices, but also to more fully exploit the flexibility of the technology. "There has always been a natural tendency away from centralization of any sort of resources," Wang declared, because centralization tends to be less than specific to the needs of any single group. "A local network gives us the opportunity to tailor a system or a set of systems to the personalities and needs of a particular group, department, division, or whatever."

Wang—the company—views local networks as nets within a building, perhaps even only on one floor of a building, he explained. "We try to look at a business from an organizational viewpoint. Organizations develop in such a way as to reflect pretty much how they do business." People who need to talk to each other a lot tend to be in the same department, the same office. "That's just natural evolution," said Wang. You want to model your system architecture after that, because that will make it fit better into the user's environment.

"So you say, O.K., if I can have quick, efficient communication of data or anything else between the people who need to talk to each other—and that, on a high priority basis—then everything else can be on a lower priority, longer-pause type of function." That sort of analysis is how Wang began planning for a system with a "within-floor network that was very tightly controlled, with very fast communications, large volumes of data possibly being shipped from workstation to workstation within the floor—but then a little slower, more methodical communications from one floor to another or maybe one building to another.

"I can afford to wait a couple of minutes to get hold of a guy down the road 10 miles, because I'm mentally set to handle that," said Wang, "whereas it wouldn't make any sense to me to wait five minutes to talk to somebody three doors down the hall."

Wang views local networks as nets within a building, perhaps even on one floor of a building, so system architecture models organizational structure.

This sort of concept will not only allow a user to have his interdependent personnel tied together and working over a high-bandwidth, high-speed network, he added, but it also has all the other obvious network advantages.

"If I'm looking to spread out workstations to all the key individuals on my floor," reasoned Wang, "I would like to put in as inexpensive a system as I can usefully offer for everybody's desk." Rather than put telecommunications ability on everyone's desk, or give everyone costly peripherals, a user can have a group of people share an expensive resource on a local network. Suppose you need a superfast processor box to do a certain thing, say a dictionary function."

The question is, said Fred Wang, "do you really need to duplicate it at every workstation, or do you really just need to give everybody access to it?"

The answer is, maybe, Wangnet. But maybe that's one more of those logical but fallible "assumptions."

—Vin McLellan

COMPANIES

SECRET'S IN THE SOFTWARE

Tektronix says the most important thing it will be selling to customers within the next few years will be the software.

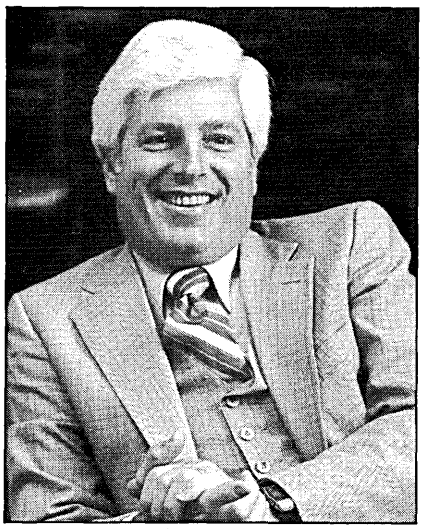
Rarely is a Tektronix display terminal or desktop graphic computer seen in an office environment producing what has come to be known as business graphics. Instead, Tek's terminals tend to be configured in computer-aided design and drafting applications systems. And that helps explain why the Information Display Division now constitutes a larger piece of the total corporate pie.

It turns out that as far as computer graphics is concerned, CAD/CAM is where the action is, not business graphics. "You read a lot about it, but in fact very little is actually happening yet in business graphics," says consultant David Penning of Palo Alto, Calif. And Tek's IDD, riding on the coattails of a corporate reputation for good hardware, among the engineering and scientific community, rang up sales of almost a quarter-billion dollars in its latest fiscal year, ended last May. The division, which five years ago accounted for 18.6% of total sales, managed to raise that to 25.7% in 1980.

For those who haven't looked lately, Tektronix this year is expected to pass the $1 billion mark in sales, no small feat. The company ranked 30th among last year's DATAMATION 100 companies, based on revenues drawn from data processing activities. The Beaverton, Ore., company, which has been experiencing a five-year growth rate in sales of almost 24%, continues to maintain its strength in the test and measurement instruments business. But it has been slower than Hewlett-Packard, for example, in drawing down revenues from the dp marketplace.

The company formed an information display activity in 1967, sold its first terminal in 1969, shipped its first model in '70, and in '75 moved into its campus-like setting in Wilsonville, 15 miles south of Portland.

Back in 1975, the IDD was structured around three different approaches to the marketplace. One was to sell to end users, shipping the display product in a box that the user unpacked and put together. The second was to sell to oems. The third was a



HOWARD K. MIKESELL: "You'll probably see us doing more application-oriented types of products."

marketing group responsible for developing applications programs, performing some integration of Tek hardware, and selling systems to end users. The latter effort, which never went over well with the oem community, bombed after some 3½ years.

Behind this failure, says Howard W. Mikesell, general manager of the IDD since '75, "was our inability to get up and running, if you will, with applications software, not understanding as a company how complex it was, not understanding that it was a total system responsibility, not understanding the degree of documentation required, the degree of handholding both before and after the sale."

It was a period when Tektronix was still a totally hardware-oriented company, strong in that technology and known for it in the technical markets it served. They found the systems business was much more difficult than anticipated, that the field didn't know how to sell it or service it. As a result, Tek never entered the lucrative and growing CAD/CAM turnkey systems business.

Tek's Information Display Division has been becoming a larger piece of the total corporate pie.

But Mikesell says this is not to rule out Tek's ever entering into the realm of users' applications. He says it's important for Tek to understand users' needs and wishes, and when the company gains this understanding, "you'll probably see us doing more application-oriented types of products. . . ." The company has been increasing its investment in software, he adds. "I think a few years from now, maybe five but certainly within 10, the most important thing we'll be selling to customers will be the software." If it's not software loaded by the user, it will be software that goes as firmware. Mikesell sees Tek tailoring products to applications through software and firmware but not developing, say, a turnkey CAD/CAM system that carries design from its initial conceptualization to an integrated and automated manufacturing process.

Development of turnkey systems, integrating Tek's hardware with applications programs developed in-house, may have to come soon. Around the industry, terminals makers by the drove are evolving into systems builders, first adding some intelligence to their terminals, later integrating some sort of input device like a digitizer, perhaps also a hardcopy output device, and then their own application software. And, of course, it's the latter that adds value to the system. While it's the type of activity that Tek had earlier abandoned, it would seem to be a natural direction, especially for a vendor that already counts among its customers some 85% of the country's 500 largest corporations.

But the firm, by staking its claim in the computer graphics marketplace, is at least traveling with a fast bunch. It is a market that in the last five years has been grow-

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	LA34 DECwriter IV	1,095	105	58	40
	LA34 DECwriter IV Forms Ctrl.	1,295	124	68	46
	LA120 DECwriter III KSR	2,495	239	140	90
	LA120 DECwriter III RO	2,295	220	122	83
	VT100 CRT DECscope	1,895	182	102	69
	VT132 CRT DECscope	2,295	220	122	83
TEXAS INSTRUMENTS	TI745 Portable Terminal	1,595	153	85	58
	TI765 Bubble Memory Terminal	2,595	249	138	93
	TI783 Portable KSR, 120 CPS	1,745	167	93	63
	TI785 Portable KSR, 120 CPS	2,395	230	128	86
	TI787 Portable KSR, 120 CPS	2,845	273	152	102
	TI810 RO Printer	1,895	182	102	69
	TI820 KSR Printer	2,195	211	117	80
CENTRONICS	730 Desk Top Printer	715	69	39	26
	737 W/P Desk Top Printer	895	86	48	32
	704 RS232-C Printer	1,795	172	96	65
	6081 High Speed Band Printer	5,495	527	293	198
DATAMEDIA	DT80/1 CRT Terminal	1,795	172	96	65
	DT80/1L 15" Screen CRT	2,295	220	122	83
	DT80/5 APL CRT	2,095	200	112	75
	DT80/5L APL 15" CRT	2,595	249	138	94
LEAR SIEGLER	ADM3A CRT Terminal	875	84	47	32
	ADM31CRT Terminal	1,450	139	78	53
	ADM42 CRT Terminal	2,195	211	117	79
HAZELTINE	1420 CRT Terminal	945	91	51	34
	1500 CRT Terminal	1,095	105	58	40
	1552 CRT Terminal	1,295	125	70	48
QUME	Letter Quality KSR, 55 CPS	3,395	326	181	123
	Letter Quality RO, 55 CPS	2,895	278	154	104
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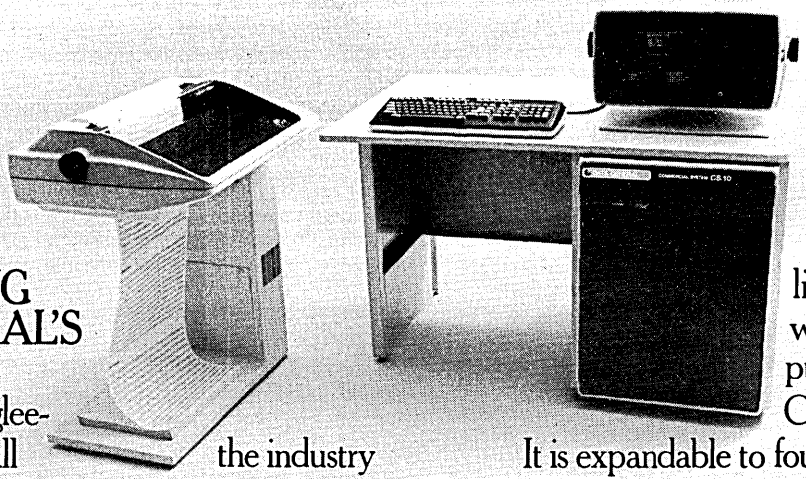

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ing by 48% a year. Over the next five years, growth is expected to be at a 24% annual clip. And, according to a recent study by Strategic Business Services, the submarkets served by Tek are the dominant ones. These three, CAD/CAM, drafting, and cartography, are said to account for 65% of total sales in 1980. And so the company is changing. Tek last month introduced electrostatic hardcopy output devices that supplement those in the product line using fiber optic technology to produce copies of images on the face of a crt. A company that formerly was heavily populated by electrical engineers and only a few software types is in the process of reversing this ratio. "In a couple of groups," says Mikesell, "the majority of expenses are in software development." As became more apparent last month, the company has been introducing unbundled software products that facilitate the use of its graphics systems. Mikesell observes that in parts of Tektronix, software development comprises more than half the engineering costs, even going as high as 65%. As this leads to new products, he adds, "to a customer it's going to look like more iron, but the secret's in the software." And the French would have you believe the secret's in the sauce.

—Edward K. Yasaki

RAYTHEON CARVED A NICHE

Despite the risks of being a PC vendor, RDS has managed to make a viable business out of IBM look-alike keyboard display subsystems.

There is always an element of risk in being a plug-compatible equipment vendor. Such companies operate within a world dominated by IBM, where one product announcement by the industry leader can drastically alter market opportunities.

Despite the shadow of impending change, some independent suppliers have carved out a unique identity in the plug-compatible environment. Such a firm is Raytheon Data Systems Co. (RDS), which operates in the 3270 crt terminal area and has managed to make a viable business out of IBM look-alike keyboard display subsystems.

The key to Raytheon's approach lies in the marketing of complete subsystems rather than individual crts, says Alphonse M. Lucchese, national director of field sales in the RDS intelligent terminal division.

The RDS Programmable Terminal System (PTS) family began in the early 1970s with the PTS-100, which was later upgraded with the PTS-1200 line. Early in 1980, the company introduced the microprocessor-based PTS-2000, which Lucchese sees as the springboard that will propel RDS into a new environment of multifunction, integrated systems.

The PTS terminals follow the standard plug-compatible approach of offering users more features at lower cost with generally faster delivery than is available from IBM. The typical user can begin with a terminal subsystem that utilizes Binary Synchronous Communications and later upgrade to a version compatible with IBM Systems Network Architecture (SNA) using Synchronous Data Link Control (SDLC).

Early this year, RDS will begin shipping 3274-type clusters that can be configured with up to 32 displays.

According to Lucchese, many users acquire PTS subsystems to replace the IBM 3276, which is the small crt cluster of one to eight displays. Early this year RDS will begin shipping 3274-type clusters that can be configured with up to 32 displays. A user can begin with a 3276 small cluster and then upgrade to a larger 3274 by installing an expansion feature device, which is quite a bit simpler than having to replace IBM controllers, Lucchese said.

A terminal subsystem from RDS on a two-year lease is typically 20% to 25% less than a comparable all-IBM configuration under the Extended Term Plan, he estimated, and purchase savings can be even more dramatic, averaging up to 35%. In addition to offering greater upgrade flexibility, pricing of the RDS controller can be as much as 40% below similar IBM devices.

The PTS-100 controller has a local format storage feature, which means that users can store a certain amount of format data in the controller. The ability to access certain information at the terminal controller eliminates the need to fetch formats from the mainframe. This instant retrieval helps to improve response time and also cuts down on network traffic, he explained.

Even with the ability to write special software or configure specialized hardware features such as custom function keys, a user often can get delivery of an RDS terminal subsystem in less than 60 days. Another advantage is SNA/SDLC capability, although users have only begun to accept this mode within the last year, Lucchese pointed out.

RDS has always been on the leading edge of the latest network capabilities—sometimes with mixed results. Two years ago, when SNA/SDLC compatibility was announced, users were not yet ready to abandon their Binary Synchronous protocol. In 1976 RDS demonstrated a working X.25 feature for the PTS line but "shelved it because no one really asked for it." Asked if X.25 might be brought back, Lucchese indicated such a move would depend on user demand.

So with more than 150,000 terminals installed worldwide at airlines, insurance companies, banks, governmental agencies, etc., are any changes contemplated? In the plug-compatible terminal area, Lucchese sees RDS competing effectively with IBM and holding its own against companies such as ITT Courier, Telex, Memorex, and Four-Phase. Some of these displace individual displays instead of offering complete subsystems with full support. And without naming other competitors, he said RDS has delivered more SNA/SDLC 3274-type terminal systems than any vendor except IBM.

But after making his case for RDS in the plug-compatible area, Lucchese said the PTS-2000 is really the "forerunner of a whole series of upgradable products." Within the next year, RDS will attach floppy disk storage and Winchester disk drives to the 2000, plus other peripherals that will turn it into a distributed processing system. The microprocessor-based PTS-2000 will be interfaced with word processing equipment from Raytheon's Lexitron division so users can begin to have integrated networks with multifunction capabilities.

By the mid-1980s, Lucchese sees RDS multifunction systems also being interfaced with specialized processors from the company's minicomputer division and its Raynet line along with specialized software for such applications as electronic mail.

Eventually these multifunction systems will be interfaced with corporate dp centers, he predicted, with the data processing staffs presiding over the integrated networks. But this evolution will occur gradually, and RDS is determined to provide a smooth migration path for its customers without obsoleting existing installed systems, Lucchese concluded.

—Ronald A. Frank

COMMUNICATIONS

VENTURE INTO DATACOM

Honeywell and its French partner are after a share of the international data communications market.

Honeywell has made a French connection to the packet switching network market. The result: 51% of SESA-Honeywell Communications, Inc., Herndon, Va., is owned by Societé d'Etudes des Systemes d'Automation (SESA) and 49% by Honeywell.

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CIRCLE 38 ON READER CARD

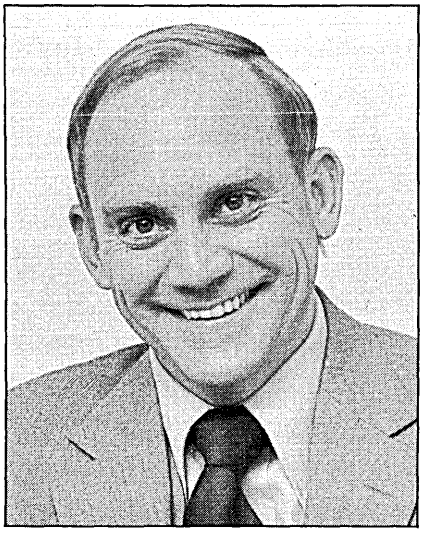
The joint venture company, launched in October, will market SESA's DPS-25 packet switching system in the U.S. and Canada and already has one customer, FTC Communications, Inc., New York City, which is using the system to allow U.S. customers to access databases in Europe and vice versa.

DPS-25 systems range in price from $1 million to $100 million.

R. Treglos, president of FTCC, said a number of firms permit European customers to access U.S. databases but none have made much of the reverse access because "until recently, European databases have generally been copies of U.S. databases. But that is changing."

He is enthusiastic about the response time he is achieving with DPS-25 which, he says, amounts to seconds. He had been using Tymnet, "and every message going to Europe had to be routed via Cupertino [Calif.]."

President of SESA-Honeywell Communications, Inc., is John J. Pendray, who had been president of SESA, Inc., a U.S. subsidiary of SESA S.A. of France. SESA, Inc. will continue to operate as a computer systems house in Boston, independent of SESA-Honeywell.



JOHN J. PENDRAY: "We'll look pretty silly if we don't [get the Honeywell contract]."

Gerard P. Schreder, vice president of marketing for SESA-Honeywell, previously held the same post with SESA, Inc.

DPS-25 systems range in price from $1 million to $100 million; typical prices are $5 million to $10 million. Initially the company will target sales to large corporations needing data communications that meet international switching standards, with specialized common carriers, computer time-sharing firms, and financial institutions making up a secondary market.

Small firms may eventually be targeted but Schreder feels that is a long way off. "We have all we can handle right now."

Pendray, Schreder, and James R. Berrett, Honeywell's executive vice president of development, make up SESA-Honeywell's board. One of Berrett's main functions is "protecting us from Honeywell salesmen," quipped Pendray.

The SESA products are based on the Z80 microprocessor.

He said the fledgling firm has been "flooded" with demands from Honeywell salesmen who see a need for the company's technology among their customers.

Berrett said Honeywell had looked at many other telecommunications companies before settling on its French partner.

As for SESA, Pendray said the French firm had been looking for a U.S. partner since it introduced DPS-25 into the U.S. market via SESA, Inc. six months ago.

One of the joint venture firm's early customers may very well be Honeywell itself. Honeywell's corporate staff had had a team looking at potential providers of a

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December 15, 1980

CIRCLE 39 ON READER CARD

communications network for its internal use before it began considering a partnership with SESA.

When that consideration started, Pendray said, "they stopped that team and said 'here's another company; look at it.' " He said the team reported favorably on SESA with one reservation: "Do they have a U.S. presence?"

Honeywell took care of that reservation, but the contract for its internal network hasn't been awarded yet. Pendray feels fairly confident that SESA-Honeywell will get the contract. "We'll look pretty silly if we don't."

Schreder said Honeywell's main requirement for its proposed system is that it be synchronous. He feels this is one of SESA's big strengths. "We started later in Europe and developed strength in synchronous communications, whereas U.S. firms typically are asynchronous."

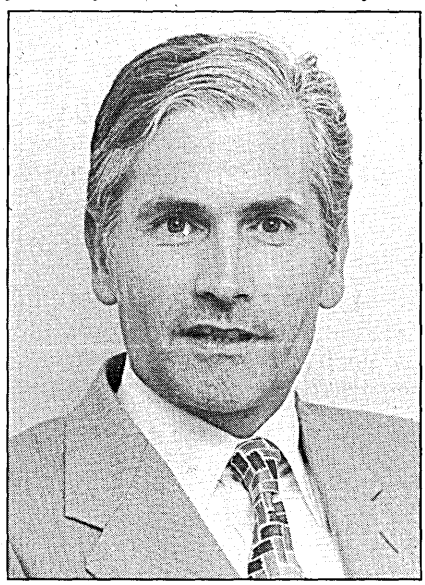
He believes SESA's packet switching networks are the most advanced on the market. "We're on our third generation in both hardware and software, and I think we're the only ones that are."

The SESA products are based on the Z80 microprocessor. Honeywell has been

One of the joint venture firm's early customers may very well be Honeywell itself.

doing some of the manufacturing for SESA in France and may eventually do some in the U.S., although the firm's principals feel that's a long way off.

Schreder described the SESA system as "the most modular system on the market. The smallest unit in the system is the size of a modem. Entry costs are low and maintenance is simple. You exchange a module just like you would a modem. The system runs non-stop while you're changing."



GERARD P. SCHREDER: "We're on our third generation in both hardware and software."

SESA data communications systems are installed in Europe at such places as the French Telecommunications Authority's Transpac, the Euronet network of the nine European Common Market countries and Switzerland, and systems for the European Railroad Assn., the French railroad, and the European Space Agency.

—Edith Myers

LAST BUT NOT LEAST

Honeywell may be one of the last major mainframe suppliers to announce a communications network architecture, but it claims DSA offers important user benefits.

Honeywell has taken another step down the road to implementation of its Distributed Systems Environment with the introduction of Distributed Systems Architecture (DSA). The unveiling of DSA makes Honeywell one of the last major mainframe suppliers to announce a communications network architecture; the firm claims there are important benefits for users.

The first DSA products follow the lower four levels of the International Standards Organization (ISO) reference model for open system architecture. Honeywell calls these four levels Communications Management functions, and they are described as providing the network user with the framework to implement peer-coupled communications systems.

The "entry level DSA product set" includes a front-end called the Datanet 8, a software package for the front-end designated the Distributed Network Supervisor (DNS), and a hardware/software system called Distributed System Satellite (DSS) that operates as a satellite processor in a DSA network.

These first offerings are meant to slowly phase users into a DSA environment, according to Arnold Langberg, manager of communications products in the Level 6 marketing group. The emphasis is on getting users who add new applications to switch to the new front-end and software so that the network would have DSA and non-DSA applications running. Actually, each application would operate like a separate network into the same mainframe, and the DSA application would look to the host like one of Honeywell's earlier networking schemes, he explained.

Current Honeywell networks running under the GCOS operating system use the Network Processing Supervisor (NPS) or the Generalized Remote Terminal Supervisor (GRTS), but these don't have the potential flexibilities promised for DSA, Langberg said.

Within the next two to three years, DSA will allow users to interconnect with X.25 and X.21 public data networks. So far, the architecture has worked with the French Transpac network, and tests are underway with Datapac in Canada and the X.21 Nordic network in Scandinavia.

DSA will not be limited to Honeywell equipment. Plans now call for an interface to IBM SNA networks, probably via an emulation scheme through a 370X front-end. This is only one possible interface and others could be implemented, Langberg said.

With total distributed configurations, network management functions will be performed at any peer-coupled processor using a Network Operator Interface feature. But users that now have hierarchical networks oriented around large central mainframes will gradually have to make changes to utilize many of the peer-coupled network concepts.

Not yet available under DSA is what Langberg called a programmatic interface for user-written applications. So until more DSA products are announced, only Honeywell-written applications can run under the new architecture.

The real advantages of DSA lie in the fact that there is 100% compatibility with the ISO open system model, according to

DSA will not be limited to Honeywell equipment.

Sridhar Meda of the communications marketing staff. Honeywell has established a framework that will ultimately allow the user to run his existing software without modification. DSA will be code and device independent and it will be transparent to both the media and the network being used. It establishes a framework for features like dynamic routing, encryption, network mixes of private and public links, and cpu-to-cpu resource sharing, Meda added.

Development of additional DSA layers is progressing both at Honeywell and at Cii-Honeywell Bull in Europe. Work is already being done on the Session and Presentation Control layers, which are called Message Management. And Langberg revealed that the efforts to finalize the highest level application software are also under way.

So the first DSA products hold out great promise for Honeywell network users. If Langberg's prediction is correct, the next two to three years should see additional DSA features coming in a steady stream to enhance the basic framework.

—Ronald A. Frank

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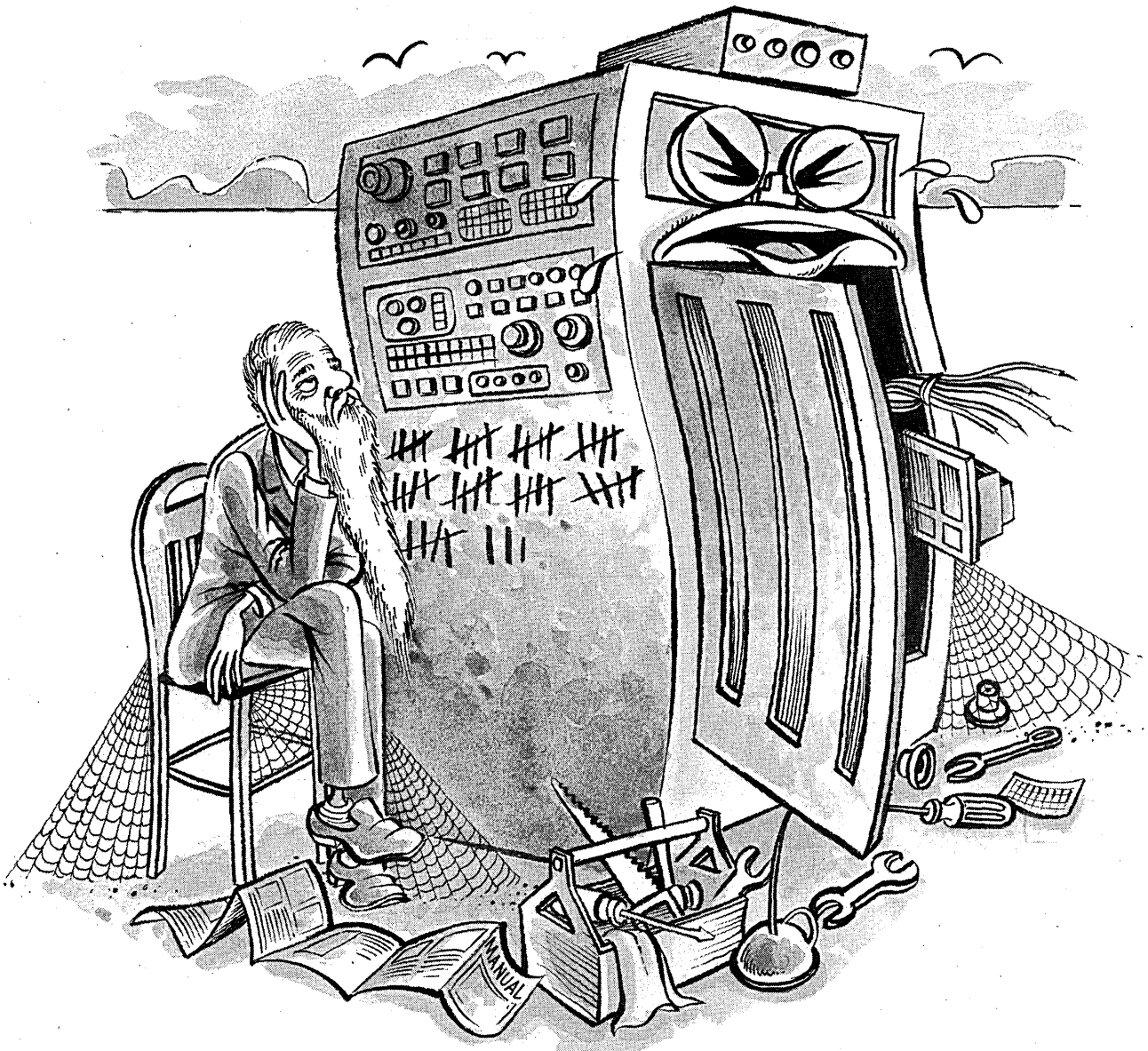

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MANUFACTURING

LEARNING FROM THE JAPANESE

The U.S. wants a quick ROI; the Japanese are willing to wait longer and end up doing better. So said speakers at three separate conferences.

That the U.S. lags behind Japan in manufacturing productivity and that something needs to be done about it was the consensus of speakers at three separate conferences late last fall.

Most speakers agreed the biggest contributor to the difference is a Japanese willingness to wait longer for return on investment (ROI). "We have always wanted a quick ROI," said Bruce Haupt, director of planning, Advanced Manufacturing Systems, IBM Corp., Boca Raton, Fla. "That is changing. The Japanese did it differently. They're making money slowly but lots of it."

Haupt was addressing a session at Info/Mfg., the first Information Management Exposition & Conference for Manufacturing staged in Chicago's McCormick Place by Clapp & Poliak, Inc. The other two conferences were Autofact West, now in its third year, staged in Anaheim, Calif. by CASA/SME (the Computer and Automated Systems Assn., a unit of the Society for Manufacturing Engineers), and the 23rd annual conference of the American Production and Inventory Control Society (APICS) in Los Angeles.

Last year, 38% of patents issued by the U.S. were to foreign nationals.

Other productivity hindrances that emerged at the three meetings included the fact that the U.S. doesn't have consistent tax depreciation schedules to enable companies to make major investments in CAD/CAM tools, that there is a lack of training and education in the area, and that there is insufficient effort to get management and users involved in CAD/CAM projects.

"I think American business has a lot to learn from the Japanese," said Richard Pawlicki, manager, management information systems, Northrop Defense Systems Div., at Info/Mfg. He said comparing use of MIS in a manufacturing environment in Japan and in the U.S. was like comparing a ballet to a hockey game. In Japan, he said, it's like a ballet. Everything is choreographed. Everything is planned. In the U.S., it's like a hockey game. "You know how many players are on the ice and you hope the referees know the rules, but apart from that, anything goes."

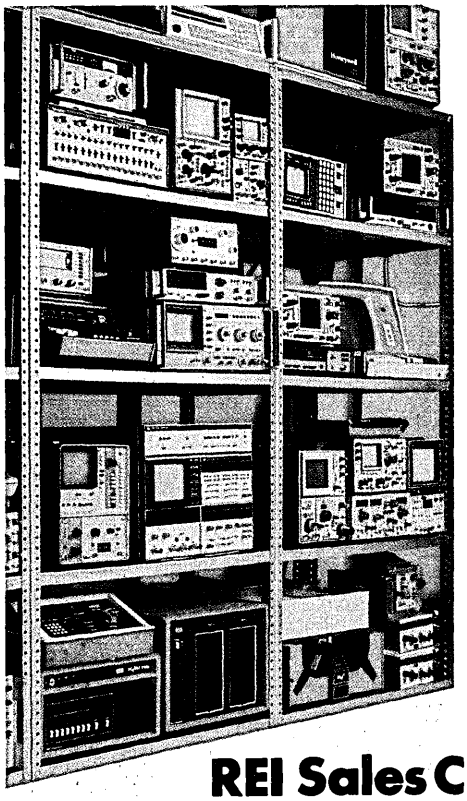
LeRoy Peterson, Arthur Andersen & Co., told an Info/Mfg. audience that "the Japanese are less concerned with year to year P&L effect than with long range market share."

And that, said Info/Mfg. keynoter Daniel T. Carroll, president and chief executive officer, Hoover Universal, Inc., Ann Arbor, Mich., is an attitude U.S. industry should cultivate. "We must encourage management and investors to take a longer view, to shift from a 90-day to at least a two- or three-year focus."

Pressure from the investment community for a quick ROI was an oft-cited hurdle to U.S. plant modernization. "In Japan, investors are willing to wait for a 20-year period for a profitable return on investment," said Frank H. McCarty, corporate director of manufacturing engineering, Raytheon Co., Lexington, Mass., at Autofact. "In the U.S., investors expect a six-month return on investment."

Joseph B. Anderson, director of manufacturing and deputy chief of staff for contracting and manufacturing with the Air Force's Systems Command, Andrews AFB, told Autofact, "A survey of Air Force suppliers last year indicated that 60% of the equipment being used was over 20 years old." Japan was reinvesting as much as 30% of sales in modern equipment, while the rate in the U.S. aerospace industry was

DANIEL T. CARROLL: "We must encourage management and investors to take a longer view, to shift from a 90-day to at least a two- or three-year focus."



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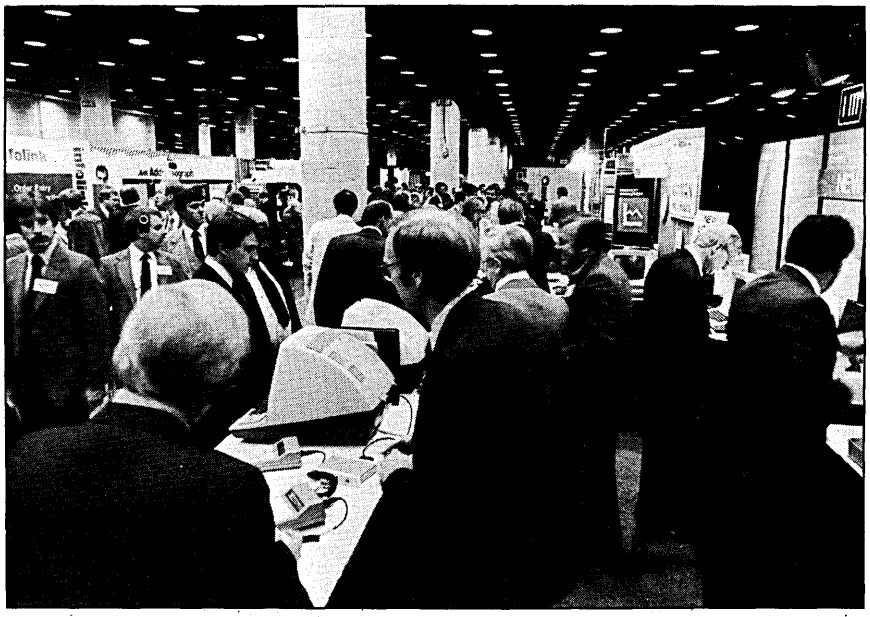

AT INFO/MFG., a first-time-out show, conference operators were hard-pressed to get exhibit viewers out at closing time.

only 2% of its sales. Anderson added that the rate of innovation in the U.S. is declining. Last year, he noted, 38% of the patents issued by the U.S. were to foreign nationals, compared with only 17% of the patents granted to foreigners in 1960.

At APICS, C. Randolph Myer, Booz Allen & Hamilton, Inc., talked about Japan's business and economic success since 1945 and how it was attained. He credited marketing emphasis, with market share considered more important than ROI; extensive market analysis and product life cycle emphasis; greater concentration on industrial than consumer markets; selectivity of industries based on economies of scale and recognized resources; and excessive competition controlled by government via price cartels and queues for capital investment programs.

He also pointed to cost controls: lifetime employment (employees more important than profits); stable employment maintained by use of temporary workers, subcontracting, and variable compensation; emphasis on process development and efficiency improvements; and less vertical integration with vendors and customers. He also mentioned government, banking and union assistance, and internal reward systems as contributing factors.

The Japanese do a better job of defining manufacturing strategy.

The Japanese, said Myer, do a better job of defining manufacturing strategy. They separate each product/market segment; define one objective—low cost, dependability, high quality, or flexibility; design plant, process, and organization to meet objectives; develop systems to meet objectives; and fully integrate systems with other functions.

David A. Entrekin, president of Desco, Inc., Mission Viejo, Calif., told Autofact: "No significant sector of U.S. industry has a five-year plan for automating factories, or even a 10-year plan." Compare that with Japan, he said, which has a series of five-year plans. "One company had a plan for a plant in 1966 that was to be remodernized five years hence. It was remodernized in 1971 and again in 1976. In 1981 the plant is scheduled to be torn out again, and it very likely will be."

The point of Entrekin's comments was that it is difficult to get management commitment to invest in new equipment, even though the old is obsolete. "Nobody at the right management level knows how to implement it."

John M. Thompson, president, Index Systems, Cambridge, Mass., and Info/Mfg. speaker, feels similarly. "The pressing need for more sophisticated information systems to support critical decisions by manufacturing executives in the 1980s will not be met unless the executives themselves play a leading role in the design of such systems," said Thompson.

He said that communications between the data processing manager and general management are getting worse instead of better. "The only thing the ceo can tell you about your computer system is when it last went down."

He called assuring the availability of more complete and more relevant information to meet tighter competition and unpredictable events "a major challenge for manufacturing management and a task that can carry high risk, in view of the shortage of competent computer professionals and rapid advances in computer technology."

David Butterfield, senior director of information resources for Prime Computer, Inc., said "you have to have management support to develop a strategic information system." But, he added, "the dp-is-different syndrome is not characteristic of our environment."

Butterfield said Prime is concentrating on user-friendly interfaces in implementing its systems.

Peterson of Arthur Andersen told Info/Mfg. that the big thing in manufacturing resource planning (MRP) is getting the users involved. "A big pitfall in user/MIS relationships is token participation of MIS in system development. You need total participation by both MIS and users, and both have to be involved in the software selection process and acceptance testing."

"Robots are not job-eating ogres. A robot equals a slave."

"You've got to get the user thinking —my system not your computer," said Pawlicki of Northrop.

Warren Doty, manager of operations systems, Pullman Standard, Chicago, suggested at Info/Mfg. that a game plan is needed to sell systems to the executive manager. "He's probably hopelessly lost. Gain his confidence in you, not what you support. That comes later. Deliver service to those he trusts most. Deliver quality and deliver promptly. When you have their confidence, you will have some of his."

Doty believes the top executive feels his involvement ends with his funding of a program: "Tell him what is necessary and why. Keep it basic and make sure he relates to it. Remember, this individual manages men, not systems. He runs a business, not a computer. Let him understand your needs. If he believes in your ability and objectives, he'll give you all kinds of help."

And start now. That was another consensus of the speakers at the three manufacturing information systems conferences.

"Don't wait for utopia," said Evelyn S. Wilk at Info/Mfg. Wilk is manager of the management information consulting division of Arthur Anderson & Co., Chicago. "If you wait for the perfect system you'll never get started. With our fast moving technology, you can't expect a hardware decision to last you 10 years. Even three years can be a long time. So, if a system is cost effective, get your feet wet now and try it."

Many speakers at all three conferences pinpointed the need for more education and training in manufacturing systems. Info/Mfg.'s keynoter Carroll said, "There is no glamour or enthusiasm in educating for careers in operations management."

If greater productivity is to be realized, Carroll said, "there must be cooperation between government and industry and corporations generally."

At Autofact, the Air Force's Anderson noted that "Japan, for instance, is involved in a joint university-industry-government program, costing $100 million, to develop an automatic factory. In this computer-controlled factory, 10 employees will do what formerly required 700 operators working with individual machines."

Dr. Angel G. Jordan, dean, Carnegie Institute of Technology, Carnegie-Mellon Univ., Pittsburgh, Pa., at Info/Mfg., said a three-way interchange with government, universities, and industry is necessary. His efforts at Carnegie-Mellon are with robots in concert with Westinghouse Electric Co.

There was also concern about union reaction. McCarty at Autofact, in talking about CAD/CAM, said, "Another possible obstacle to investment in CAD/CAM systems is the fear of union reprisals. Companies that invest in automated factory operations have to cope with the possibility of strikes as a result of that investment." But most of the sentiment expressed by speakers at all conferences seemed to downplay this risk. "The unions can't help but join us," said McCarty. "The working unions aren't fighting this. The bringing in of systems hasn't only increased productivity, it has eliminated monotonous jobs."

IBM's Haupt at Info/Mfg., whose main topic was robotics, said "Robots are not job-eating ogres. A robot equals a slave."

All three conferences had appendage exhibits, all lively and well perused, indicating the tools and the interest in manufacturing productivity via automation are there. At Info/Mfg., show operators were hard pressed to get exhibit viewers out at closing time.

The Air Force's Anderson sees hope for the future of U.S. manufacturing productivity in the fact that "Japan's reindustrialization was commenced by the U.S. and carried on by Japan. There is no reason why the U.S. can't do it also. However, to accomplish this, the U.S. needs a national strategy."

"The only thing the ceo can tell you about your computer system is when it last went down."

Entrekin of Desco, Inc. also holds out hope. "You are seeing a new breed of young persons who have a broader picture and will be more flexible in knowing how to dedicate their companies to technology."

And, Info/Mfg.'s keynoter, Carroll, said, "It's too early to despair of American productivity. We've had our slothful times, but we seem to have come back."

—Edith Myers

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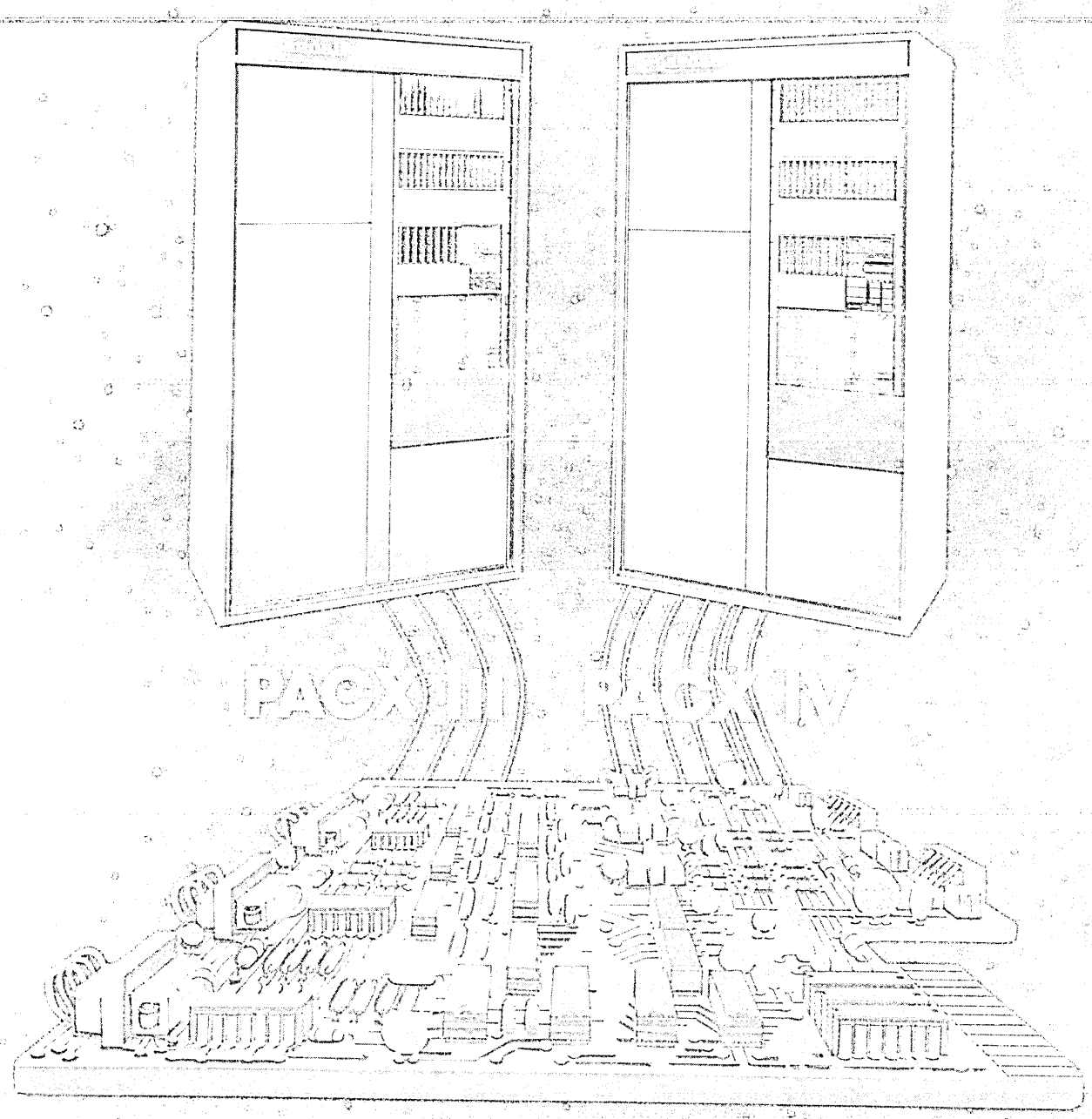

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OFFICE AUTOMATION

ADVICE FOR UNCLE SAM

The Federal Office Automation Conference clearly pointed up that government offices are of another era.

The office of the future is here. Someone forgot to tell the federal government.

More than 6,000 people spent three days at the recent Federal Office Automation Conference in Washington trying to learn why their offices are presently in the past. There were 45 exhibitors to show them what they're missing and a number of speakers to inform them how far they have to go.

"The technology is here—there's no question about that—but it's not being applied properly, and there's no question about that, either," Xerox president David Kearns told his listeners at the "Industry Day" luncheon. "The problem is that the federal government has put the bulk of its office automation expenditures into mechanizing routine operations. So, by the way, has private industry.

"But the challenge before all of us is to change the poorly structured work of managers and professionals and administrators—because they represent 78% of office labor costs. As slow as private industry has been in moving office automation equipment into the hands of professional people, the federal government has been even slower. It really should be the other way around."

But even the hardest shove won't bring on the information revolution before the next decade. Kearns cited resistance to change, cost, uncertainty, and lassitude as reasons why the rebellion creeps in its petty pace from day to day. Only one-tenth of the work force presently employed in handling information is actually aided by electronic workstations. National expenditures for office automation are $1,800 per information worker per year. That should more than quintuple to $10,000 per person by 1990, when half the work force will realize the productivity benefits of electronic workstations, he said.

"That's somewhat slower than expected," Kearns conceded. "But let there be no doubt—it *is* coming. The only thing standing in our way is ourselves. It's time for management, government, and unions to get together and not form three competing entities. This country needs to take some risks."

DAVID T. KEARNS addresses audience at 1980 Federal Office Automation Conference in Washington.

Stepping out over the line may well be the General Accounting Office. Elmer Staats, its main man and the Comptroller General of the U.S., echoed and amplified Kearns' analyses during his "Government Day" luncheon speech. Citing a recent study which indicated the government spent $35 billion in direct office costs during 1979 and office labor costs are increasing 12% to 15% each year, Staats also noted that capital investment for the office worker is a paltry $3,000, compared to $50,000 for the farm worker and $35,000 for the factory worker. White collar workers have a correspondingly lower productivity. Thus, as office labor costs rise and technology costs fall, automation becomes a major element in improving office productivity.

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Staats placed a heavy burden on top management to ensure that attempts to employ information technologies are successful. He called upon management to carefully plan and monitor the organizational and behavioral changes that will occur as offices move further toward automation. Without that attention, he suggested, automation efforts will flounder.

He offered six elements for effective use of office automation as a productivity tool: productivity improvement must become a goal of every agency; proper evaluations of office systems must be completed and procedures streamlined before proceeding with the development of office automation systems; cost benefit and cost effectiveness studies of the most appropriate technologies should be conducted; the human and user interface with the technologies must be well planned in the development of new systems; an evaluation of the system's impact on productivity and delivery of services should be conducted; and top management must be committed to the development and effective use of these systems.

There was no lack of systems from which to choose nor advice on how to implement one at the Washington show. The conference opened with a full-day office automation institute, with topics ranging from concepts and technology to document processing. The main program offered issues sessions, applications workshops, management briefings, technology updates, and product workshops. The variety of subjects—optical scanning systems, reprographics/micrographics, storage retrieval systems, productivity, and planning for the automated office—was enough to satiate the most jaded attendee. For inspiration, there was an hour-long rap by Navy

Only one-tenth of the work force presently employed in handling information is actually aided by electronic workstations.

Capt. Grace M. Hopper, who started with how it used to be when she worked on the Mark I computer at Harvard and finished by reminding the audience that "we have a bad habit of totally underestimating our young people. They know much more than we did at their age. They learn faster and they're bright as they can be. All they need is positive leadership."

A machine or two wouldn't hurt. How much they would help was graphically demonstrated on the exhibition floor, where Christmas came early for both buyers and sellers. All were bullish on automation. "The numbers of people are just overwhelming," Wang's Ray Dorris beamed. "There are people from all over the country, not just the Washington area, and most are the ones who make the decisions on what to buy. It's great for us."

It wasn't bad for the organizers, who liked it so much they'll be back for more next fall.

"There's no organization that needs to increase the productivity of its work and to improve delivery of its services more than the federal government," said conference chair William A. Saxton, who also headed the Federal Computer Conference. "Nowhere are the pressures greater than in the federal office. But no one was paying attention to the issue or to the people who run the offices. We wanted to put together a program directed at federal offices and adminstrators, coupled with a major exposition of equipment available for office automation.

"I think it was a success. We clearly made our mark on Washington."

Some of it may even rub off on the federal offices.

—Willie Schatz

THE CHANGING OFFICE

One vendor urges "organizational consensus" in implementing office automation techniques.

In any attempt to apply technology to the office, it is important that current office procedures be retained to the extent possible; don't try to change the way people do their office work. "Now, that's quite a departure from the traditional data processing attitude," charged Edward W. Scott, Jr., president of Office Power Inc.

In dp, Scott said, people try to avoid automating what they consider to be stupid procedures, preferring instead to improve the procedures and then automate them. "That's fine, if you have 100 years," he added. But he says one really should allow people to do the work as they're accustomed to doing it, permitting them to do it faster and more efficiently.

Speaking at the Word Processing and Office Equipment show in San Jose, Calif., the Washington, D.C., vendor of office automation systems said the first word processing device was introduced by IBM in 1964, priced at $10,000. At the time, secretaries were being hired for about $5,000 a year. Today the situation is reversed. A high-performance wp system is available for less than $10,000 but the secretary is making as much as $18,000.

"Thus in 1964 the cost of technology was double that of a skilled office worker. Today it's exactly the reverse; it's about half," he said. Furthermore, it's a fact that there's a shortage of applicants for office jobs, secretarial and clerical, and this has created a need to apply technology to office functions.

But, he added, it also has become important that one reach an "organizational consensus" on the implementation of automation techniques in the office. In the mid-'60s one could install a standalone wp device in an effort to improve the productivity of a typist without creating a threat to "the crotchety old reactionaries in the company." Those people didn't know the new device was being introduced to the office and weren't affected by its use. "But you can't have a proliferation of terminals throughout an organization without running into the very high risk of substantial resistance among the principals in the firm, who may or may not think it's a good idea," Scott said. "So organizational consensus today is a more significant issue than it was when this technology was introduced."

If automation is such a good thing, why aren't people rushing to automate offices? For one reason, the speaker offered, you seldom find a czar in the office, someone with the power to tell people how to do their jobs. "Offices are very personal places," he explained. "And you've got to be very sensitive to office sociology if you're going to introduce these kinds of technologies in those places."

Another reason, he said, is that until recently there has been no multifunction system that performed a variety of office procedures. We're beginning to see that now, Scott observed, adding that for the first time in the history of the computer industry, users are ahead of the vendors. Users today have a much better idea of what they're going to demand from the vendors than vendors have of what they are able to supply, he averred. In the next five years, there will be big changes, he added, "and you folks in this room will be the beneficiaries."

Speaking of workstation design, the former Department of Transportation administrator said all functions should be available at all workstations. The alternative would be that people would have to go to different workstations to do different things, and that's a bother. He used the analogy of the telephone, noting that the phone used by the board chairman will do the same things as one used by mail clerks, and therefore no special training in its use is required.

"And that's how I feel about office workstations. Anybody ought to be able to sit down at any workstation and do whatever work it is they have to do. There should not be a dramatic difference between a workstation for word processing, for billing, or for legal research."

Scott also called for the design of office systems that require minimal training

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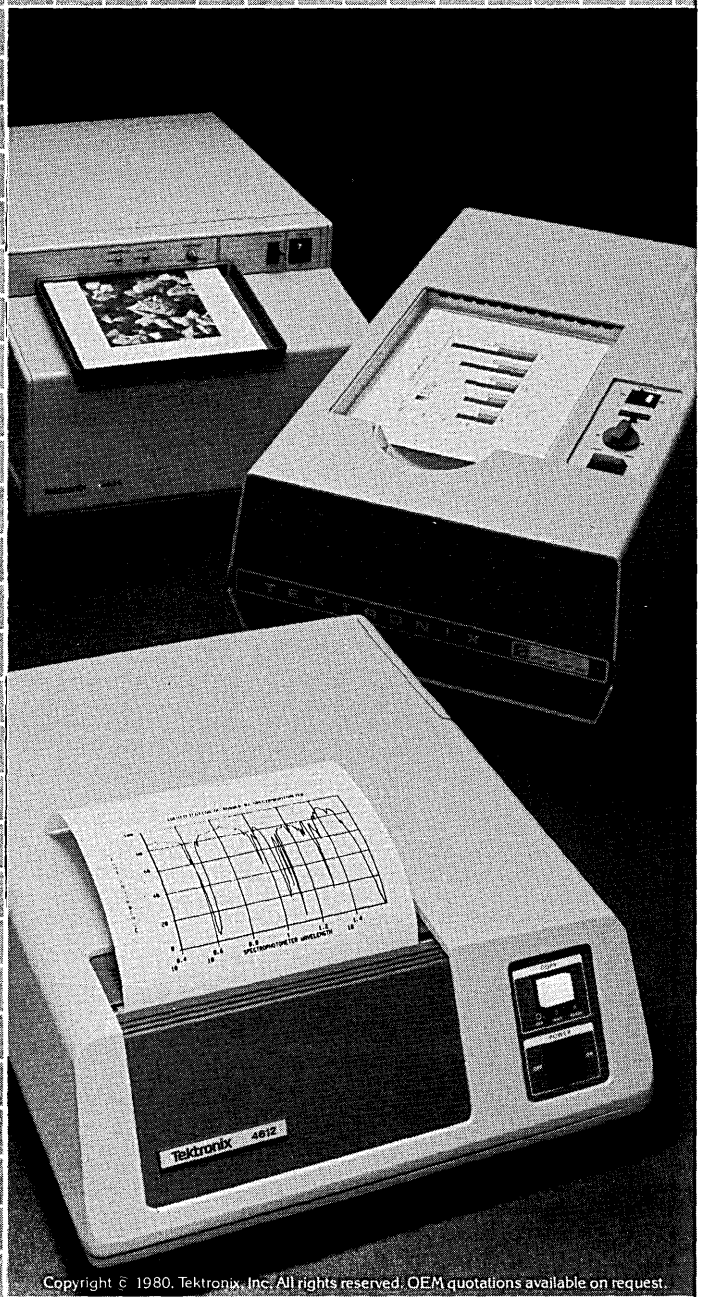

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for users. And he said one should recognize that an office consists of interdependent work groups that must share certain files. "Some of the information being worked on by one group must be shared with other groups, and we should allow this to happen."

—Edward K. Yasaki

RUNNING IN THE WRONG DIRECTION?

Office automation was a hot topic at several other recent conferences. According to some authorities, the pushers of office automation are zeroing in on the area of least potential.

Richard Wiersba told an ACM '80 session in Nashville that efforts to date have been aimed at secretarial/clerical tasks, which he said represent only one-fourth to one-third of total office labor costs.

And in Los Angeles, Ron Christman, Western regional director for The Diebold Group, told an audience at the National Retail Merchants Assn.'s data processing and retail systems conference that too much attention is being paid to the clerical area while "the real payback applications are in the professional and managerial area."

Christman believes the benefits of office automation can be divided into two camps: cost displacement and value added. He believes "value added is the larger opportunity area."

Wiersba offered a different kind of categorization, quantitative versus qualitative. He feels "technology is too often restricted to the quantitative aspects. It's a people problem and you must get people involved."

Wiersba, of Bentley College, Waltham, Mass., fears the reduction of secretarial/clerical tasks to primitive work. "You structure the 'constructural' job and take away all the fun." For sustained productivity, he said, "you need a mix of discretionary and repetitive jobs."

He also feels that communications and math skills of all white collar workers have deteriorated in recent years. "The productivity problem will require doses of technology on a temporary basis, but education is what will count in the long run. The most effective worker will need better communications skills and an upgraded conceptualization of tasks, objectives, and resources and a higher level of computer literacy. Technology should magnify human capabilities, not replace them."

Within the managerial/professional area, he divides tasks into structured and unstructured. The structured tasks, he said, include pure record-keeping and information transfer, and are the first to be automated.

He said the unstructured tasks differ with the type of business and the level of management. They require access to databases and processing packages as well as increased acceptance of technology and expertise in its direct use.

Another panelist at the ACM '80 session, Ron Oliver, The Mitre Corp., also feels managers should be retrained to use a different tool in a different way and that their staffs should be trained too. But "we can't depend on that," he said. "We should not require them to become computer scientists, only to be comfortable with their machines."

Oliver believes that, "in parallel with retraining," the computer science community should offer the new automation user "a service similar to that offered by lawyers and accountants, a place where they can secure periodic professional expertise of computer scientists without putting them on the payroll and without paying exorbitant consulting fees."

Oliver also advocates "different vendors for different boxes," and feels there "is a great need for better communications from vendor to vendor." He would like to see different functions brought in separately.

Wiersba's big push was for identification of needs. "Define the problems, then call in a vendor via a request for proposal."

Christman at the NRMA conference envisioned a day when truly integrated office systems would be offered by "IBM, AT&T and Exxon Enterprises."

He sees the stages of office automation, a term he feels is unfortunate, as conception, integration, contagion ("the prairie fire stage which will characterize the early '80s"), and creative evolution ("work of the visionaries which will come to pass in 1990-plus").

—Edith Myers

MEETINGS

FRENCH STOLE THE SHOW

The French Pavilion, starring 25 French companies, was easily the dominant feature in the Intelcom '80 exhibit hall.

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ple to the Los Angeles Convention Center in November. And many of them were French.

The French Pavilion, with 25 participating French companies, was easily the dominant feature in the exposition's exhibit hall. Champagne and sandwiches were served in the pavilion on the show's first day, but it was obvious the refreshments only whetted the appetites of show-goers for the exhibits of French technology, as the area was as crowded on the three ensuing days as it was on the first.

Among the many languages heard in the aisles and in the halls, French was second only to English. Also, the French outnumbered any other country in representation in the press contingent.

Star of the French Pavilion was the group of products under the umbrella Telematique, the name the French have given to their national program of "democratizing" technology.

Roy Bright, managing director, Intelmatique, the international marketing arm of the program, explained that its aim is to bring the advantages of computer and telecommunications technology within the reach of everyone who has a telephone.

The French, who never have been noted for the efficiency of their telephone service, seem to have come a ways toward doing just that. They're working on improving phone service too. Bright said that by 1983, everyone in France who orders a phone will get one in less than one month.

The Intelmatique managing director, an Englishman imported for the job because of his experience with the British Post Office and its Viewdata project, explained that his organization is "a wholly owned, arms-length subsidiary of the French PTT. We want to create a shop window worldwide for Télematique. Our mission starts at the boundaries of France."

He described Telematique as a coordinated program of product development with emphasis on low cost and ease of use. "We want to keep things user friendly and improve the ability of the nonexpert to communicate."

He called videotex the "cornerstone" of the Telematique program, emphasizing that its diversity is in sharp contrast to the single product approach to videotex adopted in some countries.

Bright said no product in the program is restricted to one developer. For the electronic phone directory, one of the program's products demonstrated in the French Pavilion, he said four companies are working on the gear.

The electronic telephone directory was demonstrated at the show using a database of numbers and other data from the Big Bear lake resort community 60 miles east of Los Angeles. Data included more than 15,000 names plus Yellow Page information on restaurants and the area's range of tourist attractions. It was accessed via an alphanumeric keyboard.

The directory is a simplified version of the videotex service the French call Télétel, also demonstrated at Intelcom. Télétel uses more expensive video terminals and can access a wider variety of databases over telephone lines.

There was also "mass-Fax," a consumer facsimile service developed by several French companies, which can transmit a page of paper through the existing telephone network in speeds ranging from 40 seconds to two minutes. It also can act as a photocopier or hardcopy printer for the Télétel terminal.

The aim of the Telematique program is to bring computer and telecommunications technology within the reach of everyone who has a telephone.

Visitors to the French Pavilion also could "telewrite" multicolored messages and drawings from tablet to telephone line to distant tv screen, with simultaneous participation by the person at the other end of the line.

The French also showed their "smart card," a credit card-like device in which a tiny chip is embedded. The chip's memory contains its owner's identity, money value or banking power of the card, and other personal information as needed. It can be used at home with a Télétel terminal to shop or pay bills and can be used in stores with special transaction machines.

Flonic-Schlumberger, Cii-Honeywell Bull, and Electronique Marcel Dassault all exhibited smart cards at Intelcom along with automatic tellers and point-of-sale terminals.

Bright emphasized the fact that Intelmatique is exporting technology, not products. "We are looking for international partners." A U.S. firm expressing interest to Intelmatique in a particular technology would be put in touch with any and all French firms working with that technology.

In a major Intelcom address, delivered in French, Alain Bravo, deputy director general for French Telecommunications, said that "a truly international Telematique in the best interest of the users can only result from a balance between liberalism and standardization."

He said the French Telecommunications Administration sees its role limited to that of an information carrier. "It will supply the basic Telematique service made up of the telephone and of the electronic directory. The other services such as videotex, in France called Télétel, will be offered by information suppliers who will benefit from

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a very liberal atmosphere, encouraging creativity and competitive dynamism."

But Bravo does not feel liberal evolution should stand in the way of standardization. "We must, at all costs, avoid former mistakes. There must not be a European Telematique, another American, another Japanese."

In an earlier press conference, speaking in English, Bravo said the French have always wanted to cooperate with all countries working on Telematique.

It was, after all, an international conference. Six different countries were represented in the exhibits and 35 countries were represented by attendees.

The Third World was there with a plea that they not be left out. Emmanuel Egbe Tabi, Minister of State for Posts and Telecommunications, Cameroon, said there is "a big gap in the telecommunications of industrial and developing nations . . . While we are dependent on the products of industrial counries, they come too fast." He said products change frequently and "are put on the market for us to buy." He urged industrial countries to "think how we can integrate [technologies]."

Tabi said that developing countries frequently have to develop their telecommunications networks with funds borrowed from abroad. "And then they make us buy their things."

One of the basic tenets of human rights, he said, "is the right to know-how. Should developed countries deny developing countries that right? Transfer of technology would work for the common good of all. We have a duty to appeal to developed countries to see that telecommunications technology no longer be a secret."

Festus Ho Akindele, general manager of the Nigerian Telecom Co., didn't talk about money problems; Nigeria has oil money. "We have money, but not the capacity to spend it." He noted that intra-African telephone calls are still routed through London if English is spoken and through Paris if French is spoken.

He asked developed countries to put a price on technology transfer. "We appreciate that technology costs money and they're not going to give it out free. But please, please be more sincere with us. Tell us, 'This is the cost,' and then we can shop around."

But things are happening. Robert J. Saunders, chief of the Telecommunications Div., the World Bank, said his bank in fiscal 1981 loaned $400 million for telecommunications in developing countries and half as much again for telecommunications as subcomponents of other projects.

Terry Heenan, president of Trans-Canada Telephone Systems, was a voice from Canada on behalf of "communications on an international basis." He said Canada has "taken a responsible role in developing standards."

He noted that Canada's Data Route, established nine years ago, is still growing at the rate of 20% per year. He said Data Route would begin testing fiber optics in Toronto this year and that Saskatchewan was constructing a $56 million fiber optics network for multiple use throughout the province.

Another Canadian, Tom McPhail, School of Journalism, Carleton Univ., Ottowa, who also talked about fiber optics saying he believes they will be the communications vehicle of the 1990s. He considers cable the vehicle of the '80s.

Videotex is the cornerstone of the Telematique program.

McPhail said he believes that the era of mass communications has passed and that we are in an era of mini communications—that we have gone from mass media to select media.

"The news," he noted, "was one of the first areas to be collected electronically. It is only a matter of time for it to be disseminated electronically. The distribution system is becoming more and more expensive in terms of labor, energy, and newsprint, while the cost of electronic distribution is falling by one-half every two years."

McPhail believes even the ad base of a newspaper lends itself to selective distribution.

Conference keynoter Charles D. Ferris, in what was one of his last public appearances as chairman of the Federal Communications Commission, also talked about the future. "We are embarking on a decade of definition. We will be defining the very quality of life on earth." He said this would be fueled by two related trends: "a seemingly limitless flood of technical innovations and a furious growth of market applications and federal regulatory policies which are becoming an active force in removing obstacles."

He said the U.S. economy is becoming more clearly dependent on the rest of the world and that fundamental policies have, for the most part, been established.

He was concerned about privacy. "As you develop goods and services for the information society, I would ask you to think of the privacy consequences and to try to address them at an early stage. Design them away, program them away. Do your human engineering with this human interest goal in mind."

Of his own future, Ferris had less to say. He told a press conference gathering that the new President would appoint a new FCC chairman. His own term as a commissioner, he said, expires in 1984.

—Edith Myers

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NEWS IN PERSPECTIVE

FUNDS TRANSFER

EFT IS ALIVE AND WELL

According to the Electronic Money Council, electronic funds transfer systems are growing by leaps and bounds.

Electronic funds transfer systems are alive and well. That's the latest word from the Electronic Money Council, as told to some 50 attendees of its recent national financial conference in Washington.

That good news for EFT enthusiasts is based on a 15-month survey of 23 banks and 12 thrift institutions, the median assets of which were $1.6 billion, conducted by the EMC's Electronic Money Index. According to the council, the index is the first systematic measurement of the growth and use of EFT systems.

For the survey, the Index covered five EFT services—automatic teller machines (ATMs), telephone bill payment (TBP), automated clearing houses (ACH), check guarantee services, and point-of-sale (POS) services. In the 15 months ended April 1980, overall EFT services had grown 26%. ATMs surged 60%, TBP rose 27%, ACH (e.g., direct deposits) jumped 67%, check guarantee grew 34%, and POS was up 29%.

"The extraordinary growth in the use of these so-called 'money machines [ATMs]' by consumers is a clear signal that, despite some alarmist predictions, consumers like their EFT, and are finding it convenient, reliable, and safe," EMC president Wendell McHenry said. "Even more significant is that, of the 30% growth in ATM installations, two-thirds came from expansion of existing services. That means those institutions that made an initial investment to install ATMs are finding that business is good enough to install more."

But of course. It's downright un-American not to want to run to the bank, stick your card in the little slot, and watch the machine spit back $20 bills. It's equally unpatriotic not to crave the latest, greatest office technology—as long as it's at someone else's workstation.

"We professionals haven't adapted to change as rapidly as we think," Louis Mertes, vice president, systems, of Continental Bank of Chicago, said at the EMC conference. And that's easy to see when you look at office productivity, he added.

"Everybody's talking about it," said Mertes, who has done something about it by developing an office so totally automated that he rarely sees his secretary more than 45 minutes a week, "but they're only referring to automating the support staff. If you concentrate on word processing, you're missing the whole point. What we really need to talk about is management and professional productivity."

To this point there's been much talk and little action, due mostly to workers' desires to automate anywhere but at their desks.

"The hardest part is overcoming the behavior problem," said Robert Grant, a vice president of Booz Allen & Hamilton, Inc., who discussed findings of his firm's most recent study on office productivity. The report revealed that American businesses spent $800 billion in 1979 to support office-based white collar workers. By 1990, the direct cost of white collar operations could reach $1.5 trillion. But $300 billion can be saved annually by implementing office automation.

"You can put in a system in three months, but it takes five years to get people to use it," Grant said. "It's extremely difficult to convince people to change their habits and how they spend their time. The less productive segments of how they spend their day are more open to automation and less resistant to change.

"The focus on automation in the past has been on the support staff. It should be focused on the managerial and professional levels, because that's best for user benefits. Further benefits can be realized from improvement in managerial and professional productivity. But until that occurs, the marketplace will not realize its full potential."

To hasten that process, Mertes, who swore productivity can be increased 13% by saving a professional one minute per day, offered a five-step program.

Start with audio mail, thereby eliminating "telephone tag," in which the parties call each other six times per day but never speak until the following week. Follow that with text automation (basically word processing and dictation); then include electronic mail and an instantaneous retrieval information system (IRIS), which permits the user access to information through a telephone terminal. Finish with education, because people will demand to know what you're doing and why you're doing it to them.

"What we really need to talk about is management and professional productivity."

"I thought it could be done in two or three years," Mertes admitted, "but it takes five to 10 because of the behavioral changes required in individuals. It's not easy to get started. You need some innovators to get you going."

—Willie Schatz

BENCHMARKS

MEMOREX DROPS BSD: Memorex has dropped its Business Systems Division, and has moved its small business system, peripherals, and software product lines to other Memorex groups. The move is due to increased competition and lack of profitability in the System/34 and System/38 marketplace, sources say. The move also follows the recent departure of Gary Hughes, former general manager of BSD. Memorex spokesmen say they will continue marketing System/3, 34, and 38 products through the Storage Systems and Communications Groups. Storage Systems' group vp of sales, Richard McCraney, is now responsible for business system sales, but Hughes will not be replaced, and BSD will "no longer exist," Memorex said. Before Memorex acquired BSD in 1977, the division was a company called Business Systems Technology, worth about $13.6 million. Facilities for the defunct division, Santa Ana, Calif., will continue to manufacture System/3, 34, and 38 products, and no layoffs are expected. The division drop is said to be part of C.W. Spangle's plans to shape up Memorex by getting rid of lagging and low profit programs.

Meanwhile, Memorex is not faring well in the courtroom. Its request for a reversal of the August '78 verdict that cleared IBM of antitrust charges was rejected. But Memorex hasn't abandoned hope, and plans an appeal.

WELCOME OLIVETTI OPE: Olivetti Peripheral Equipment S.p.A. has created a U.S. subsidiary corporation named, like its parent, Olivetti OPE. It will operate as an independent company, separate even from other Olivetti operations in the States, to make and implement decisions with regard to the American oem peripherals market. Presently, there are no plans for manufacturing facilities in the U.S., but there will be limited facilities to adapt and modify equipment design at Olivetti OPE's headquarters in Elmsford, N.Y. Gianni Subrizi, vp of sales and marketing for the new U.S. operation, states, "By the end of 1981 I expect our U.S. revenues to reach somewhere in between $6 million and $10 million." Parent Olivetti OPE, previously the peripherals division of the Olivetti Group, became an independent company on Jan. 1, 1980. While Olivetti OPE is completely independent operationally, it will still maintain access to the resources of the Olivetti Group in areas such as R&D and financing. OPE will employ a direct sales force to market its products to large oems, and a network of 10 to 12 distributors who will sell to end users and small systems manufacturers and assemblers. OPE's first distributor is Printer Systems Corp., Gaithersburg, Md. Olivetti OPE markets three types of printer systems: thermal, daisywheel, and dot matrix. It also

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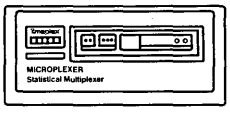

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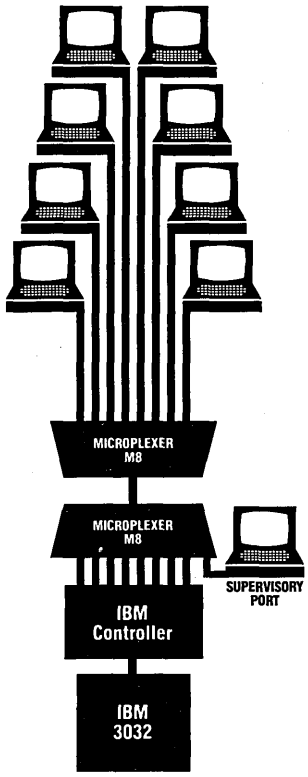

This West Coast data communications network, which is managed by Alco Data Services, is based on SERIES II MICROPLEXER statistical multiplexers located in Los Angeles, California and at the Corporate Data Center in Valley Forge, Pennsylvania.

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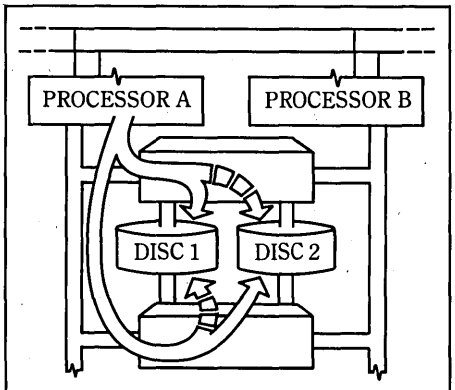

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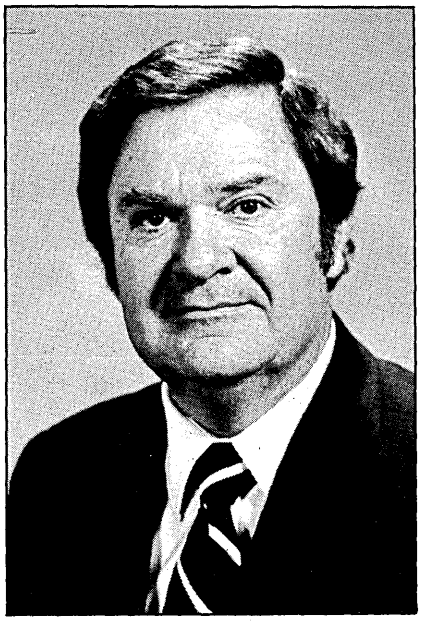
NEWS IN PERSPECTIVE

CANOVA'S NEW COMPANY: Calcomp's former president and ceo, George M. Canova, has formed a company, Novell Data Systems, Inc., to manufacture and market small business computers and intelligent terminals. Located near Salt Lake City, the company will offer a new concept in computer hardware/software for small business markets, Canova claims. Major financing for the company is being provided by Safeguard Industries, Inc., Philadelphia, which is the majority shareholder. Novell Data Systems will offer its products worldwide through a network of computer dealers and distributors. Canova is president of Novell; joining him are Jack L. Davis, senior vp of sales and marketing; Sherril A. Harmon, vp for engineering; Philip L. Long, vp for software development. Other announcements concerning key executive appointments and details of initial hardware/software products are expected this month.



GEORGE M. CANOVA: He's formed a new small business computer company.

DP SALARIES RISING: From June '79 to June '80, dp position salaries increased in the U.S. at an average rate of 10.2%. The 16th annual edition of A.S. Hansen, Inc.'s *Weber Survey on Data Processing Positions* states that the "increase is the largest year-to-year, across the board increase ever recorded by the survey." According to the report, entry level salaries continue to be strong, and have increased 11.8% over the last year, compared to a 9.1% increase for senior level positions. Because of the higher cost of recruiting, many firms are turning to "homegrown" dp staffs, the report says. Top dp executive salaries increased 10.3% to an average of $46,000. The highest paid person at this level reported earnings of $140,000 annually in direct compensation. Five years ago, the average was $29,588, and the highest paid was $59,020. Location is also important—cities with higher than average increases were Los Angeles, up 11.1%; Minneapolis, up 11.3%; New Orleans, up 13.5%; and Cleveland, up 11.3%. Included in Hansen's survey were such companies as AT&T, Chase Manhattan Bank, and R.J. Reynolds.

NCC FOR KIDS: The 1981 National Computer Camp will feature two action-packed one-week sessions this summer. The first session is scheduled for July 19-24, and the second for July 26-31. Campers, ages 10 to 17, will learn on mini- and micro-computers in small groups—to insure ample "hands-on" time. This recreational and educational experience is directed by Dr. Michael Zabinski, professor at Fairfield University, Conn., and assisted by elementary and secondary school teachers. It is the original computer overnight camp. Kids with all levels of experience are welcome. For further information, contact Michael Zabinski, PhD, at (203) 795-9069, or write to Computer Camp, Grand View Lodge, Box 22, Moodus, CT 06469.

OFFICE FUTURE BRIGHT: "Today, pioneer users of office automation products frequently must undergo a wrenching experience to replace a manual operation. Often, the benefit is only partial at that, e.g., a word processor that focuses on only part of a business' needs. Its functions remain isolated from other automated facilities, e.g., machine dictation, telephone, and facsimile." These two major drawbacks—incompleteness and isolation—in current office automation will determine how future office technology evolves, says a report, *Future Office Systems, Equipment, and Associated Software Markets*, by Frost & Sullivan, Inc., New York. The report claims that the current "piecemeal" office automation is a first step that will last through 1984, but during the second half of this decade, true integrated office information systems will "begin to take hold." Frost & Sullivan predict that by mid-1980, "an office automation system will have to offer a broad range of facilities to be successful, such as text editing, report formatting, teleconferencing, on-line data access, project management, telephone services, etc." Other findings are that the hardware components necessary for integrated systems are available, but software is still a primary bottleneck. However, the greatest need currently felt by the innovative office is to have smarter filing systems, where DBMS is the starting point.

CHIPPING AWAY: According to a market analysis released by Creative Strategies International (CSI), a California-based market research and consulting firm, worldwide sales of microprocessors and microcomputer products will top $5 billion by 1985, showing an annual growth rate of 32%. Although there are more than 100 competitors, the industry's top four firms account for 80% of the revenues. CSI has segmented the market into four categories: product type (microprocessor chips, microcomputer chips, microcomputer boards, general-purpose microcomputer nucleus systems, and microcomputer development systems), architecture, geographical production and consumption, and end-user industry distribution. The U.S. accounts for nearly three-fifths of the total market—it is the largest microprocessor-based product user. Due to the maturing of technological sophistication in other countries this figure is expected to decrease to less than half total consumption by '85. The sum of the Japanese and Western European markets will show an increase of nearly 35% in the world market, making up most of America's decrease. The report shows that "microcomputer boards will see the largest increase in unit shipments through 1985. Microprocessor and microcomputer chips, as well as general-purpose microcomputer nucleus systems, will all grow at rates greater than 30% compounded annually." It also stated that currently, across all five product types, the 8-bit models dominate. However, the highest growth segments will be 16- and 32-bit models during the next five years; these advanced architectures will grow at the expense of 4-bit units and, to some extent, the 8-bit versions. CSI also believes the Japanese will continue chipping away at the U.S.'s production lead, but that U.S. firms still have a three- to five-year lead in most industry segments.

GROWTH THROUGH '82: Recession and inflation will not have a significant impact on the U.S. computer industry, according to a report from Venture Development Corp. titled *The U.S. Computer Industry 1980-1982: A Strategic Analysis*. Industry shipments are expected to grow at an annual rate of 15.3% through 1982, to reach $49.2 billion in '82 from $27.9 billion in '78. Three key industry categories will all share a growth of about 15% per year: computers, peripherals, and data storage systems. Some statistics from the category of computers are that minicomputers will show a 26.7% annual increase in shipment value through '82, desktop computers will show a 36.5% growth rate, and small business computers will show a 39.1% growth rate. Computers as a group will grow by 15.6% annually in shipments, peripherals will increase by 14.8%, and data storage or memory devices wil grow at a slightly lower rate of 13.8%. Venture Development's report not only forecasts U.S. shipments for every major product, but also identifies key marketing and technology trends that will affect specific product groups.

—Deborah Sojka

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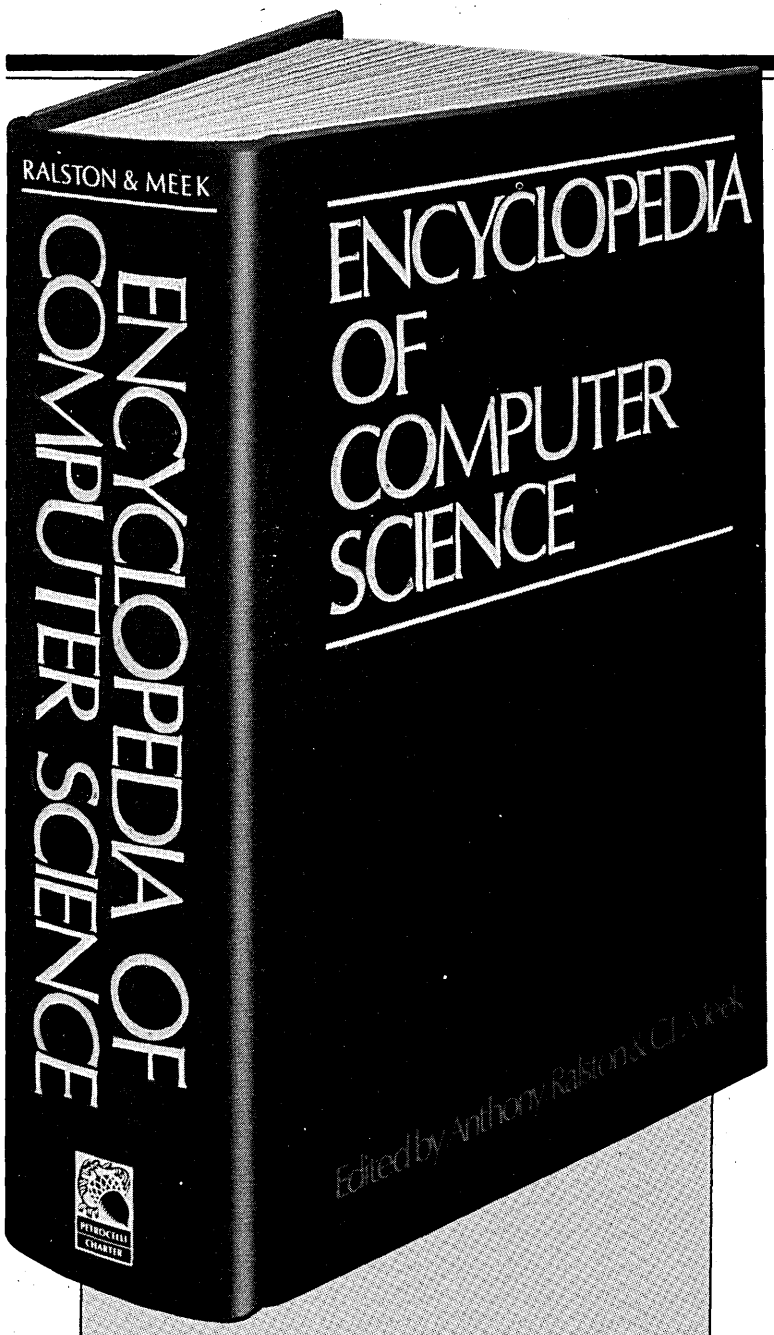

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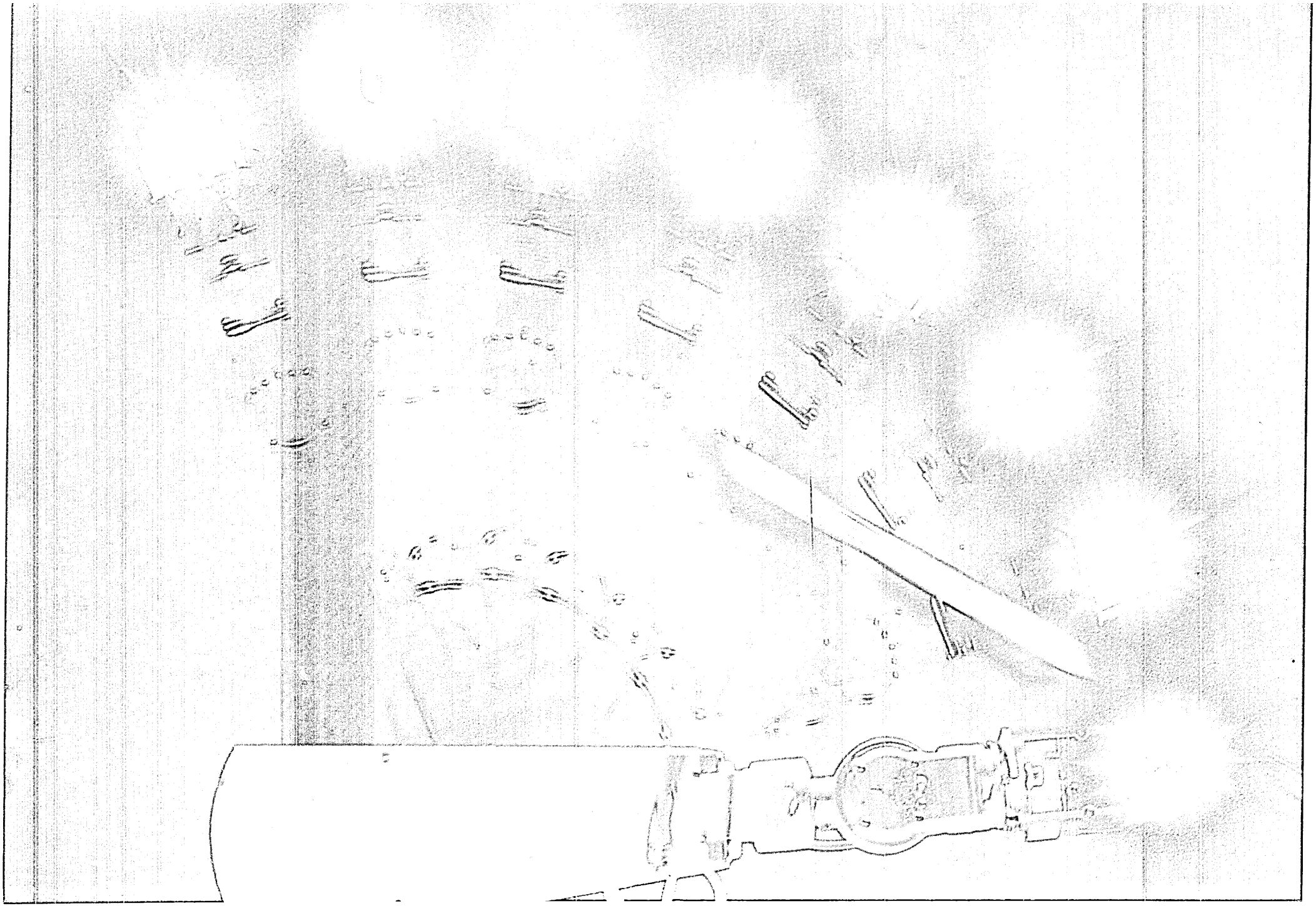


ROBOTS TO THE RESCUE?

by Leopold Froehlich

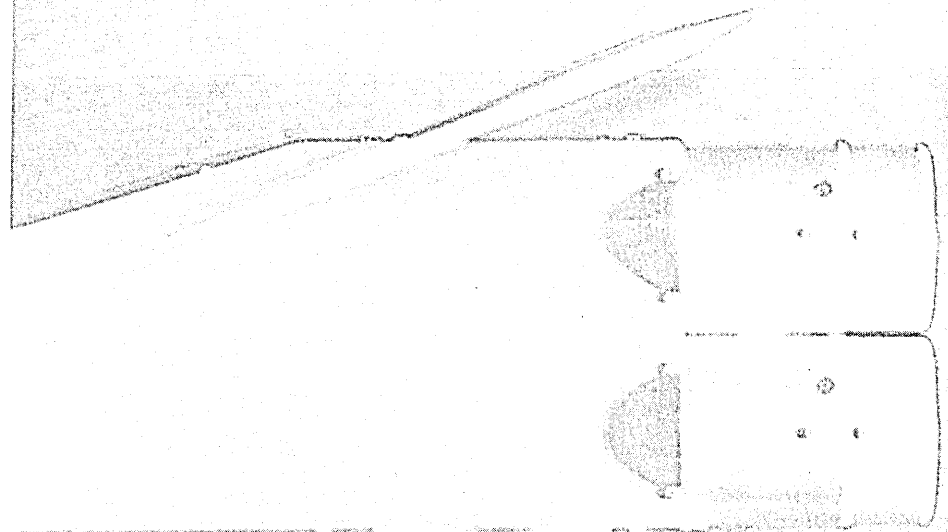
The robotics industry is entering an era of explosive growth that may be just what the U.S. economy needs.

The undeviating KUKA IR601/60 moves through a spot-welding operation with a certain actuated grace. The thyristor-controlled motors make little noise as they imitate the movements of a human arm and wrist. It's an unnerving process to watch the machine appears animate, and its wide radial motion seems powerful and effortless.

The KUKA is one of about 25 robots that worked nonstop during the three-day Robots V Conference and exposition held in late October in Dearborn, Mich., and sponsored by the Society of Manufacturing Engineers. The Exposition Hall of the Hyatt Regency was crowded with manufacturers, product engineers, and roboticists, all of them reflecting a mood of buoyant optimism. As well they might: the robotics industry is almost certainly entering an era of explosive growth, and according to many economists, that is exactly what the U.S. needs. With the aid of robots—so goes the consensus—productivity will increase and U.S. industry will be made whole once again.

While many people who long to solve the malaise of the industrial West see the industrial robot (IR) as an elixir, many more are beginning to recognize the manifold applications of these machines. So the atmosphere at Dearborn, if not one of wanton confidence, at least suggested a manumission from current industrial woes.

The KUKA IR may appear frighteningly vivified, but it bears little resemblance to the popular notion of a robot. It looks like an unwieldy jumble of counterbalanced axes connected to enclosed control and power units by a fascicule of cables. This is a robot employed by European auto-body makers such as BMW for spot welding and flexible assembly. West Germany's KUKA has installed some 170 robots to date, with current orders for at least 126 more. Prab robots are used in die-casting operations at Milwaukee's Briggs & Stratton. Unimation's PUMA robot palletizes and packs skin lotion containers at Chesebrough-Pond's plant in Clinton, Conn. (at a savings of up to $40,000 a year), while an Auto-Place Series 50 robot is used in an automatic system for transferring glass parts at Corning Glass Works in [illegible]



Robots are already proving themselves adept—most notably in auto manufacturing—at increasing productivity, reducing waste, and maintaining quality. They are variously applied in welding, material handling, machining, and assembly. Some analysts predict a fivefold jump in robot-makers' revenues during the next two years. The Robot Institute of America (RIA) conservatively predicts a 1985 market of $212 million (up from $63 million in 1980). Everyone seems to believe in robots, and a lot of these believers are now scrambling for ways to em-

Everyone wants new machinery and newer processes, and robot manufacturers are scrambling to seize a part of this gold rush market.

ploy them.

John DiPonio, president of Robotics International of the Society of Manufacturing Engineers, was surprised at the response to this year's conference: "In 1979, we had about 480 people in attendance. This year we had over 1,000." It appears that everyone wants new machinery and newer processes, and robot manufacturers are scrambling to seize a part of this gold rush market. What is the key word in this wide-open field? DiPonio says, "This year's conference emphasized the use of industrial robots to increase productivity."

Productivity is the cipher to understanding the pullulating interest in industrial robots. It is an estimate of output per labor hour worked, or more simply, the ratio of output to input. During 1947-67, U.S. nonfarm productivity increased at an annual rate of 3.2%. In 1977, there was an increase of 1.3%; in 1978, only 0.6%. In the first half of 1979 it actually declined at a projected annual rate of 3.2%. U.S. productivity increase (1.1% for the years 1967-77) has lagged behind that of other industrial nations, most notably Japan (6.2%), West Germany (4.2%), and Italy and the U.K. (3.6% and 2.4%, respectively). Had our productivity held at a rate of 3.2%, real GNP would have been $250 billion greater in 1978, representing $3,500 additional income for every family in the U.S. Lags in productivity help cause both inflation and unemployment. Robots appear suited to reverse this trend.

PRODUCTIVITY FACTORS

Classical economists posit that three factors determine productivity: labor (said to account for about 14% of productivity rates), capital investment (contributing 27%), and technological advancement (59%). In recent years there has been a bottoming out of the historical shift from agricultural to industrial workers, and this may have lessened labor's contribution to productivity increases. Economist John Kendrick has suggested, however, that labor may be the only factor in the classical equation that contributed more to productivity growth during 1973-78 than it did from 1948 to 1965.

Capital investment stock did not expand as rapidly as our work force, and this caused a real decline in the amount of capital invested per man-hour of labor. Ominously, 34% of U.S. machinery is over 20 years old and 69% of our cutting tools are over 10 years old. The real U.S. nonresidential fixed investment since 1966 has been a smaller percentage of the Gross National Product (13.5%) than in Japan (26.4%) or West Germany (17.4%). It is hoped that congressional efforts such as the Jones-Conable Capital Cost Recovery Act or the 10-5-3 depreciation allowance will redress this imbalance in capital formation.

Progress in technology, including improved management techniques and integration of the manufacturing process, is the most important factor in the classical equation for productivity, hence, the mainstream emphasis on two related technologies currently offering prime opportunities for improvement: computers and robots.

But not everyone is in agreement on the determinants of productivity. A so-called doomsday approach attributes the decline to the law of diminishing returns and to inherent limits to growth. A doomsdayer points to declining natural resources and increasing population while claiming that restitution must be made for the imbalances generated by past efforts to sustain productivity growth. The Club of Rome is the best-known proponent of this view. It contends that we are reaching the limits of improvements to either products or processes. Says economist Edward Renshaw, "The prospects for further improvements in labor productivity appear to be quite limited."

Neo-Marxists ascribe the decline to an increasing alienation and dissatisfaction among workers caused by the deintellectualization of the workplace and a segmented process of worker control. Workers' priorities have shifted in the last few years from issues of pay toward issues of improving the workplace. A special task force for the 93rd Congress noted: "Simplified tasks for those who are not simple-minded, close supervision by those whose legitimacy rests only on hierarchical structure, and jobs that have nothing but money to offer in an affluent age are simply rejected."

Free-market economists like Milton Friedman, on the other hand, reckon that productivity slowdown is primarily caused by governmental intervention, namely, high marginal tax rates, environmental and safety regulations, and restrictive fiscal and monetary policies.

Some writers even question whether our present difficulties stem from failures in productivity at all. Long-standing assumptions are being challenged; society may be rendering, according to University of Nebraska economist Campbell R. McDonnell, "a more or less conscious decision that 'more' is not 'better.' "

The Council of Economic Advisers reported in 1977 that "the reasons for the slowdown are not fully understood at this time." But whether or not the phenomenon is fully understood, manufacturers are turning to robots as a means of improving productivity. The world population of robots is estimated today to be about 6,000, 45% of which are in the U.S.

What exactly is a robot? Definitions vary and the distinctions are often muddled. The Robot Institute of America defines a robot as a "reprogrammable multifunctional manipulator designed to move material, parts, tools, or specialized devices through variable programmed motions for the performance of a variety of tasks." Another definition comes from R.L. Paul and S.Y. Nof (1979): "The industrial robot might be viewed as a combination of a remote manipulator and a numerically controlled machine tool." Joseph Engelberger, president of Unimation, the largest robotics firm in the U.S., defines an IR as a "programmable manipulator with a number of articulations." By commonly accepted American standards, a robot should be both programmable and capable of performing a variety of tasks. The robot is a general-purpose tool.

The Japanese Industrial Robot Association (JIRA) specifies four levels of IRs: manual manipulators that perform fixed or preset sequences; playbacks that repeat fixed instructions; NC robots that execute operations by numerically loaded information; and intelligent robots that function through their own recognition capabilities. The RIA would not include manual manipulators, so Japanese and U.S. IR population figures are not precisely comparable.

There are essentially two classes of robots: servo-controlled and nonservo-controlled. With the latter, the tool center point (TCP) can stop only at the fixed end points of each axis. Many motions can be made in sequence with a nonservo IR, but only to these end points, and without provision for either acceleration or deceleration. Prab conveyors are nonservo robots, as are most pick-and-place or point-to-point manipulators. A servocontrolled robot can generally be programmed to stop at any point within its range of motion (movement is controlled by oil flowing through servo valves or by DC electrical engines), allowing for both acceleration or deceleration of the TCP.

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Low-technology machines often get the assigned task done as well as high-technology models. The Japanese are acutely aware of this fact; they are not as concerned

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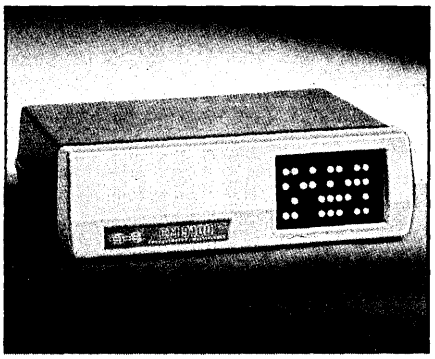

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with high-technology IRs as are U.S. users, and instead tend to concentrate on implementing existing technology. The majority of IRs installed in the U.S. today are low- or medium-technology devices, such as the pick-and-place manipulator.

The simplest low-technology pick-and-place manipulators, such as the Seiko minirobot, usually offer only two or three degrees of freedom. The medium-technology robot is a special-purpose device, such as the Trallfa, which is designed for one specific purpose, namely, spray painting. The third and highest level is the universal manipulator, such as Unimation's PUMA or Olivetti's Sigma/MTG assembly robot, which offers the greatest degrees of freedom and variety.

HOW ROBOTS WORK

There are two forms of robot control: point-to-point and continuous path. A point-to-point robot can be programmed to stop at many predetermined points, but movement is not controlled between these points. A continuous-path robot can follow an irregular path exactly. Point-to-point robots usually offer greater accuracy of repeatability—some to within ±0.010—because of their fixed-stop endpoint positioning. Servo robots, because of the inherent limitations of their feedback systems, are typically not as accurate.

Three of the most common configurations used in robot design are the polar, or cylindrical (such as the Versatran), rectilinear (such as the Reis), and anthropomorphic, or jointed arm (such as the Cincinnati Milacron T3). Each configuration has its advantages, notably the work area required for the robot and the reach that the robot can attain, as well as its weight-carrying capacity. Jointed-arm configurations generally cannot carry as much weight as other types, although there are a number of exceptions.

There are three primary programming methods for an IR: lead through, in which the operator controls the robot through the desired positions and locations by means of a remote teach box; walk through, where the IR is physically manipulated through the desired motions (which are recorded and then played back by the robot); and plug in, where the IR operates via prerecorded program without manual intervention. Again, each method has its advantages. For example, debugging problems are less common among walk-through programs, while plug-in programming can be library stored for faster reprogramming.

In prevailing industrial robots there are three types of power or drive sources: pneumatic (costing roughly $8,000 to $20,000), hydraulic ($24,000 to $140,000) and electrical (from a minimum of $80,000 to upwards of $170,000). Not surprisingly, the

"NO GENERAL BUT LUDD MEANS THE POOR ANY GOOD"

Edward Ludd, a half-witted Leicestershire workman who destroyed stocking frames in 1799, was the spiritual progenitor of the most opprobrious of antimachine movements.

Beginning in 1811, Luddites assaulted the power looms and shearing frames that were transforming the manufacture of textiles and throwing many of them out of work. Luddism proper had ended on the scaffold by 1815, but the fear and rage that unfamiliar technologies can inspire has proved more difficult to deal with.

Because the widespread use of robots is likely to result in social change no less sweeping than those the industrial revolution wrought, it seems not completely amiss to wonder whether the robotics revolution might provoke a modern kind of Luddism. To date, certainly, there has been little large-scale opposition from labor, partly because this second revolution is still in its infancy and partly because at least some heed has been paid to the affected workers. Society is now better equipped to cope with change and anticipate it in a way the precapitalist West could not. Too, nascent capitalism was often a brutal force; it seems safe to say that workers and management have made some improvements since the Luddites raged. But change can still be painful, particularly for those who are its objects rather than its authors.

Jürgen Kuczynski dates the industrial revolution from Wyatt's invention of the spinning machine. Weavers had worked faster than spinners, leaving a productive disproportion. Arkwright's spinning jenny shifted that disproportion against the weavers, prompting Cartwright's weaving machine of 1785. Wool and cotton fabrics were becoming cheap and abundant, but the price was a kind of social disequilibrium hitherto unknown.

Technical innovations have long been feared and hated. Prohibitions of ribbon mills in Germany started in Danzig about 1529—when the inventor was secretely suffocated or drowned—and continued until 1797, when corporate laceworkers in Annaberg attacked a ribbon mill.

The Luddites published their "Declaration Extraordinary" on copper plate in 1811, announcing themselves as "General Agitators for the Northern Counties, assembled to redress the Grievances of Operative Mechanics." Secret meeting cards reading "No General but Ludd Means the Poor Any Good" were passed out in rural communities. At night, small disciplined bands armed with guns, hatchets, and pikes attacked workshops in widely separate villages. On April 9, 1812, some 300 Luddites attacked a factory at Horbury, destroying machinery. Cartwright's mill in Rawfolds was attacked by Luddites in 1812. Factory owners were told to remove their laborsaving frames or face the wrath of General Ned Ludd.

E.P. Thompson has noted that the Luddites were not concerned only with those directly displaced by the machine. They were a quasi-insurrectionary movement revolting against the new industrial society as a whole. Hegel wrote that many of the workers displaced during this period saw only "the machine apart." For them, the machine was neither a means to increase production nor a harbinger of progress; it was a tangible thing with a deleterious impact on their lives.

As industrial laborers rallied under Ludd, the banner of the agricultural workers was carried by the mythical Captain Swing. Eric Hobsbawn and George Rudé detailed many attacks on machines, particularly the threshing machines that displaced agricultural workers from their traditional winter occupation, during the years 1830-1831. James Thomas Cooper, a 33-year-old Wiltshire laborer, styled himself Captain Swing and organized a raid to burn threshers near Fordingbridge in 1830. He then led some 300 laborers into town, where they destroyed all the machinery in two factories. *The Times* reported Cooper to have boasted that they "had come from 20 miles above London, and were going as far down the country as there was any machinery, to destroy it." Cooper was hanged for his part in the Fordingbridge riot.

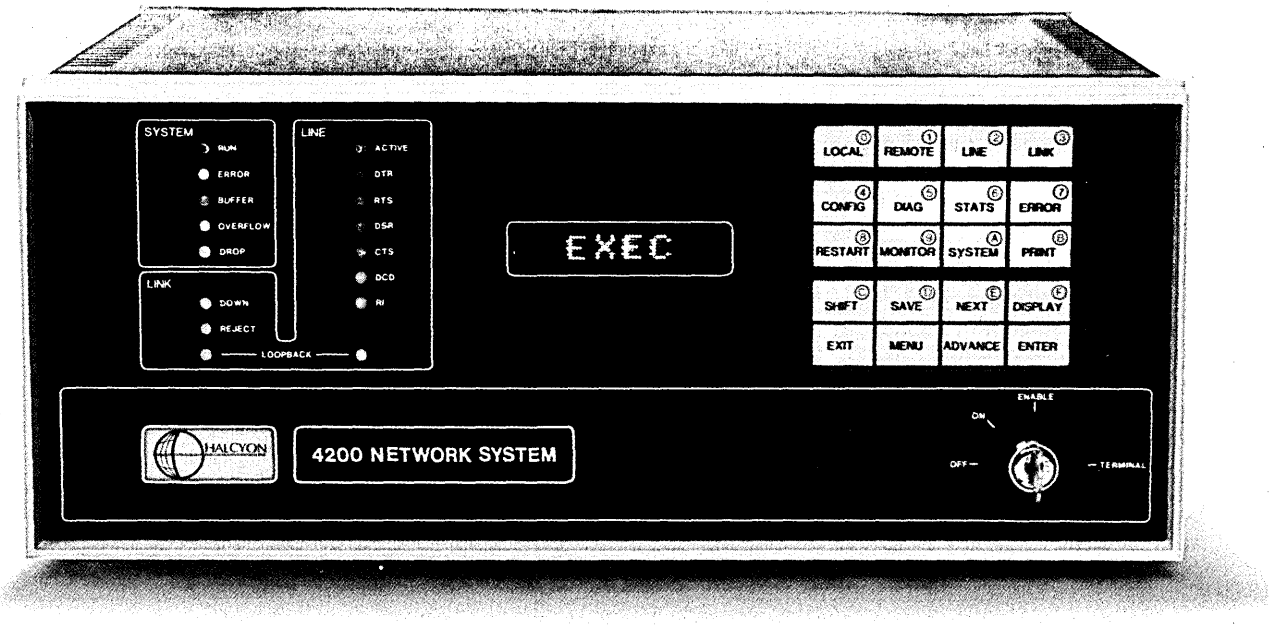
A labor shortage spared the United States this kind of large-scale opposition to the implementation of machinery. Here, machines have perhaps been more closely associated with progress and plenty. But

Change can still be painful, particularly for those who are its objects rather than its authors.

like the rest of the industrial world, the U.S. is now at the point where machines necessarily make a difference in the lives of workers, either by changing their working routines or by forcing them into different jobs altogether—if there are jobs to be had. Robotics is expected to grow rapidly, and this would seem to be the time to look beyond mere technical improvement, to try to consider the shapes given everyday lives by large-scale networks of technology.

Langdon Winner, in *Autonomous Technology*, has called for an epistemological Luddism, a method of discerning the human value of a given technology. He does not propose the nihilistic destruction of machinery, but argues that innovations are worthwhile only insofar as they enhance the quality of the product, or improve the quality of the work. Epistemological Luddism would try to evaluate the patterns that rationalized technique imposes on human lives. Perhaps Winner's less violent form of Luddism could prevent a recurrence of machine-breaking in the future.

—L.F.



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The robot should be engineered so that the user need not be a computer scientist but someone in manufacturing with a minimum of training.

drives that can handle the greatest weights tend to cost the most; pneumatics are capable of the lowest loads, electrical drive the highest. DC servo electric drive systems use less power than either the hydraulic or pneumatic power drive systems. In the power and drive sources, electrical relays and air-sequencing modules are currently used for control.

Above all, an industrial robot must be a practical device, and that entails: 1) flexibility of application, either in the area of handling (which includes loading, injection molding, material handling, parts retrieval, packaging, or palletization) or as a processor (spray painting, seam and spot welding, metallizing, or cleaning); 2) reliability, with a minimum of down time (Unimation currently pledges a down time of only 2% to 3%), and with no need for retooling (beyond the changing of grippers and programs); and 3) ease of teaching, either with on- or off-line programmability with teach boxes.

PROGRESS IN ROBOT ABILITY

Roboticists are currently most interested in enhancing two breakthrough developments: sensory capabilities and off-line programming. IR sensory capabilities have three components: force, with application in fitting operations; tactile, with application in both positioning and orienting; and vision, with application in positioning, inspection and monitoring.

Current systems are relatively primitive; one need only contemplate the elaborate nature of human senses to understand the arduousness of establishing mechanical sensory capabilities. Force sensing, along with other tactile senses such as torque, compliance, and slip, is tending toward the development of an array or matrix of sensory systems modeling the human sense of touch. The need for a high-resolution, fast, and durable tactile sensing system still remains. SRI International and Draper Laboratories are among the best-known researchers in the field of force sensing (Draper for its remote compliance wrist and SRI for its wrist-force sensor), but there is still a need for integration of signals with realizable control systems. Dr. Leon D. Harmon, professor of biomedical engineering at Case Western University, predicts that there will be as much action in developing tactile senses in the next decade as "vision went through in the last decade."

Vision is currently an idée fixe among American roboticists. Extensive work in vision systems has been done at the University of Rhode Island. Most systems depend on a solid-state camera used with pattern recognition matrices or connectivity analysis for either gross recognition or proximity sensing. Camera use makes it easy for a robot to see; it is, however, far more difficult for a machine to analyze what it has seen. American technologists seem to regard a vision system as the terminal impediment to a truly universal programmable machine. More importantly, there is a need for a fully programmable IR that is capable of using *all* available sensory feedback systems. Such sensory capabilities would allow a robot to work with unoriented objects.

It is believed that with vision, the problem of feeding workpieces from disarrayed bins—the bin-picking problem—will eventually be solved. An acceptable machine vision system will probably have to meet the following requirements: a cost of no more than 10% to 25% of the total robot cost and the ability to supply sensing information within 0.2 to 1.0 seconds for a moving line (a longer time is permissible for a stationary workpiece).

Such a system is not likely to enter into practical use before the latter half of this decade. Today's vision systems, as a rule, require a contrastingly lit background, a controlled workplace, and noncontiguous parts. To date, these systems have been successfully applied in riveting and fastening for airplane structures.

The ability of an IR to interface with a large computer-controlled manufacturing system is another priority. Phillipe Villers, president of Automatix Inc., a robot systems firm, says, "Our view is what's needed is better sensors and software rather than better robots." Programming that creates a task description without the necessity of using a robot's actual motion would open several doors.

ABILITY TO ADAPT

Programmed automation offers both flexibility (the ability to manufacture in a wide variety of configurations with minimal effort and cost) and adaptability (the ability to adjust or conform to changing environmental conditions). Off-line programming offers some engaging opportunities. Subordinate microcomputer hardware and software in the robot itself can be dedicated to performing certain tasks (e.g., translating general instructions into specific trajectory points), while an executive computer is free to control and interface a system without concern for the details of local processing. A general executive system of this sort was described by the National Bureau of Standards/Air Force Integrated Computer Aided Manufacturing Workshop on Robot Interfaces as "a procedural description that is generated indicating the flow of control with various branching descriptions."

According to the workshop, coordinate values that are independent of the robot can come from "a number of sources and can be used to control execution of the programmed task of any robot with sufficient physical and performance capabilities." Robots with differing configurations, say, rotary and joint-arm, can position an end-effector or gripper in the same space coordinates even though the joint values of the robots may be quite different.

Standardized Cartesian space coordinates were suggested for describing desired trajectories. Such a procedure would permit real-time scheduling where robot-independent programmed trajectories could be downloaded to robots available in the workstations. Robot-independent coordinates could be interchangeable among robots, permitting greater hierarchical systems integration to the manufacturing formula. Manufacturing could be controlled from the lower processes and workstations up to the higher levels of centers and factories.

The NBS/Air Force ICAM Workshop acknowledged a need for an independent and hierarchical language system in both explicit languages, detailing robot joints and positions (as in "move joint 6 in x direction") and implicit languages, describing the task to be performed rather than the motions through which the IR will pass (as in a command such as "weld fixture"). There is also a need for a standard integration of control throughout the factory, as well as a database for access to manufacturing, inventory control, shop-floor scheduling, design, and process planning. Among explicit languages, candidates for a standardized interface include VAL, EMILY, SIGLA, and WAVE. Implicit language candidates include AL, ROBOT APT, AUTO PASS, RAPT and MAL. These languages are, for the most part, already familiar to NC programmers.

Another advantage of off-line programming would be the ease of programming. With regard to robot-independent languages, the NBS/Air Force workshop recommended that "programming of the robot should be engineered so that the user need not be a computer scientist but rather someone involved in the manufacturing process who has had a minimum of training." This is common sense; the operator usually has the best understanding of task routines. It is with the development of an interface that the greatest potential for true robot-based manufacturing may lie.

GROWTH OF THE INDUSTRY

Learning-curve pricing would seem to assure rapid growth of the robotics industry. Digital Equipment, Texas Instruments, IBM, Olivetti, and Volkswagen all appear prepared to introduce their own lines of robots. If the cost of a $50,000 robot could be reduced to $10,000 by 1990, demand could rise to over 200,000 units a year. Higher volumes, in turn, would generate lower prices.

With computer control replacing the

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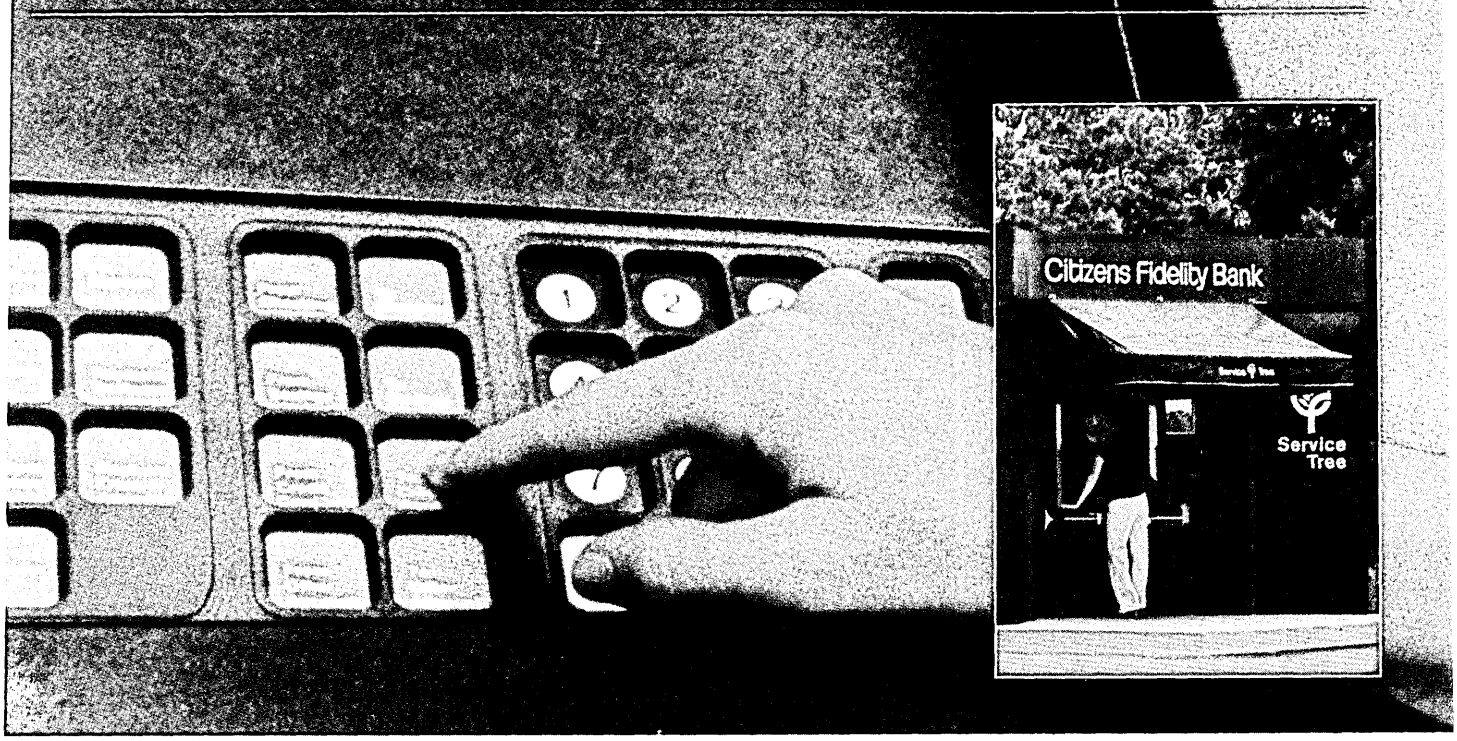
Notes and observations from the IBM Data Processing Division that may prove of interest to DP professionals



Citizens Fidelity Bank reports online services have enabled them to increase transactions and customer base with no increase in the number of branches built.

A Louisville Bank Goes Where the People Are

A bank in Louisville, Kentucky, believes that more depositor transactions will soon be performed in non-banking locales.

Says Frank M. Knego, senior vice president of Citizens Fidelity Bank & Trust Company: "We need some fundamental changes if we are to offer consumers the convenience they expect. It costs too much to build new branches and to extend banking hours. We chose the alternative—customer-operated services off-premises, through an online banking system—and we haven't had to increase the number of branches since 1975.

"We've also cut back hours in 33 branches. We had been feeling pressure for Saturday banking, but we've been able to meet that demand with electronic funds transfer (EFT) instead."

In addition to the 16 IBM 3614 Consumer Transaction Facilities online to its IBM 3033 Processor, Citizens Fidelity worked closely with local merchants to develop point-of-sale (POS) service. Depositors can now withdraw and deposit money, as well as pay for purchases, through in-store IBM 3608 Point-of-Sale Terminals. The customer inserts a plastic card and keys in the dollar amount, Knego explains. The terminal produces a printed slip that the depositor hands the store clerk, who then accepts the deposit or pays out the withdrawal.

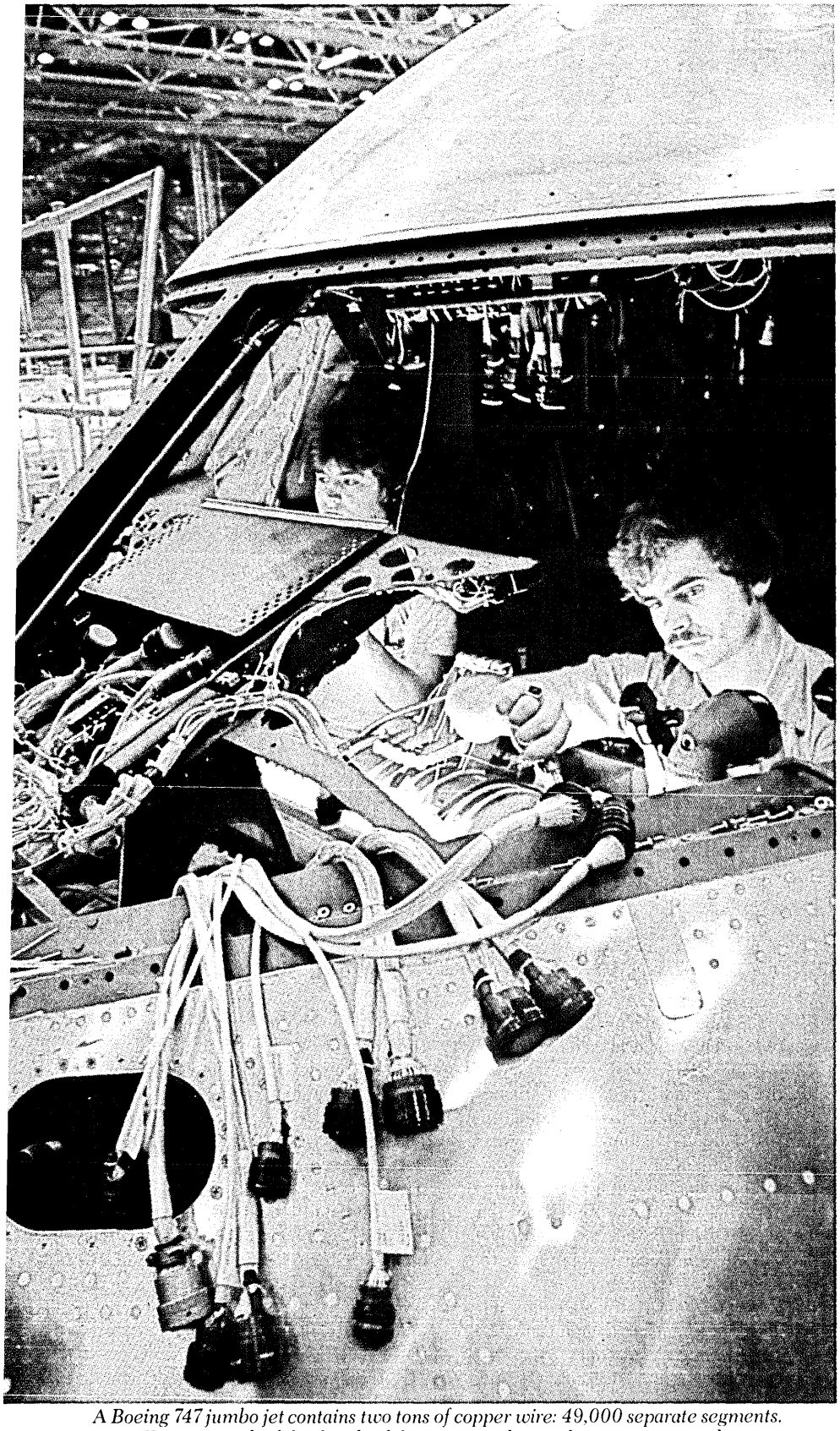
"Everyone gains," Knego points out. "We pay merchants to handle our EFT service, although we charge them to process paper checks. The funds are transferred to the stores' accounts immediately, rather than after a check clears. Surveys show that EFT users make significantly higher average purchases than they did before. The merchants gain in goodwill by offering the service. And withdrawals help them dispose of surplus cash.

"For the depositor, there is the convenience of one-stop banking and shopping. Banking hours are more flexible. And we've found that many depositors prefer to do their banking in neighborhood convenience stores.

"The bank has avoided new construction and longer hours. The cost per transaction is declining steadily as the volume of EFT activity increases. And a survey showed that our best EFT customers maintain higher balances and write 35 percent fewer checks.

"And, most importantly, implementing the EFT program has allowed us to be innovative in our approach to the distribution of banking services. Rather than bring people to the bank, we are bringing banking to the people."

WIRS Wraps up 747 Wiring in a Neat Bundle



A Boeing 747 jumbo jet contains two tons of copper wire: 49,000 separate segments. Keeping track of the details of this massive electrical system requires the services of a large IBM computer.

As a jet airliner is designed and buil the details of its electrical system underg constant change. For the 747 jumbo je Boeing Commercial Airplane Compan uses a computer to keep track of eac piece of wire.

Since there are extensive wiring diffe ences for different customers, and eve among individual planes, Boeing uses inte active computing based on the IBM Info mation Management System/Virtual Sto age (IMS/VS). This permits changes an variations to be entered immediately, a they arise, and allows engineering an manufacturing people to stay abreast of th configuration for each plane.

Running on an IBM 3033 Processor i Kent, Washington, the Wire Informatio and Release System (WIRS) stores the iden tity of each of 49,000 segments of wire in a 747, and its assignment to a bundle Robert M. Beers, functional manager WIRS, explains. Through the design, re lease, and fabrication of the bundle, WIRS identifies the device or connector at eac end of the segment, the wire type an gauge, and the aircraft to which it applies. Data is added or changed by filling in blanks on the screen of a terminal in on of five Seattle-area plants or the plant in Wichita, Kansas.

During an average week, 500 engineer ing change notices are entered against th wiring of the 747, affecting one plane, all o them, or a limited number. For each entry WIRS performs 38 engineering edits whic identify such errors as two wires using th same pin or the same wire number, releas sequence errors, or connectors that don't match. Other automatic checks catch in valid wire codes, aircraft effectivity errors and the like.

"By catching errors before they get into the system," Beers points out, "we cut the total number of basic changes to be processed by 25 percent. And we accomplish more of them in sequence, without reworking a completed bundle.

"IMS lets us access a wire or bundle in many ways," says Beers. "Engineers can look at a particular bundle or equipment item, or look for all wire of one type. They can go in by airplane number, change number, or by customer. Since a complete history is retained, they can look at past configurations, and see when a change was made.

"Today, we roll out seven 747's a month," Beers continues, "for any of 64 different customers. Since there is less lead time on wiring than on any other part of the design, we couldn't sustain that production rate without such a system."

Engine Development Revs up With Low-Cost Online Simulation

Online simulation at an affordable price has helped Mechanical Technology Incorporated, Latham, New York, to reach its goal of becoming the U.S. leader in the technology of Stirling Cycle engines. The company recently installed an IBM 4341 Processor, and engineers can now interact directly with a detailed model of the engine in the computer, through the use of IBM's Virtual Machine/Conversational Monitor System (VM/CMS).

"Compared to our previous use of outside services for computing, we've lowered our costs while gaining important capabilities," says Don Castor, manager of the data processing center. "For example, a programmer now has a full-screen editor and can directly change a program through a terminal.

"The 4341 allows us to distribute terminals to all the people who need them. It has placed interactive computing within our means for the first time."

The Stirling Cycle engine is a 160-year-old invention that Mechanical Technology is developing for practical modern use. The kinematic engine has exciting potential for automotive power, and the free-piston Stirling has a wide range of applications. The company has already tested baseline Stirling engines installed in three modified passenger cars. A newly designed automotive Stirling engine will be available for testing shortly.

Development of the engine to its full potential is a formidable challenge, explains Roy Krasse, manager of administration, Stirling Engine Systems Division.

"With many variables to manipulate, we would like to build and test 200 automotive engines; actually we'll test eleven. As an alternative, we use computer simulation."

Each user enters test variables through one of 23 IBM 3278 Visual Display Stations, and sees the results of the simulation on the screen in seconds. "An engineer can change a parameter and rerun the simulation immediately," Krasse says. "He has better control—he doesn't interrupt his train of thought. The model, or any other engineering program, is available online. An operator needn't load it from tape."

"We've been able to process more requests for application development," Castor adds. "With only about 2½ people programming, it took just four months to convert 700 programs. Today we do in one shift what once took a full three shifts.

"And data entry is now online—entered by the users at the source under CMS—which saves us a lot of manhours and greatly reduces the error rate."

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Technicians tear down a prototype free-piston Stirling engine. With an IBM 4341, Mechanical Technology Inc. can present an online model of the engine to designers through 23 terminals.

Robots do not require extensive training, have no grievances, and surpass the up time of an hourly production worker.

limited plugboards and potentiometers of past endeavors, the outlook for robots has rarely seemed so rosy. This wasn't always the case. Cummins Engine Co. established a sequential IR installation in July 1974, but "application problems" shut the program down in February 1975. It has since been successfully reestablished.

The first installations tend to be the most important, for they are the ones watched most carefully by management and labor. Most roboticists have been sensibly cautious about predicting too splendid a future. But the technology advances at a rapid pace, and most of the fundamental debugging of IR systems appears to be already accomplished.

Dr. James Albus of the National Bureau of Standards has pointed out that mass-production machines are expensive because they are produced in small quantities. But mass-produced, universally programmed machines could be sold for one-tenth of the present prices. "When automatic factories begin to manufacture automatic factories," writes Albus, "cost reductions will propagate exponentially from generation to generation." If the effect of robot self-regeneration resulted in a 20% per annum reduction in cost (as it has in the computer industry), then the price of even the complex computer-controlled robot might fall to several hundred constant dollars within two decades. When rated on a 168-hour week, that would equal a robot labor rate of only pennies per hour. Annual return on investment in that case might exceed 100% or even 1000%, by some estimates.

But the Automation Research Council warns that major engineering advances will be needed before it is possible to build and operate self-regenerating factories. Dr. Roger Nagel, manager of the Robotics Manufacturing Organization of International Harvester, regards a fully automated factory as "too complex" for current techniques. He also cites, as an inhibitor to such a development, the difficulty involved in robotic handling of flexible parts. While Unimation has already used robots for welding in the production of other robots, the volume was not sufficient to justify the cost. The welding Unimate only worked about an hour a day. KUKA also reports that it is using robots in the production of other robots.

What else can be anticipated from the robot of the future? The NBS/Air Force Workshop offered the following predictions: robots will become more complex, rely on off-line programming and a high-level language, have vision and other sensory capabilities (including voice control), will use a postprocess language, and have mutiple-arm configurations (four- or six-armed robots).

"Even though the evidence may lean in their favor, I'm going to vote against Amalgamated Refining for one simple reason: bad vibes."

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CARTOON BY SIDNEY HARRIS

PROCESS SEEN AS FLEXIBLE

To be sure, there are limitations evident in the current approach, the persistent anthropomorphization of the manufacturing process on the part of some engineers being one. There is a tendency to view the manufacturing process as standard while inventing machines to function as humans once did, rather than inventing new processes for the machine to perform. High technology is sometimes overemphasized, at the expense of a more exacting systems approach to manufacturing. In viewing the manufacturing process as flexible, the Japanese seem to enjoy an advantage over many U.S. firms.

Some engineers and management personnel complain about the cost of implementing an IR installation, suggesting that current amortization schemes are unfavorable. But robots can work two or three shifts daily (although J.G. Broeger, manufacturing engineer at Cummins Engine, noted that at his installation, "the robot takes a break when the operator takes a break"). Cost justification for a robot used in a two-shift automatic subassembly spot-welding routine is as follows: total expenditures, including robot, installation and accessory costs, should be around $70,000; labor savings for two men plus maintenance would amount to $52,964. This means that payback could be accomplished within two years. In addition, robots do not require extensive retraining, have no grievances, and surpass the up time of an hourly production worker (IRs are operational 97% to 98% of the time, while a human worker has a built-in 9% productivity lag owing to such things as lunch breaks).

It is difficult to deny that robots will revolutionize the workplace. Even if no additional advances were made in fields such as sensory perception, robots would still have a place in our manufacturing processes. But to gaze longingly at a projected golden era when robots will be cheap, flexible, and abundant

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"A foresight of the social consequences of robots and automation is badly needed; the technologist must tread cautiously."

is to ignore the awkward period of realignment that must precede such an era. As French sociologist Jacques Ellul puts it, "A question no one ever asks when confronted with the scientific wonders of the future concerns the interim period."

According to *Business Week*, General Electric is initiating a sweeping automation plan that may eventually replace half its 37,000 assembly workers with robots. The Big Three automobile manufacturers have already introduced robots to handle many of their subassembly routines. Some automation experts have claimed that robots could displace as much as 65% to 75% of today's factory work force. It is true that robotics will create other jobs in much the same fashion that computers did. It is also true that an increased demand can be expected for service occupations. But how is this conversion from the hourly worker to the robot worker to be achieved? As Neale W. Clapp of Block Petrella Associates warns, "Our technology is highly sophisticated compared to our understanding of the social system of the factory."

Robots are currently concentrated in tasks that are either hazardous or monotonous. Workers relieved of these dispiriting jobs have been retrained and placed in other operations. The problem of surplus labor has been handled through attrition. No one has yet lost a job to a robot. A spokesman for Prab Conveyors mentioned, and with good reason, that robots are not yet about to render the human worker obsolete. In answering a question about labor resistance to robots at one of the sessions at the Robots V Conference, this same spokesman pointed out that the current robot population represents less of a threat to the American worker than did, say, the number of Cubans entering the U.S. during Operation Flotilla in 1979.

ROBOTS REPLACE WORKERS

But William Tanner of Tanner Associates, a consulting company for robotics, foresees a problem in accommodating or retraining those workers replaced by robots within a decade. Attrition of surplus labor will not continue to be a wholly viable solution because of the unique demographic character of our work force. There will be fewer elderly workers in the immediate future and more younger ones.

Thomas Weekley of the UAW Skilled Trades Department believes that workers are not antagonistic to installation of IRs when they are kept on in some other capacity, and there is good reason to believe that many of them will indeed be retained and retrained. But considering that assembly workers constitute 17% of the U.S. work force and inspection workers another 10%—two areas where advanced robots may eventually be applied—IRs could prove to have an astonishing impact during the next two decades. Once the price of installation for IRs diminishes and once off-line programming and sensory capabilities come on-stream, it may prove increasingly difficult to maintain a justification for human workers. The time may be near, as Neale Clapp has suggested, "to scrutinize the social systems of manufacturing with the same blunt objectivity we apply to the robot."

Although some studies have been done in Europe and Japan on the social effects of labor displacement, distressingly little appears to have been done in the U.S. Without this kind of thought, one might question whether we shall succeed in moving from a labor-based industrial society to an automated postindustrial one. Denis Gabor has stated that "a foresight of the social consequences" of robots and automation "is most badly needed," and warns that "the technologist must tread most cautiously" in these fields.

Historian of science J.D. Bernal defined Lord Stamp as "by no means a scathing critic of the present dispensation" when quoting this passage from Stamp's *Science of Social Development*:

"All these discoveries, these scientific infants duly born and left on the doorstep of society, get taken in and variously cared for, but on no known principle, and with no directions from the progenitors. Nor do the economists usually acknowledge any duty to study the phase, to indicate any series of tests of their value to society, or even methods and regulation of the optimum rate of introduction of novelty. These things just 'happen' generally under the urge of profit, and of consumer's desire, in free competition, regardless of the worthiness of the new desires against old, or of the shifts of production, and therefore, employment with their social consequences."

Nigel Calder has described, in his *Technopolis*, a society drastically altered by technological innovation, where scientific policy is either nonexistent or is concerned solely with efficiency and speed of results. Karl Marx was troubled by this lack of moral concern for our innovations: "All our invention and progress seem to result in endowing material forces with intellectual life, and in stultifying human life into material force."

A policy of benign neglect is unlikely to solve the problems that IRs ineluctably raise. We must evaluate robotics in terms of human purpose and in relation to a human and social scheme of values. Without such an appraisal, as Lewis Mumford has pessimistically suggested, "the social unemployment of machines will become as marked as the present technological unemployment of man."

Pietro Varvello, an economist at the Italian Federation of Scientific and Technical Associations, argues that the most important discussion throughout the next decade will be "the social implications of robots. In the end the robots will have won the debate." If that debate does not include some regard for a social homeostasis, an Erewhonian backlash against robots could easily occur.

One of the few persons to venture a proposal for the future has been James Albus. In *People's Capitalism: The Economics of the Robot Revolution*, Albus asks, "If robots eventually do most of the economically productive work, how will people receive an income? Who will own these machines and who will control the powerful and economic and political forces they represent?" Albus proposes, among other institutions, a federal department of science and technology that would focus technology more directly on human needs. For him, the real threat implicit in so-called superautomation would derive from "the concentration of economic and political power which will fall into the hands of the machine owner."

A policy for change today might well avoid the need for harsh corrective measures at a later date. Jacques Ellul and Siegfried Giedion have both cited the perils of practicing technique for its own sake: it is to be used as a means toward an end, and not as an end in itself. Ervin Laszlo, the pioneer in systems thinking, has remarked that all highly complex systems require a monitoring phase of some sort. The robots themselves are equipped with such monitors. Should we not allow for similar methods in evaluating and monitoring our social systems?

Robotics is a provocative field with startling potential. An enthusiast standing in the Exposition Hall in Dearborn remarked, "The robotics industry is today where the minicomputer industry stood in 1961." Robots may offer a means to increase productivity and to free workers from boring or unsafe tasks. But the ramifications of technological innovation must be weighed. Too many times in the past objects have been designed and made without care for their social impact. Such concerns cannot be neglected this time around. *

LEOPOLD FROEHLICH

Leopold Froehlich lives in New York, where he toils daily for a national business magazine. He is DATAMATION's robotics consultant, and is currently at work on a history of Chicago.

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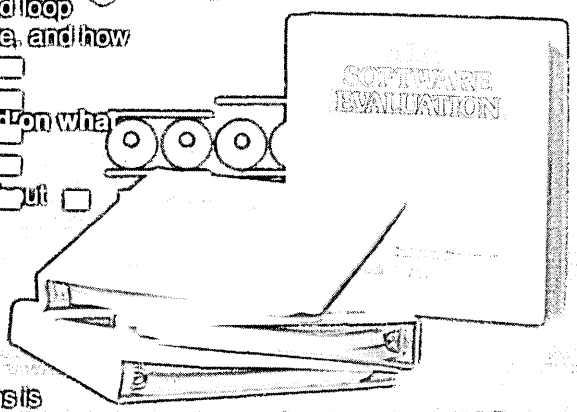

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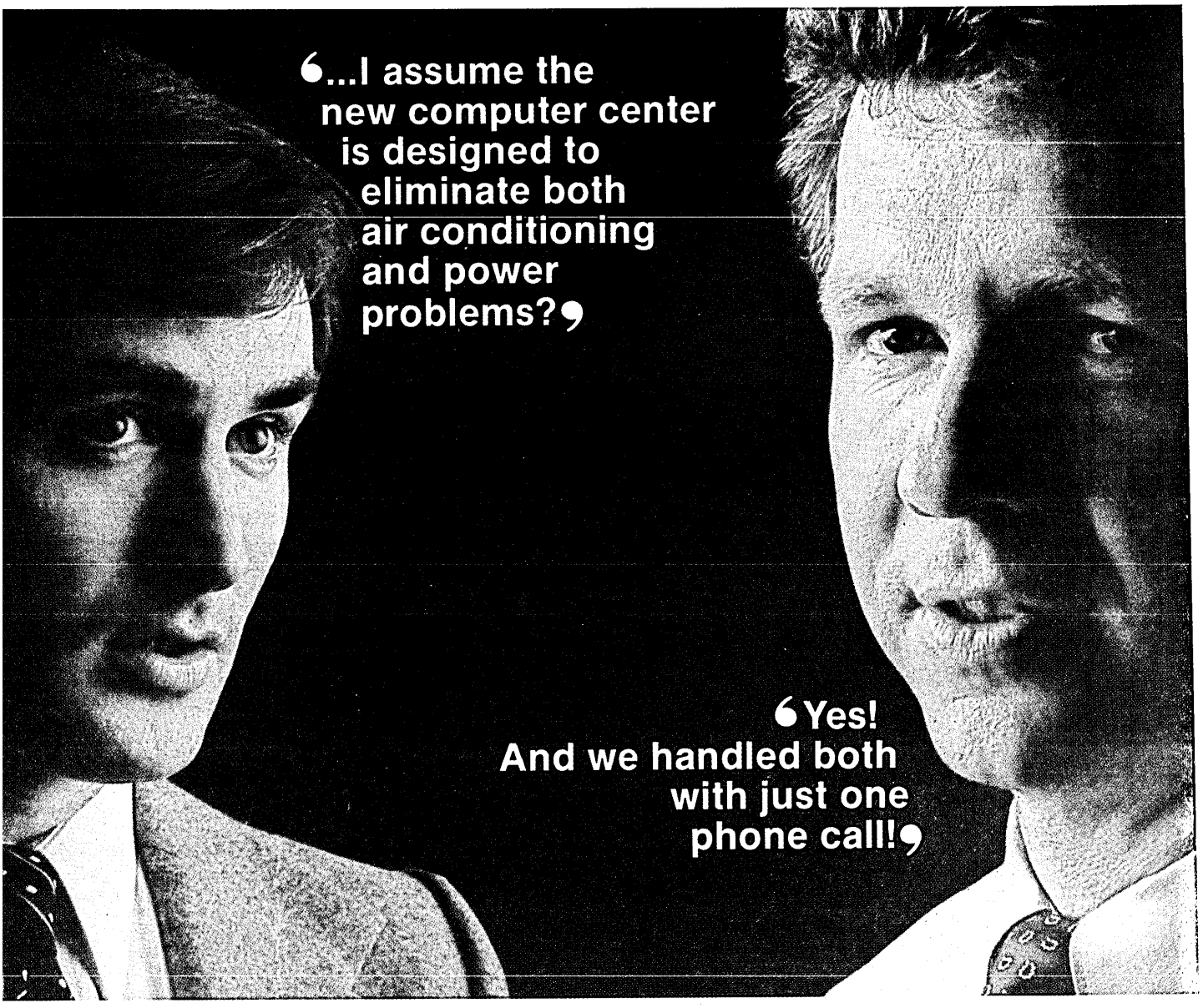

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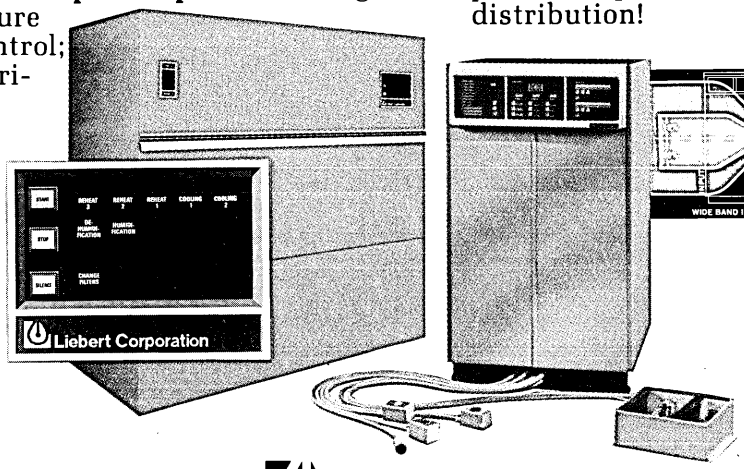

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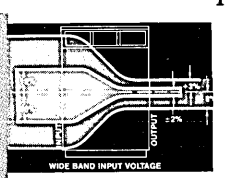

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A description and sources for industrial robots offered by 18 manufacturers.

VENDORS OF ROBOTS

The following vendors displayed their wares at the Robots V Exposition in Dearborn, Mich.:

ADVANCED ROBOTICS CORP.
Newark Ohio Industrial Park, Bldg. 8
Hebron, OH 43025

The Cyro-Arc robot 5+2 was demonstrated. It uses two hands for simultaneous torch and part manipulation in arc welding, a process requiring sophisticated controls. The 5+2 is equipped for off-line programming, using rectilinear coordinates with a five-axis torch system and a two-axis second-part manipulator. It has DC servomotor control drive. ARC has placed a four-armed robot—along with 18 other systems—at Hayes-Dana, Ltd. in Berry, Ontario.

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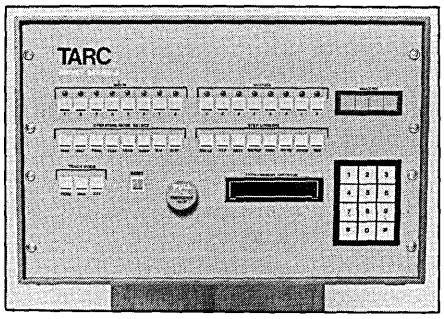
AMERICAN ROBOT CORP.
P.O. Box 10767
Winston-Salem, NC 27108

ARC has a six-axis robot designed to manipulate objects weighing less than 3 lbs. With DC electrical drive, the GRIVET series 5 industrial robot sells for a low $10,000. It offers continuous path, with lead-through teach mode and a 16 line I/O control, an operating speed of 3 ft./sec. with maximum load, and a repeatability accuracy of ±0.04".



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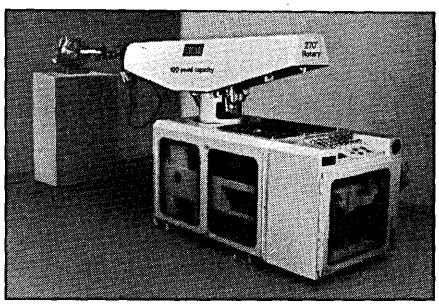
4 New King St.
White Plains, NY 10604

There are over 600 ASEA robots installed to date. The parent company, in Vasteras, Sweden, is well known in the field of robotics. ASEA sold out its entire 1980 production capacity by March of last year. Two units were demonstrated in Dearborn: the IRb-6 and the IRb-60. Both were shown in interactive use for deburring of parts. Both have six axes and an intriguing adaptive control system that automatically compensates for misalignment. Also demonstrated was curve adaptability, using sensory control of velocity and path. Both controls are useful for work when the path is known but the work surface is variable. Speed control is applied to feed rates, while continuous contour allows the machine to follow a path that is not clearly defined. Along with NC transducer search functions, these devices are in the vanguard of robotic technology. The smaller IRb-6, selling for a base price of around $85,000, can carry loads of up to 13 lbs. (including gripper) and has a repeatability rate of better than ±0.20mm, with a radial speed of 0.75m/sec. The larger IRb-60 has a weight capacity of 132 lbs. and a repeatability accuracy of ±0.40mm. Both machines have 16 line input/14 line output control systems for communication with peripheral machines, and can be used in either point-to-point or linear control functions.



FOR DATA CIRCLE 402 ON READER CARD

ASTEK ENGINEERING
5 Bridge St.
Watertown, MA 02172

AST-100 multiaxis compliance device for automatic assembly equipment was demonstrated.

FOR DATA CIRCLE 403 ON READER CARD

AUTOMATIX INC.
217 Middlesex Turnpike
Burlington, MA 01803

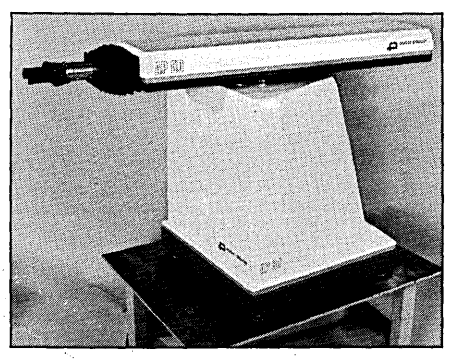
The managers of Harvard's Endowment Fund, in a break with its tradition of blue-chip investment, put $200,000 in venture capital into Automatix. Automatix bills itself as a robot systems company, offering complete turnkey systems for potential users. Dr. Jerome Weisner, president emeritus of MIT, was recently named to the board of directors. Three systems were demonstrated in Dearborn: the Autovision system for automated visual inspection, capable of detecting and identifying parts and capabilities; the Robovision AID800 five-axis robot arc-welding system, with vision system for off-line inspection; and the Cybervision robot assembly, with vision feedback. Dr. Gordon VanderBrug, formerly of the National Bureau of Standards, has developed the RAIL language for programming, which uses a simple English command vocabulary. Automatix currently has about $5.75 million in financial backing, can offer complete systems engineering teams of anywhere from 50 to 100 persons, and expects a solid $50 million in sales by 1985.

FOR DATA CIRCLE 404 ON READER CARD

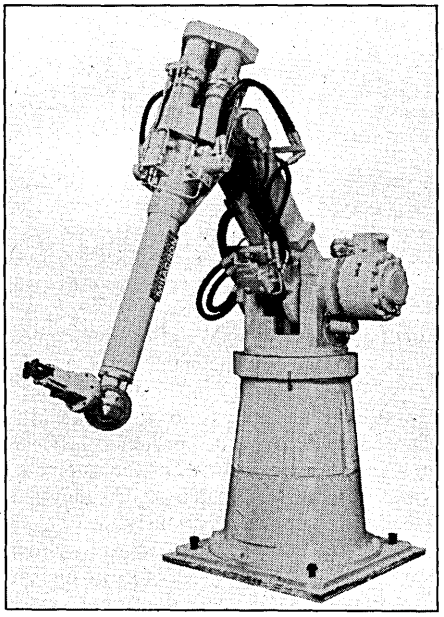
AUTO-PLACE INC.
1401 E. Fourteen Mile Rd.
Troy, MI 48084

The company demonstrated the TCR-1 microprocessor-based teach control as well as the automated assembly of a four-component keychain using the Opto-Sense vision system with LC111 microprocessor. The keychain was assembled with some difficulty, and required a human attendant to keep things running smoothly. Two of Auto-Place's robots are the 5 lb. capacity AP10 (with basic configuration price of $14,500) and the 30 lb. capacity AP50 ($21,000), a self-contained unit with robot, controller, and valve package interface housed within the robot body.

FOR DATA CIRCLE 405 ON READER CARD



VENDORS OF ROBOTS



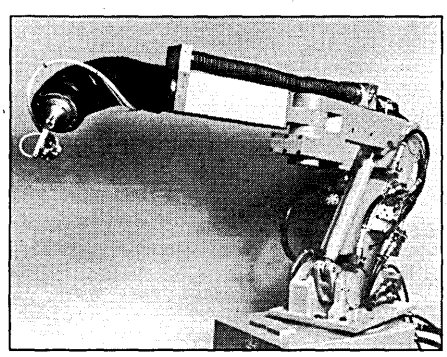
CINCINNATI MILACRON
4701 Marburg Ave.
Cincinnati, OH 45209

The second largest U.S. manufacturer of IRs, this machine-tool company demonstrated its advanced T3 servorobot with minicomputer control and special T3R3 wrist. The hydraulic drive robot with up to six axes has a repeatability of better than ±0.020″ and a load capacity of 100 lbs. The HT3 is similarly configurated, with a load capacity of 225 lbs. and an operating speed of 35 ips. Milacron is "actively developing advanced sensory systems."

FOR DATA CIRCLE 406 ON READER CARD

CYBOTECH
P.O. Box 88514
Indianapolis, IN 46208

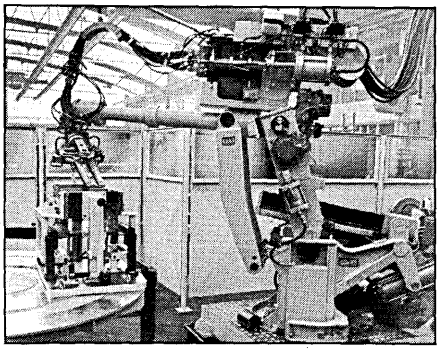
A joint venture between Indiana's Ransburg Corp. (51%) and France's Renault (49%), this company's robots are highly regarded in Europe for both precision and capability. Cybotech offers five different robots: the H80 hydraulic servo (both point-to-point and continuous modes), with six axes, a weight capacity of 175 lbs., and a repeatability of ±0.008″; the V80 offering top accesss; the G80 gantry configuration; the V30 with a load capacity of 30 kg and a hydraulic repeatability of ±0.008″; and the P15 continuous path robot with seven degrees of freedom, a load capacity of 15 kg, and a repeatability of ±5mm. Cybotech also offers the RCDA control system, with extensive sensory capabilities such as vision and force feedback. The control system uses a Cartesian coordinate system rather than complex configuration coordinates. ACMA-Cribier, Renault's engineering subsidiary, is the leading French robot manufacturer.



FOR DATA CIRCLE 407 ON READER CARD

DEVILBISS-TRALLFA
300 Phillips Ave., P.O. Box 913
Toledo, OH 43692

A division of Champion Spark Plug Co., Trallfa—home-based in Bryne, Norway—the company is the world leader in surface coating robots. The hydraulic TR3003S has six axes and computer robot control with storage for 64 programs.



FOR DATA CIRCLE 408 ON READER CARD

KUKA WELDING SYSTEMS AND ROBOTS
Zugspritzstr. 140
Augsburg, West Germany

Two series of IRs were demonstrated: the IR250/500, with five axes, DC electric servomechanical drive, a speed of 3.6m/sec, 100 lb. capacity, and a repeatability of ±1mm; and the IR601/60, a heavy-duty six-axis advanced robot with articulated arm and a load capacity of 60kg at full speed (1 m/sec.). KUKA has currently installed some 170 IRs in Europe.

FOR DATA CIRCLE 409 ON READER CARD

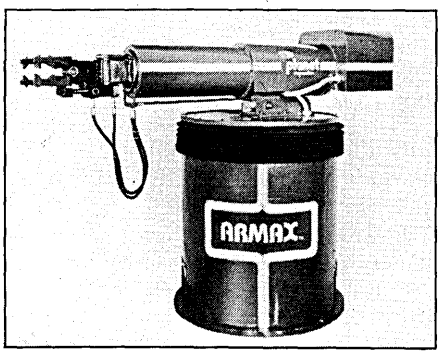
PRAB CONVEYORS INC.
5944 E. Kilgore Rd.
Kalamazoo, MI 49003

Prab bought the Versatran line of robots from AMF and is now considered one of the leaders in medium technology nonservo robots. The Prab 4200 basic model offers a load capacity (including gripper) of 75 lbs., a repeatability of ±0.008″, and sells for approximately $27,000. The 5800 series has a weight capacity of 50 lbs. The Versatran line, with cylindrical coordinates, has three essential models: the E (100 lb. load capacity, repeatability of ±0.030″), the FA (250 lb. capacity, ±0.050″ repeatability) with a seven-axis servo-controlled point-to-point mode, and the FB/FC (with weight capacity of 600 lbs. and a repeatability of ±0.050″).

FOR DATA CIRCLE 411 ON READER CARD

PLANET CORP. ROBOT DIVISION
27888 Orchard Lake Rd.
Farmington Hills, MI 48018

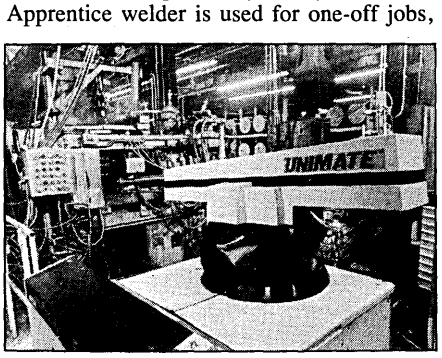
One of the first manufacturers of robots, Planet entered the market in 1955 with its Universial Transfer Device, Planobot. The Armax IR carries a 150 lb. weight in either point-to-point or continuous path modes and uses walk-through programming. The nonservo robot with cylindrical configuration sells for about $37,000, while the continuous path servo markets for around $100,000.

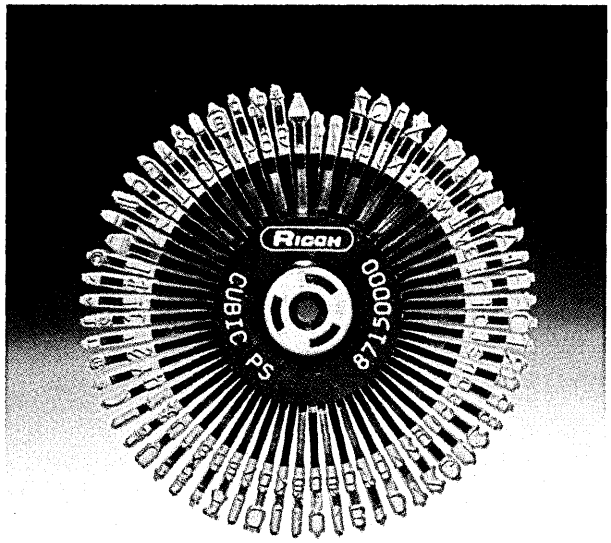


FOR DATA CIRCLE 410 ON READER CARD

UNIMATION INC.
12 Shelter Rock Lane
Danbury, CT 06810

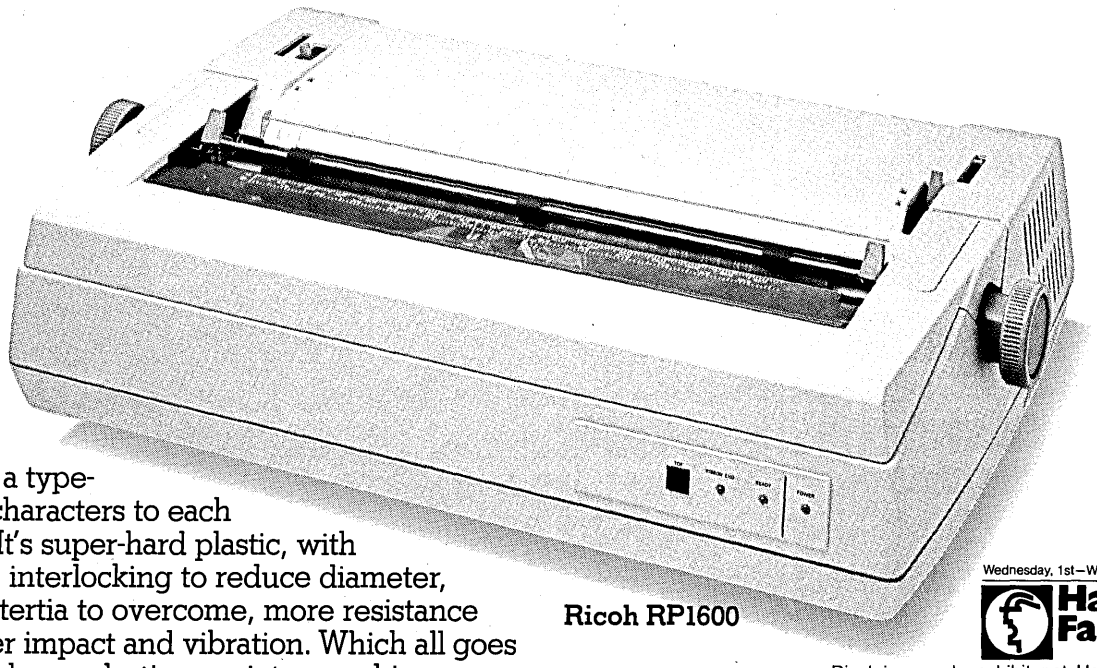
The company is, effectively, the founder of industrial robotics, and is a subsidiary of Condec Corp. One in three of the Western world's 6,000 or so installed robots are Unimates. In Chrysler's Newark, Del., assembly operations, 98% of all spot welding is performed by Unimates, and as a result, the capacity for car assembly there has risen from 60 to 70 cars an hour. Five different models were demonstrated at the exposition. The Unimate 1000 (selling for around $27,000) is a five-axis hydraulic servo ideal for machine-loading. The larger 2000 series (around $48,000) and the heavy-duty 4000 (with weight capacity of 205 kg and repeatability of ±2mm) are all spherically configurated. The Apprentice welder is used for one-off jobs,





Actual size.

A little wheel's a BIG wheel when it carries 124 characters.



Ricoh RP1600

It's like a typewriter, 2 characters to each type bar. It's super-hard plastic, with the petals interlocking to reduce diameter, for less intertia to overcome, more resistance to hammer impact and vibration. Which all goes to make a longer-lasting, quieter machine.

And the Ricoh RP1600 is *versatile.* Wheels come in many fonts, interchangeable with a touch. And it interfaces with Q-3, H-II, 10DATA, RS-232C.

Ricoh RP1600—The Big Wheel Among Daisy-printers.

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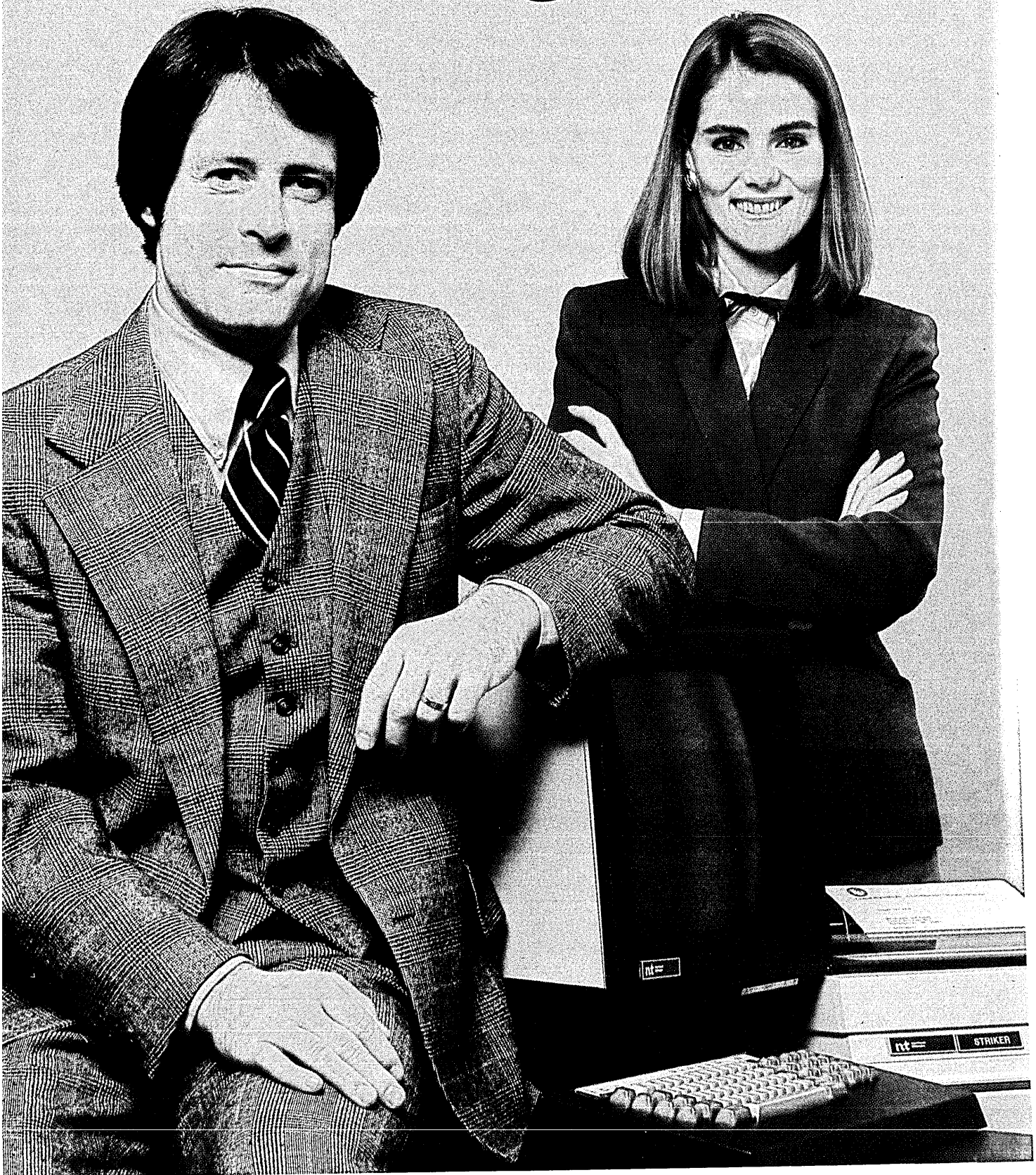
CIRCLE 65 ON READER CARD

"It speaks our language."



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38 delivers

The productivity advances of IBM's new System/38 are being confirmed in early installations.

IBM has started delivering System/38's to customers.

And customers have started delivering comments like these to IBM.

"I created a special equipment report in 15 minutes flat. Before, it would have taken a day and a half of programming;" —Chuck Petter, Data Processing Manager, Road Machinery and Supplies Company, Minneapolis.

"System/38 makes our programming staff more productive. We've developed applications in weeks instead of months. And they're more effective."—Norbert Gottenberg, V.P.-Planning & Management Information Systems, United Merchants and Manufacturers, New York City.

"The System/38 significantly reduced the amount of code necessary to write a program and the time and effort required to move into new applications. We're extremely enthusiastic."—Larry Petterson, Director of Data Processing, St. Olaf College, Northfield, Minnesota.

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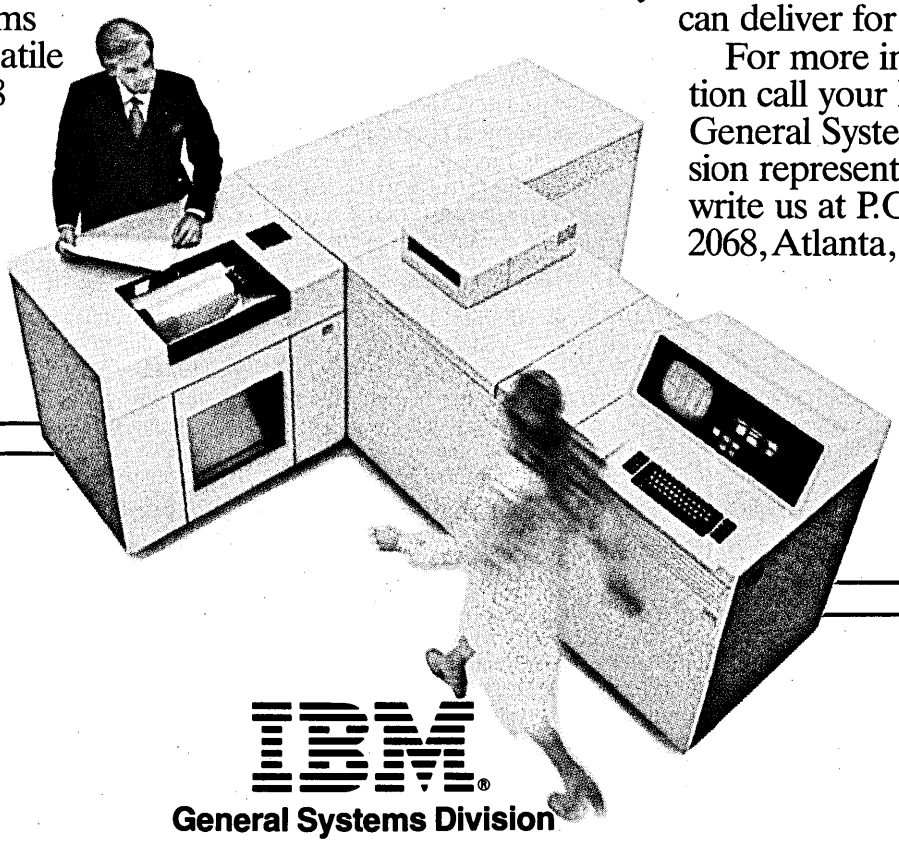

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CIRCLE 19 ON READER CARD

Dp managers rarely accept new tools with alacrity. Here are the reasons.

MAKING FRIENDS WITH USER-FRIENDLY

by Fred Gruenberger

You're a dp manager. Let's assume you're intelligent, rational, capable of complicated reasoning, and thoughtful and careful in your decisions. Why, you even subscribe to *Consumer Reports* for your personal purchase decisions.

Now go back and analyze the last few purchase decisions you made, including your new car, your printer ribbons, the programming language of your installation, and your camera. Being intellectually honest, try to separate those decisions you made rationally from those you made emotionally.

Next, look around your installation. When was the last time that one of your people wrote a sort routine? How recently did someone in your shop write a simple merge? When did you last hear a long discussion on the best way to calculate the day of the week, or leap year? (We are in the only period in the history of our calendar in which, for 199 years, every year divisible by four is a leap year, so *calculating* leap years can't be a very big deal.) When was the last time your people meticulously programmed a file search?

There is now a new breed of software products, characterized by terms like "user-friendly," "menu-driven," and "prompting," that makes it easy for people who are relatively unskilled in computing to perform almost any canonical task in data processing. When you think about it, what task could possibly be performed on a file (excuse me, they are now databases) that hasn't been performed countless times before?

It isn't necessary to define "user-hostile" to anyone with more than six months' experience in our field. This is the milieu that favors messages like "Error 3062 at line 678"; "Phase error in stage two"; "Invalid response. Job aborted"; "Loop index illegally altered"; and "Format error in statement 23."

"User-friendly" is harder to define, but much pleasanter to experience. My first encounter with anything friendly coming out of a computer was with a British interactive program to aid in reactor design. When the user was asked to input the proposed diameter of the control rods, the entry "31 feet" would trigger the message, "DON'T YOU THINK THAT'S A BIT LARGE?"

That was friendly enough, but today we can go much further, and we do. The objective is to get the work done with the least strain and annoyance to the user. The user is assumed to be intelligent, but not skilled in the dp field. Thus, he should be guided into correct actions, politely prevented from incorrect actions, and never made to feel abandoned or lost or disliked. This, of course, puts a heavy burden on the programmer who writes the "user-friendly" programs, but there are only a few of *them* (and they're highly paid professionals), and thousands of those who will use the programs.

The tools I'm talking about include products such as RAMIS, NOMAD, FOCUS, Query By Example, INFORMATICOM, and Just Ask. There will be many more as these pioneers gain acceptance.

"NEW" SOFTWARE PRODUCTS

Earlier, I referred to these products as "new." Just how new are their techniques? Generator programs for report writing date back to 1957. Sort generators were doing well in 1960; how many parameters can there be for a sorting routine? By 1965, we saw the first attempts to combine different generators into larger, more powerful packages. But even earlier, around 1964, programs like JOSS were being written, with the basic philosophy of helping the (unskilled) user do what he wanted to do, while gently preventing him from doing dumb things; this was one of the precursors of "user-friendly" software products. In other words, all the mechanisms and techniques were available long ago but are only now being used wholesale.

Let me be more specific. How much time would elapse in your shop from the time the task described below is defined until correct reports are delivered?

Here's the task: extract from the payroll program each week a list of all employees who are either under 26 or over 55 years old, have base salaries between $19,000 and $22,000, and a length of service greater than two years, or, if less than or equal to two years, are over 60?

Play this game honestly. Don't start to tell me how easy it would be with decision tables or Venn diagrams, just answer the question. The report was needed yesterday, of course. The request for it comes from middle management; no fair dropping everything that is going on in your shop in favor of this request. If the task has to enter a waiting queue, add queue time.

Now, are we talking about 10 minutes, or 10 years? Some of the new tools we're talking about put this task closer to the 10-minute range. They are powerful tools indeed, and very impressive to anyone who has ever coded anything the hard way, in COBOL.

User magazines can and do devote pages to "new" algorithms for calculating things like Julian calendar day, which is one dumb thing to spend time on. It's been done, and done well; it seems to be difficult and painful to sell the idea of doing things *once* and doing them efficiently.

We *do* accept new ideas. Very few installations still code in absolute octal any more. Think back to any significant advance, such as index registers. They haven't always been around; they first appeared on the IBM 704, around 1956. Every programmer in the country then went through the same cycle:

Stage 1. Who needs them? I've been writing programs that work for years. I'm an expert.

Stage 2. Well, I suppose I ought to try them, just to be able to say that I did.

Stage 3. How come IBM gives us only three of them?

Do you suppose you could persuade

ILLUSTRATION BY BRUCE CAYARD

LET'S
DISCUSS
THIS
OVER
DRINKS

If there's a choice between cutting costs and cutting empires, the empire strikes back every time.

your programmers today to give up their index registers? But you say your programmers don't really use index registers; they write everything in COBOL, and maybe *it* uses index registers, but you're not sure. Actually, they use *structured* COBOL, or so you tell everyone. Would you care to display the last dozen programs written in your shop to show off all that structure? We must accept new ideas in our field, or we'll be using our equipment in the same manner we used that old 704, and we'd look mighty silly.

But the process of accepting new tools is so slow, it makes dp people look like an irrational crew. The industry is producing new and powerful tools in profusion, but the acceptance rate is pitiful. The sales effort for software products that have been around for 14 years is precisely the same today as it was when the product was introduced. In other words, widespread acceptance of a product (which surely must imply that *someone* found it to be profitable to use) and even enthusiastic testimonials have no effect on the next sale; the next manager has to be convinced from scratch. One wonders how the second electric typewriter ever got sold or, for that matter, the second business computer.

ADOPTING A NEW PRODUCT

There are two immediate explanations for this slow acceptance: inertia is just human nature; that is, people don't change very rapidly, and the dramatic changes in consumer attitudes are due to massive advertising campaigns. Advertising works, but it is expensive.

On the other hand, quite a few items have been wildly successful with little or no advertising—quartz digital watches, pocket calculators, color tv, video recorders, and Hershey bars. Don't get me wrong: there were plenty of ads, and there still are, for different *brands* of color tv, but I can't recall any campaign to sell the *concept* of color tv; it sold itself.

Well, then, in our industry, does someone have to spend millions to cajole managers into using these new tools? Are there reasons other than inertia for rejecting them? Is it fear of the unknown or the need to explain to top management why they've been doing it badly all these years? Maybe it's the natural wish of most people to put off decisions in the wistful hope that the problem will go away.

A decade ago, there was a rational explanation along these lines: the tools emerging then required considerable effort by the users to learn how to use them properly. Take for example the Mark IV program of Informatics, a little goodie that sells, quite successfully, for upwards of $36,000. According to the Mark IV people, it is not uncommon for a firm to say "We took an existing application written in COBOL and reran it under Mark IV and it took longer to run, and therefore . . ."

The answer to that is twofold:

(1) Mark IV shouldn't be used that way. It is a powerful tool, and the user should capitalize on that power. For example, the user can call for several things to be done in one pass with no significant increase in cpu time.

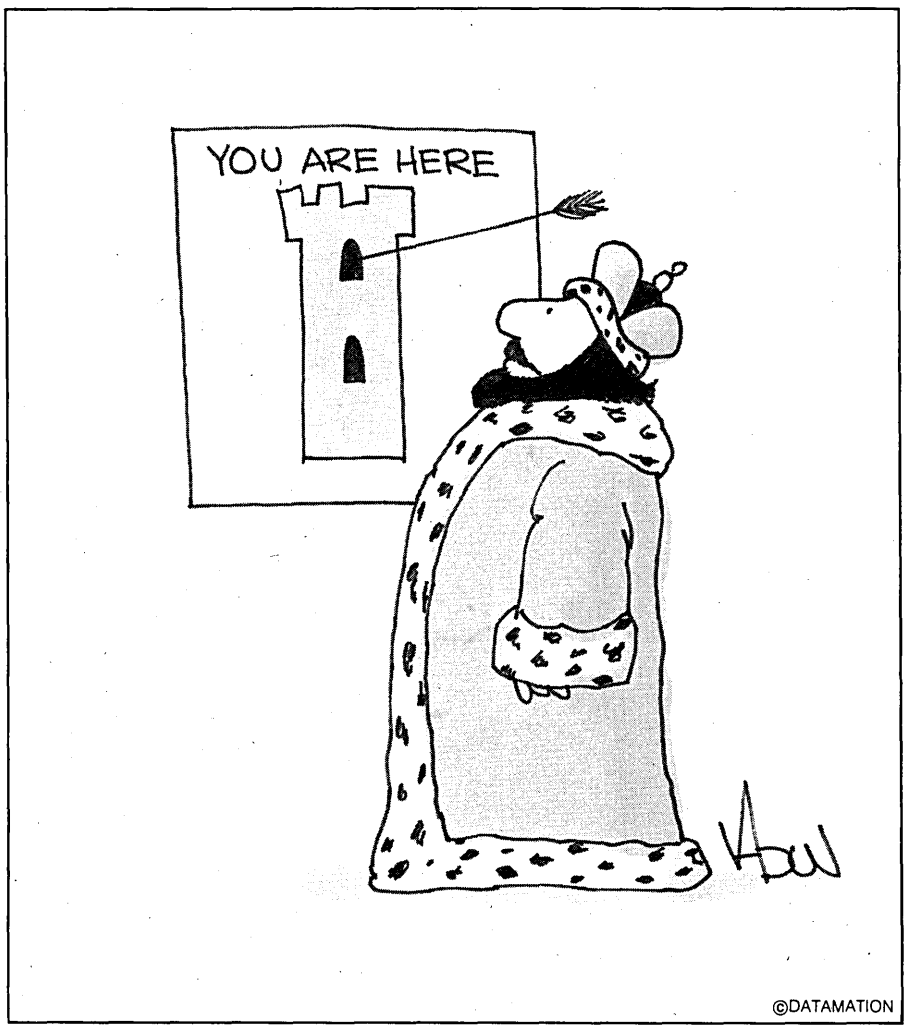
(2) The Mark IV implementation does a great deal more, in terms of validation, run controls, and reasonableness checks, than most users would ever dream of putting into COBOL programs, and eventually the user will be grateful for those extra precautions.

In any event, to use a product like Mark IV efficiently, the user must invest a fair amount of time and effort in learning the system. If you buy a Nikon, do you then use it like an Instamatic or do you take the trouble to read its manual and capitalize on the investment? Not only can you still ruin film with the Nikon, you can do it much faster than with the Instamatic.

So years ago users could find a rational excuse to avoid using new tools; they required work to learn, and most of us can find wonderful reasons for avoiding work. But even that excuse is now gone; the new breed of software products do more things with less effort on the part of the user. It is becoming more difficult to explain why supposedly intelligent people have to be coerced into buying something that could greatly increase the efficiency of their organization.

DP USE REDUCES WORK

But perhaps there's a clue in that last statement. In data processing, "increased efficiency" means shifting work from people to the computer (which is why the machine was bought in the first place—to increase the *company's* efficiency). In other words, an increase in efficiency in the dp shop can (and should) reduce the work force needed for the same amount of work in that shop. But industry does not reward cutting of empires; it tends to punish this. If there is a choice between cutting costs and cutting empires, the empire strikes back every time.



CARTOON BY CHUCK VADUN

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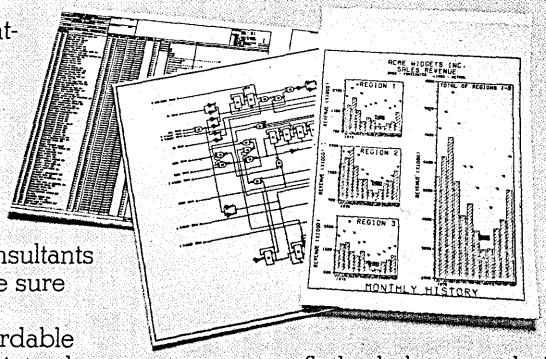

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The new breed of software is here, and much more is on the way.

A dp manager can readily sell the idea of cutting the costs of paper by 3%, but he will be reluctant to sell his management on the idea of cutting his empire in half (or even slowing down its growth rate). Management has been known to reward such efforts by cutting the manager's salary in half or, at the least, cutting his status and influence in the company. These are not actions that motivate the manager to embrace new tools.

So perhaps the message about the new tools should really go directly to top management, except in that case the dp manager (who has been bypassed) will look for ways to kill the idea; his ego has been bruised. The new tools tend to benefit the end user, and thus relieve some of the pressure on the dp department. But sales of programs aren't made to end users. Besides, there is a long history in every shop of end users screwing up the game (always just a few hours before payroll is due), and dp managers remember things like that.

The solution to this awkward problem is fairly obvious. The new tool should not be used as a device to trim the staff but as an opportunity to increase staff effectiveness. There are few dp departments that do not have an enormous backlog of tasks; there are cases where it is claimed that the task queue is *two years* long.

Of course, if the product is aimed at helping the end user, then who has the decision power to buy it? The marketeer has to find the lowest level of management that has the power to say yes, rather than the highest level of management that can only say no. And if the sales effort takes the slightest misstep, then the project can be neatly killed by "studies" that have built-in, predetermined results.

There is one more factor, namely, the fear of again buying an orphan. Quite a few companies have come out with a fine product, but then the vendor suddenly disappears, leaving the customers up a tree. The solution to this problem is the same one used in Hollywood to locate a stable film company: make sure the firm is listed in the yellow pages, so you know it's over six months old.

The new breed of software (or, more often, software/hardware combinations) is here, and much more is on the way. If your shop is writing tight codes in octal for use with on-board spacecraft, then you're not involved, and you can relax. But if you are running a typical dp shop, and you are using COBOL or RPG or assembly language exclusively, and your people wrote their thousandth sort routine yesterday—take heed. You need to think your problems through again. But when one of the new tools is presented to you, try not to trot out that tired old list of the 30 stock reasons for not doing something new. Try this thought: your competitor might take the plunge and get the jump on your firm. ✲

FRED GRUENBERGER

Mr. Gruenberger is a professor of computer science at California State Univ., Northridge, and is the publisher of *Popular Computing*. He is the most prolific author in the computer field, with 26 books and more than 100 journal articles to his credit in the last 25 years.

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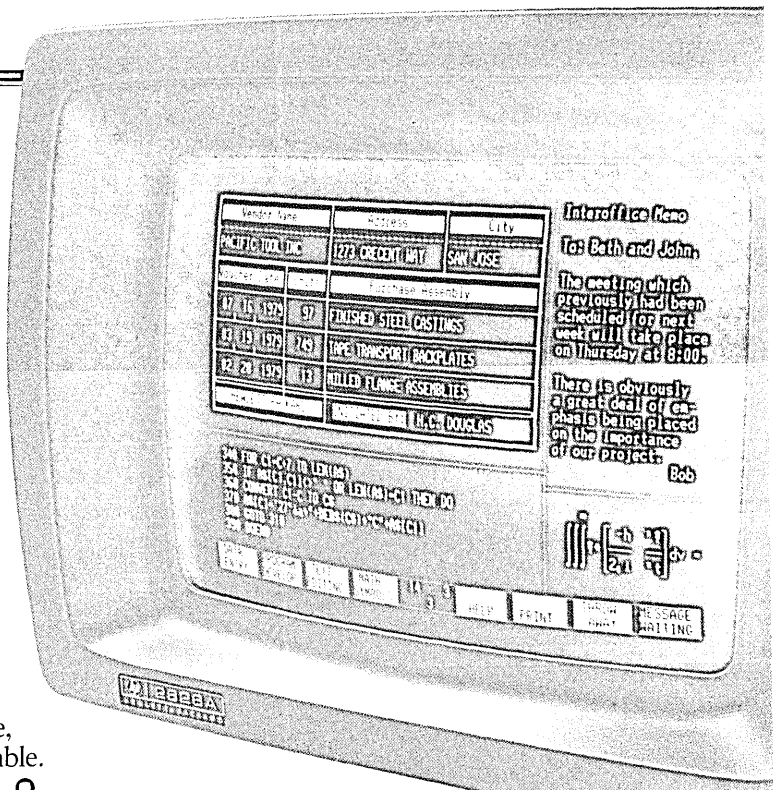

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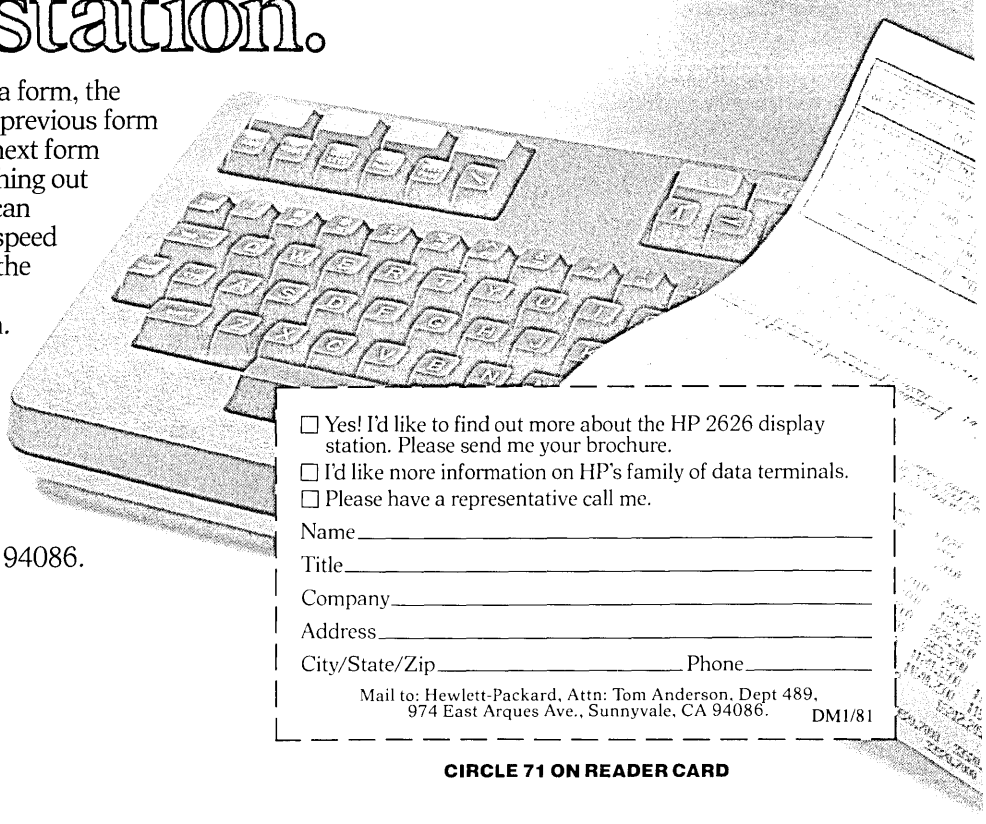

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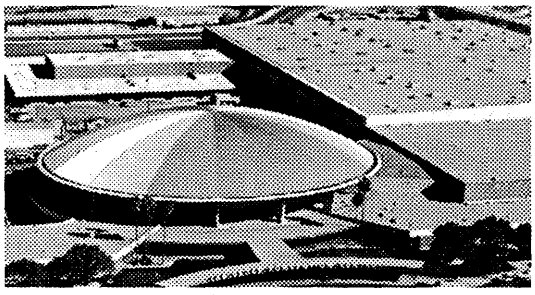

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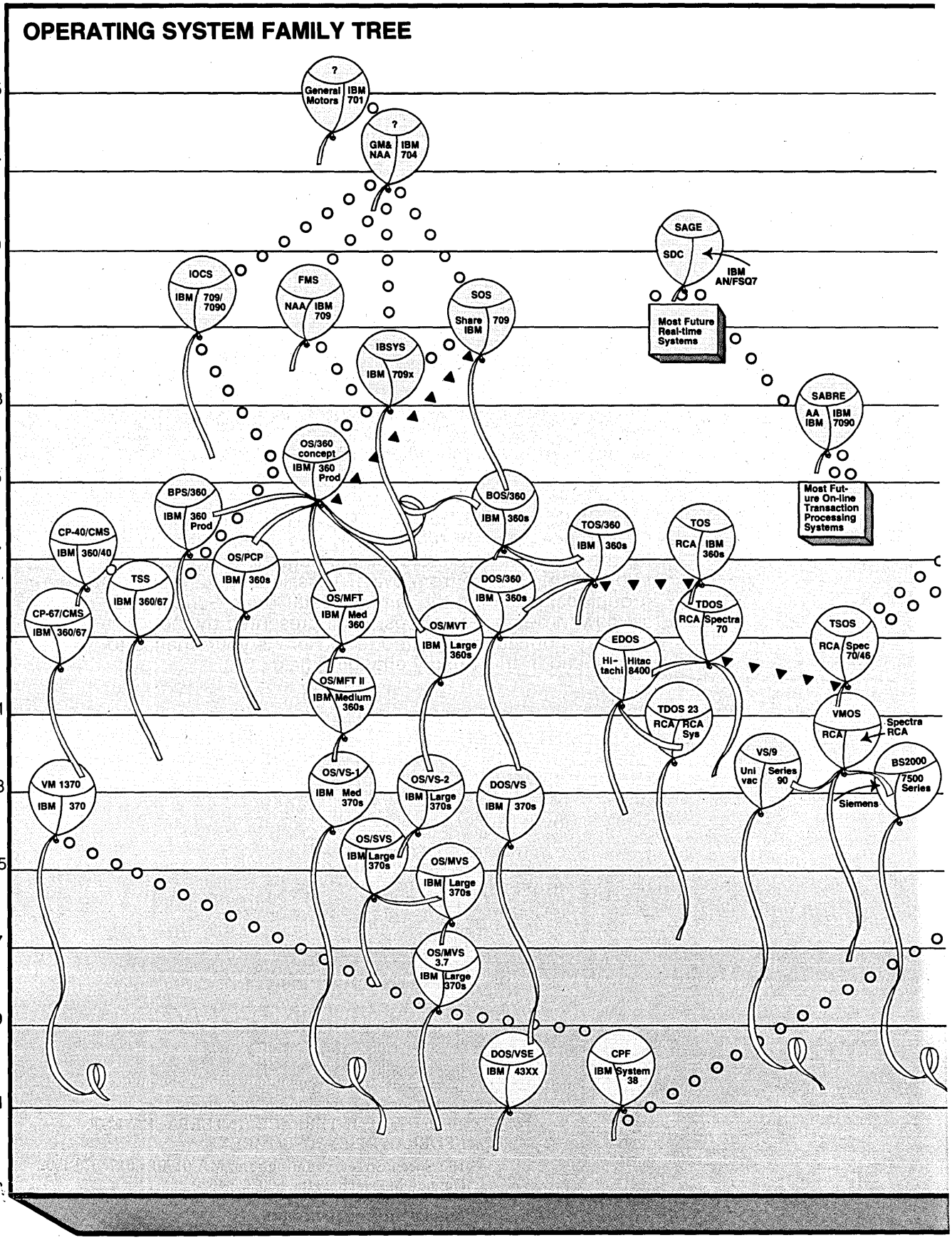
FIG. 1


OPERATING SYSTEM FAMILY TREE
FIRST GENERATION
SECOND GENERATION
THIRD GENERATION
FOURTH GENERATION
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
? General Motors IBM 701
? GM& NAA IBM 704
IOCS IBM 709/ 7090
FMS NAA IBM 709
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BPS/360 IBM 360 Prod
OS/PCP IBM 360s
BOS/360 IBM 360s
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TOS RCA IBM 360s
CP-40/CMS IBM 360/40
TSS IBM 360/67
CP-67/CMS IBM 360/67
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OS/MVS IBM Large 370s
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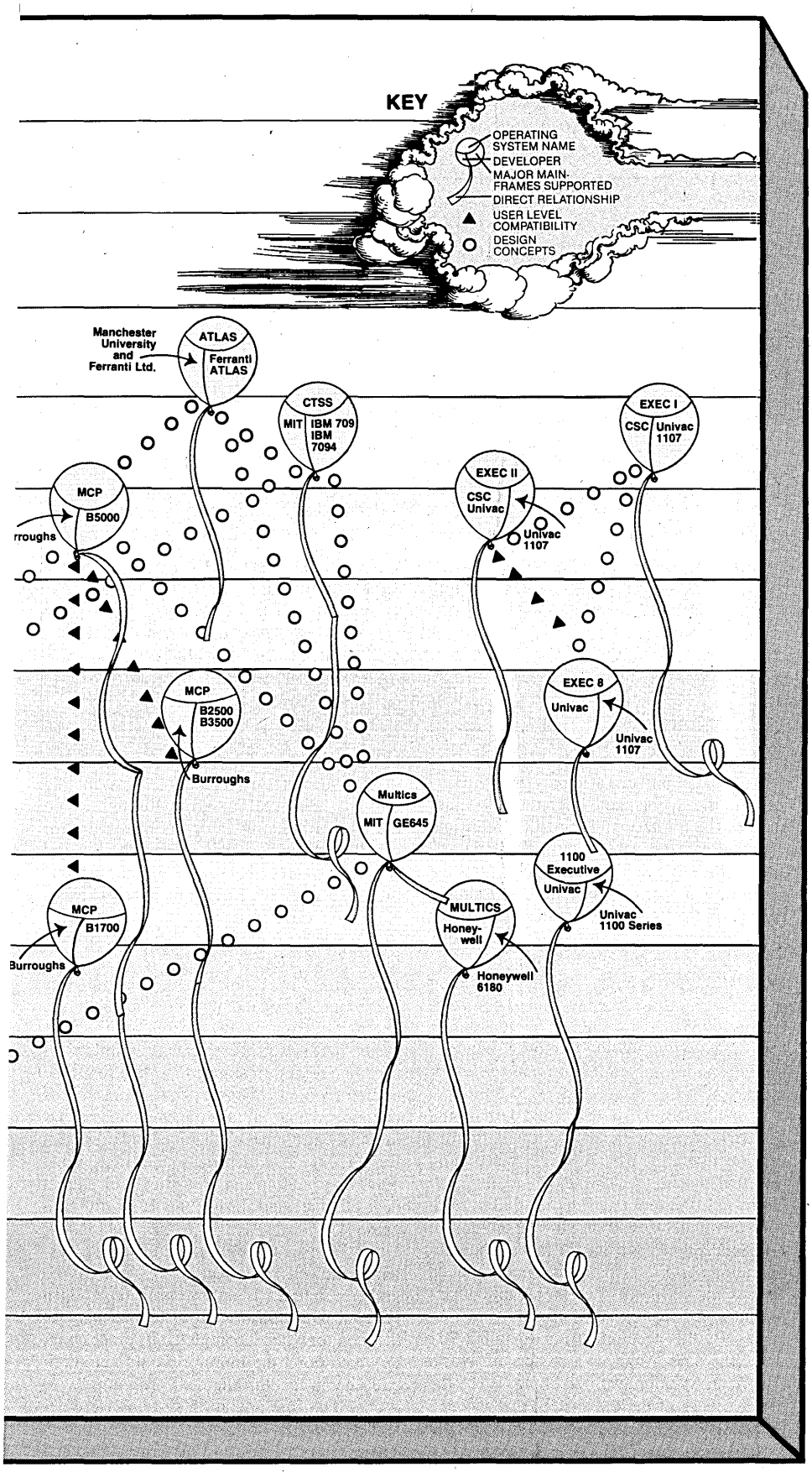

An examination of the origins, use, and future of the ubiquitous OS.

A HISTORY OF OPERATING SYSTEMS

by Norman Weizer

Operating systems have been one of the banes of existence for 25 years. While the graybeards among us remember when there was no such animal, most people have never worked with a computer that did not have at least a rudimentary operating system to help them out. Operating systems are ubiquitous; they are used in the smallest personal computers to the largest mainframes.

Over the years, we have seen one single operating system given four names (TSOS from RCA, Univac, and Siemens), and three or four operating systems given one name (MCP from Burroughs). They have been home brewed, university developed, developed by a user's group, provided by the computer vendors at "no cost," and finally, licensed in "unbundled" pieces from the manufacturers.

Many users have consistently believed that operating systems were, and are, a tool used by the manufacturer to sell more main storage, peripherals, or larger processors. It has been estimated that an operating system uses between 20% and 45% of a processor's cycles. The largest operating systems require a main storage size of between 4 million and 6 million bytes before they can get out of their own way and allow the computer system to produce some useful work at a reasonable rate of speed for the user.

Manufacturers, on the other hand, view operating systems as extremely expensive necessities required to sell systems. At one time, a mainframe manufacturer with whom I was associated was supporting, in one form or another, 13 separate operating systems, spread over five product lines. Each operating system had at least one current version. For the product lines actively sold, most of the operating systems had two or three supported versions.

Six years ago, it was estimated that a mainframe manufacturer spent from $2 million to $10 million a year for programming and associated activities to support a single operating system. Considering the inflation

CHART BY CYNTHIA STODDARD

The development of operating systems was not a straightforward evolutionary development; it was a complex, interwoven process.

rate, those figures could probably be doubled today. An estimate of the total user and manufacturer costs for operating systems over the past 25 years would probably run into the tens of billions of dollars. What has caused people to spend so much money?

An operating system is an integrated set of systems programs whose major function is to manage the resources of a computer system at both the macro and micro levels. Such functions as resource scheduling, I/O control and error recovery, memory management, processor management, task and job scheduling, system error recovery, and security can all be considered integral parts of an operating system.

The users interact with operating systems through such interfaces as operator control languages, administrative control languages, and job control languages. Programs interact with the operating system through what are variously called supervisor calls (SVCs), executive requests (ERs), monitor calls, etc.

Usually, I categorize operating systems as belonging to one of four generations (Table I). Each succeeding generation of systems has in general been characterized by increasing complexity, size, and functionality. It is only in the latest (the fourth) generation that this trend has been reversed.

The transition from the third to the fourth generation of systems is the most difficult to pinpoint; we are too close to the transition point to clearly see the change. Also, the full capabilities of the fourth generation systems are not yet visible. Finally, the manufacturers are very concerned with compatibility between systems, and much of the change taking place is still invisible at the user level.

Many people believe the development of operating systems has been a straightforward evolutionary development that started with OS/360; that each manufacturer started its own operating system development and continued independently along its own development path.

TABLE I

OPERATING SYSTEM GENERATIONS

GENERATION	PERIOD OF MAJOR USE	MAJOR CHARACTERISTICS
First	1955-1962	Single stream batch monitors with few capabilities beyond providing job-to-job linkages. Designed to operate on only one system.
Second	1960-1968	Single mode of operation (batch, real-time, transaction processing, or time-sharing). Limited multiprogramming, multiprocessing, device independence, and data management capabilities. Designed to operate on one or a few systems.
Third	1965-Present	Integrated, complex multimode, multiprogramming and multiprocessing systems. Major emphasis gradually shifting from batch to on-line modes of operation. Designed to operate on a family of systems.
Fourth	1977-Present	Modular layered systems making heavy use of firmware. Many functions of third generation systems being absorbed by the system utility layer of software. Moving from processor-oriented to data-oriented emphasis. Designed to operate on a family of systems across hardware generations.

THE OS FAMILY TREE

It didn't happen that way. It was a complex, interwoven developmental process that is only approximately demonstrated in the accompanying family tree (Fig. 1). In order to illustrate the major transitions and to keep the tree from getting out of hand, I have concentrated on the major U.S. mainframe manufacturers' operating systems. This is in no way intended as a slight to other U.S. mainframe manufacturers, the foreign mainframe manufacturers, the developers of university operating systems, the minicomputer manufacturers, the small business systems vendors, or the microprocessor operating systems developers. Each of the above deserves its own story.

The family tree also only gives lip service to the specialized operating systems, such as the military and industrial real-time systems, and the transaction processing-oriented airline systems. These systems played a major role in operating systems development because in the '50s and early '60s the military invested more money in hardware and software development than anyone else. Although few, if any, military operating systems were directly converted to commercial use, the inevitable technology transfer took place as the workers moved between military and commercial software development.

T.B. Steele, Jr.[1] says that perhaps the first serious semipublic discussion of the concept (of operating systems) took place at an informal meeting of IBM 701 users in Herb Grosch's hotel room during the 1953 Eastern Joint Computer Conference in Washington. It is generally conceded that the first elementary operating system (or monitor) was produced by the General Motors Research Laboratories (*not IBM*) for its IBM 701.

By this account, GM and another 701 user, the Los Angeles Division of North American Aviation, were so impressed by the effectiveness of the GM system that in 1955 they joined forces to produce an operating system for the IBM 704. The 704 was then one of the most powerful scientific processors in the world. Its user grapevine was mainly through the IBM SHARE group through which the idea of building an operating system (or monitor, as it was called) spread. Several sources[2-5] agree that by 1957 many home brew operating systems for the IBM 704 existed among various users.

The basic idea of the primitive operating systems was to reduce system idle time. Before they were developed, each job was loaded into the system with its own boot loader, mainly from cards, and ran alone in the system until its processing was complete or, for some reason, it stopped. At that time, the operator would either dump, if necessary, or dismount the tapes, take the cards and printer output away from the machine, and prepare it for the next job, which was loaded in the same way. This loading and unloading took a great deal of time, and during this time, the machine was idle.

The new monitors or operating systems allowed a collection of jobs to be gathered into an input batch on tape. Each program was constructed to branch back to the monitor when it completed its processing, at which point the monitor would automatically begin loading the next program.

The first operating systems were designed for the large scientific computers. Then, the processor and memory accounted

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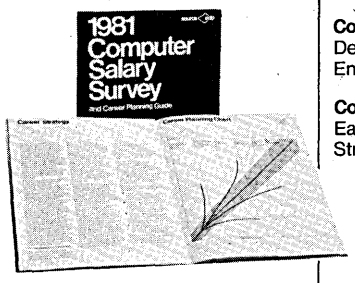

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The first elementary operating system (or monitor) was produced by the General Motors Research Laboratories for its IBM 701.

for 60% to 70% of the entire configuration's cost. Therefore, having these big machines just reading cards and printing reports was also considered very wasteful (the machines at that time could only do one thing at a time; multiprogramming wouldn't appear for another few years).

As can be noted from the operating system family tree, IBM users, IBM itself, and the U.S. were not the only places where operating system development was under way. Some of the other U.S. manufacturers, some universities both in the U.S. and in Great Britain, and foreign manufacturers were also starting to experiment with the idea of programs whose only function was to help run the machine.

In order to support the compilers being developed and to obtain a level of device independence, conventions for certain "system" file usage and standard routines for reading and writing these "system files" had to be developed. This development showed up in the IBM-SHARE SOS[2] and in similar systems of the period. The obscure and troublesome SYSIN, SYSOUT, SYSUT1, SYSUT2, SYSUT3 are the modern descendents of these old system files that were developed to allow this phase processing, and to permit compilers and assemblers to work with each other and the linkers and loaders that used their output.

A VERY CONFUSED STATE

The situation at the end of the '50s was very confused. Most manufacturers were announcing single stream, batch operating systems that contained standard I/O routines for handling the major I/O devices, program-to-program linkage abilities to allow a new program to be automatically started when a previous (usually unrelated) program was completed, simple system error recovery techniques, and (Lord preserve us) the beginning of a JCL.

Most users were either developing their own operating systems or doing major rewrites of operating systems provided by the manufacturers or by other users. The industry was in general disagreement as to whether operating systems were really worth all the resources that they consumed and if, in fact, they cost an installation much more than the installation gained from it. Most of the big scientific systems had an operating system, but the smaller commercial systems (e.g., the 1400) in many cases did not, or had one that had far less capability than those on the large scientific systems.

The early '60s saw a steady increase in operating system development activity by all manufacturers of the period. IBM, Burroughs, RCA, General Electric, Philco, Honeywell, Bendix, CDC, and Univac (without the Sperry) were busily engaged in developing large amounts of system software. Not only were operating systems becoming more complex, such as IBSYS for the 709 or the SOS operating system, but many new high-level languages, such as ALGOL, COBOL, and several others whose names only reside in history were coming into general use. (FORTRAN, developed in the late '50s, was already popular.) The prime concern of the operating system developers was to get the most work out of the large batch processing systems. Ideas like overlapping peripheral I/O, card reading and printing, and "multiprocessing" (what we now call multiprogramming) were implemented.

A primitive form of asymmetric multiprocessing, in which a smaller computer system was coupled with a larger one to handle the larger system's paper and card I/O tasks, was also implemented using such operating systems as IBSYS.

Two major developments took place in the early '60s which were to shape much of the rest of operating system history. One was the development of a completely on-line transaction processing operating system, American Airlines' SABRE system; the second was the development of the first major third generation virtual storage operating system, the Burroughs master control program (MCP) for the Burroughs B5000 system.[6]

MCP, first released in 1963, contained such modern capabilities as:

- multiprogramming
- multiprocessing (with two identical cpus in a master/slave mode)
- virtual storage (using segmentation rather than IBM's paging)
- high-level language development (the operating system was developed in a proprietary variant of ALBOL called ESPOL)
- source level language debugging facilities supported by the operating system

It also included many other features we now take for granted.

The IBM—American Airlines' SABRE system (grandfather of today's IBM ACP operating system, many minicomputer operating systems, and the transaction processing facilities in other manufacturers' operating systems), while not as great a technical achievement as Burroughs' MCP, still had a major impact on future operating system developments in on-line transaction processing.

By the time OS/360 was announced in April 1964, the second generation of operating systems was fully established in users' shops.[6-8]

Most of the third generation concepts, such as multiprogramming, JCL, multicode operation, SYSGEN, et al., were implemented in at least primitive form. "Advanced" manufacturers bragged about on-line and multiprocessing capabilities of their systems. Users complained about how much overhead was consumed by the operating systems and the expense of converting from one incompatible system to another as they quickly outgrew the hardware with its bundled operating system.

SYSTEM 360 A SHOCK

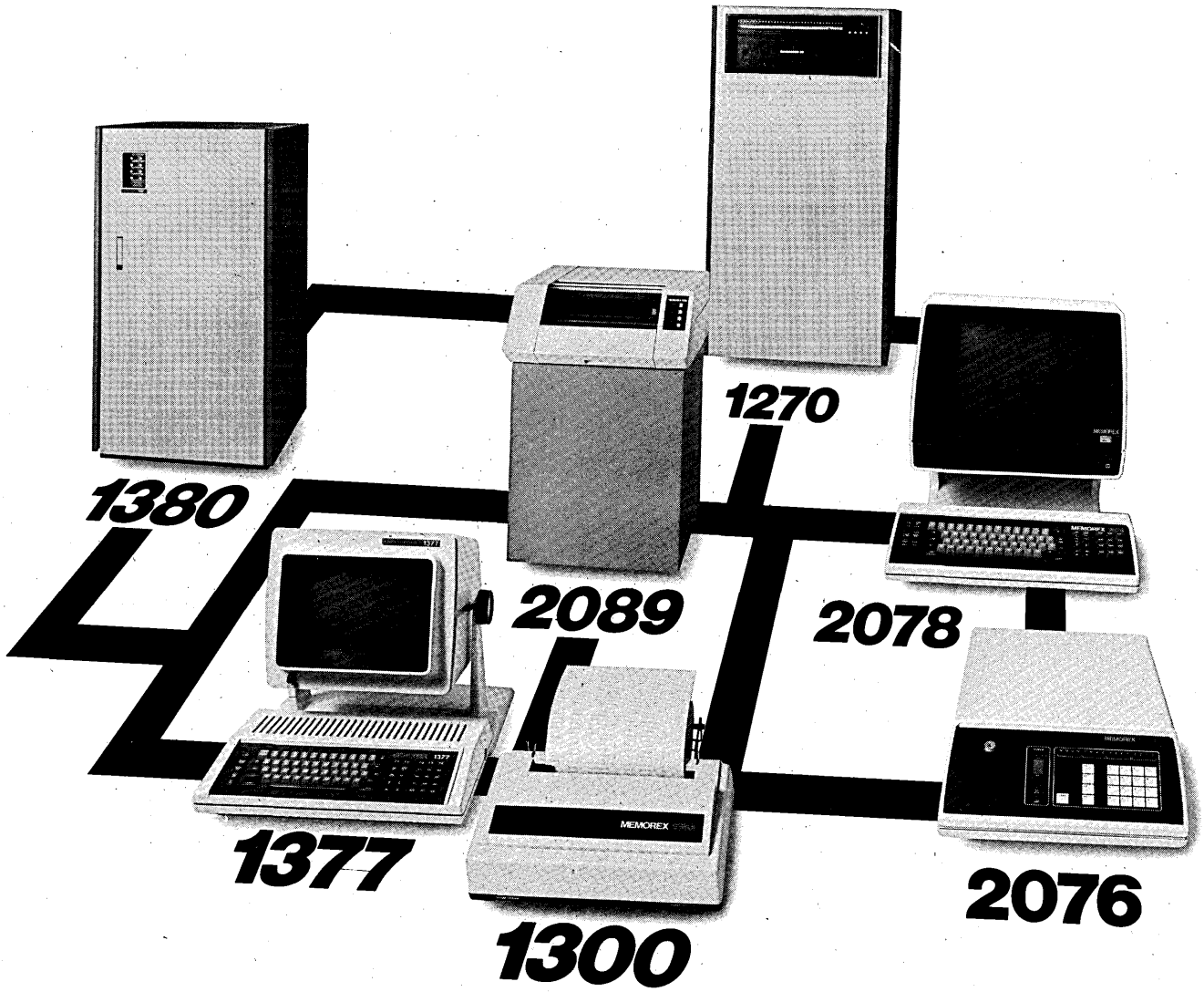
In April 1964, IBM shocked the computer world: the System 360 product family was completely upward compatible and had a single operating system concept (OS/360) to operate all machines in the family. The 360s, except for emulation capabilities, were largely incompatible with any IBM hardware or software product that had come before. Although OS/360 was conceptually a single operating system with a real attempt to maintain complete upward compatibility across the 360 product line, IBM was eventually forced to produce four distinct OS/360 operating systems (Fig. 1). Although OS/360 was not the first of the third generation operating systems, it has undoubtedly had a greater impact on future operating system developments than any other single operating system.

However, OS/360, even in its most complete version, OS/MVT, was missing some of the more advanced features of the Burroughs MCP, such as multiprocessing, virtual storage, and source level debugging support. But it did provide a more complete set of facilities and supporting utilities than did any other operating system of its time. In such areas as job scheduling, peripheral support, number of different systems supported, and conversion support from older systems, OS/360 was unequaled.[9]

The announcement of the 360 added impetus to the spurt of new hardware and software development being carried out by other manufacturers. Existing vendors began developing new product lines of their own or intensively upgrading and expanding their old product lines to compete with the new 360 systems.

All of this activity was generally directed along one of three strategic lines. The first was to produce a family of 360-compatible machines with compatible operating systems. The idea was to produce lower cost machines with more features in the software to achieve better cost performance over the IBM systems. Such vendors as RCA, with its Spectra series of processors; English Electric Company of Great Britain; Siemens of Germany; and Hitachi of Japan were major proponents of this strategy. Some of the operating systems produced by these companies are shown in Fig. 1.

The second strategy was to develop 360-*incompatible* product lines which, because of architectural features or better engineering, were more cost effective than IBM's.



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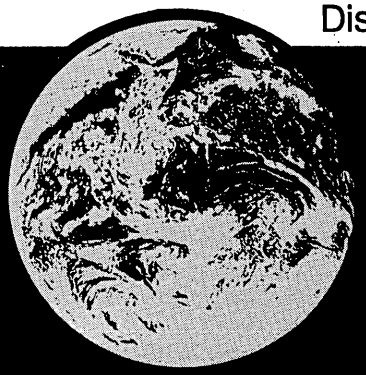

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The IBM SABRE system had a major impact on future operating system developments in on-line transaction processing.

Companies such as General Electric and Burroughs followed this approach.

The third strategy was to take advantage of the major incompatibility between IBM's older 1400 and 7000 hardware and software systems and the new 360 systems by producing product lines more compatible with older 7000 and 1400 lines than with the 360, but using all the functional capabilities in the hardware and software that the 360 did. The major manufacturers following this strategy were Univac with its 1100 product line (aiming for the IBM 7000 base) and Honeywell with its 200 product line (aiming for the 1400 base). Control Data also attempted to attract the large, scientific 7000 machine users who now faced difficult conversion to System/360.

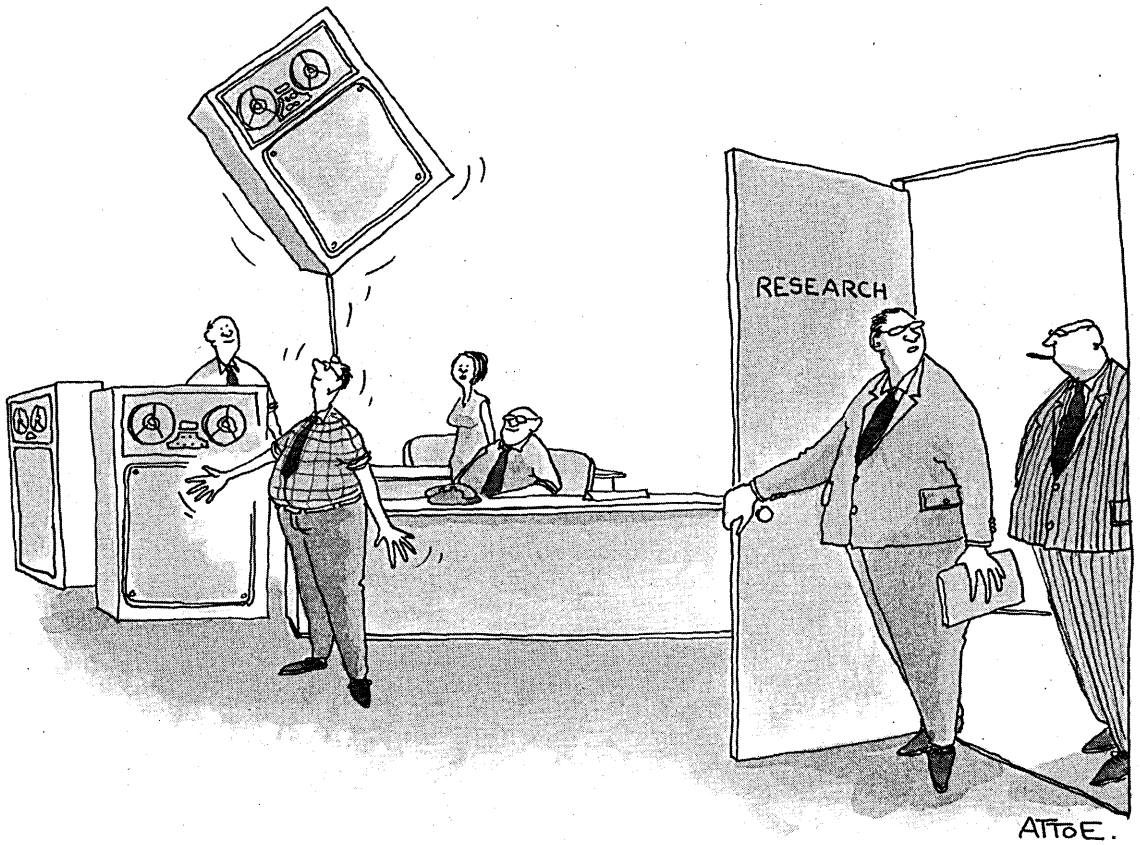
Although IBM announced a single product line with a single operating system, we all know it didn't quite work out that way. After all the dust had settled, IBM users were confronted with four operating systems: DOS/360 for the small machines, OS/MFT II for the medium to large machines, OS/MVT for the large machines, and a system out of left field (IBM Cambridge Scientific Center) called CP-67/CMS.[10] Even though it proved impossible, at least in IBM's case, to generate a single operating system for all members of a product family, the idea of compatible product families had taken hold and the users were insisting on this feature from all the manufacturers; it was the product family approach and the need for operating systems, language processors, communications facilities, and other utility software that caused the major shakeout mainframe manufacturers.

TIME-SHARING SYSTEMS

Throughout the '60s as the industry made the transition from second generation to third generation, people worked on the problem of allowing multiple users to interact with the system on-line—in a word, time-sharing. One of the first time-sharing operating systems to be developed in the U.S. was the CTSS system, developed at MIT by a group known as Project MAC. The system was first developed for the IBM 709 in 1961 and later transferred to a modified IBM 7094 computer. It was rather primitive compared to present-day time-sharing, without the virtual memory capabilities, but it worked.[11]

Meanwhile, Project MAC was at work developing another modern time-sharing system, MULTICS, while the major manufacturers were developing and delivering their own general purpose time-sharing systems. IBM brought out two systems, one being CP-67/CMS which has since evolved into VM/370, and a system called TSS. RCA produced TSOS which was quickly renamed VMOS, CDC, and United Computing Systems produced a system called KRONOS for the Control Data 6000 computer series, and there were many others. Manufacturers who chose not to bring out general purpose time-sharing systems added time-sharing options to their larger operating systems to meet the demand.

In general, these time-sharing systems were third generation systems with multiple modes of operation. Almost all depended upon one form or another of virtual storage. Although they provided a great deal of experience in the use of virtual storage and many of their design concepts were incorporated into later versions of major third generation operating systems, few could be considered commercial successes. IBM's TSS system is a notable example. It was rumored in the industry that IBM had spent as much money on TSS as it had on MVT; and that at one



"I hear they're doing some amazing things with computers these days."

CARTOON BY STEVE ATTOE

©DATAMATION

No matter what form fourth generation OS take, we can be assured that transition from third to fourth generation software will be practically invisible.

time, TSS was considered a successor to MVT. However, as we now know, TSS is history; its place has been taken by VM/370 and the various time-sharing options on the IBM VS operating systems.

A few other general purpose time-sharing systems still exist. The RCA VMOS has become the VS/9 on the Univac Series 90 and the BS2000 on Siemens' medium scale equipment. MULTICS is still used at MIT and has been commercialized by Honeywell on its large-end equipment. In general, these time-sharing operating systems succeeded in direct relationship to their ability to adapt themselves to full multimode use rather than just the time-sharing use, except for those few which are used by the very large time-sharing service bureaus. The proprietary systems developed by time-sharing service bureaus are a story in and of themselves, too long and too detailed to discuss here.

As can be seen (from Fig. 1), operating systems have slowly evolved. The major excitement in the '70s was provided when IBM blessed virtual storage with its VS hardware and software announcements in 1973. Most manufacturers have been mainly concerned with improving the throughput and reliability of their systems, reducing the number of operating systems they actively supported, and working on the higher levels of systems software, such as data base management systems, communications network architectures, and improved facilities for transaction processing, and time-sharing.

During this period, another major change occurred in operating systems in addition to technological changes—unbundling. In many ways, unbundling laid the groundwork for one of the major attributes of fourth generation systems appearing today. By charging for separable pieces of software, manufacturers were forced to perform major software redesigns and rewrites so various pieces of the integrated third generation operating systems could be separated into independent units that could be licensed on an individual basis. It is rumored OS/MVS release 3.7, introduced in 1977, was in fact not just a simple level release of this system, but a major rewrite (up to 60% of the code rewritten) of MVS. This rewrite was required to permit system unbundling and to prepare for the fourth generation successor of MVS.

This process has been so effective that seemingly ever-growing, ever more complex third generation operating systems have finally begun to shrink as more of their functions are absorbed in the next level of unbundled software. Thus, instead of having what was seen by a writer in DATAMATION, a version of OS that was so big and complex that once it was booted the entire machine was occupied with OS just taking care of itself, we now find ourselves in the position where IBM has announced that all future enhancements to its system software will occur in the priced program products and that what is considered the operating system itself will be smaller and will perhaps eventually wither away completely.

FUTURE CHANGES IN OS

Based on the trends discussed, many industry pundits have concluded that operating system development has stopped and that operating systems have reached a stabilization point where no major future development can be expected. I do not hold this view. I believe that we are right now in the midst of another major revolution in operating systems design that has been going on for two or three years and will continue at least until the mid '80s.

Although the form of these fourth generation operating systems is not as yet apparent, it appears clear they will all have similar major characteristics. They will probably all be based on some form of virtual machine architecture (like that in VM/370) which will completely shield the user level application program from the characteristics of the hardware on which they are executed. Thus, we expect the same user application program to run on almost any size system in a family, and to run on multiple generations of systems in a family without need for any conversion effort on the user's part. We expect a great deal of the operating system to be contained in firmware with only skeletons of the system in software. The various separate operating systems will gradually lose their identity over the next several years and become merged into that IBM dream of a single operating system running across a complete product family line.

The operating systems will become data centered with definition, control, protection, and manipulation of the data distributed across an extended system integrated into the very basic elements of the operating system itself.

The Control Program Facility on the IBM System/38 is an example of such a system, although not necessarily compatible with the way in which it will be implemented in the mainframes. The single level addressing virtual I/O as implemented in the VSE mode of the IBM 4300s appears to be the first step in this direction on the mainframe IBM equipment. Since IBM usually does not announce all the capabilities that are in a system at its first release, we can expect that there are more surprises hidden in the 4300 than have been announced.

No matter what form fourth generation operating systems take, we can be assured that transition from third generation to fourth generation software will be practically invisible. It has become conventional wisdom in the industry that OS/360 cannot ever happen again; no manufacturer can afford to force its users to make a massive transaction from one incompatible operating system to another.

So, for the students among us who ask whether the study of operating systems offers a career, my answer is a definite yes. However, I caution they had better learn a great deal about microcode and its uses and even more about data base management systems and the various structures that are required to make them work effectively. Operating systems, instead of being dead, are just entering perhaps one of the most exciting times in their evolution. They will continue to evolve, but they will remain essential parts of all computer systems for a long time to come. ❋

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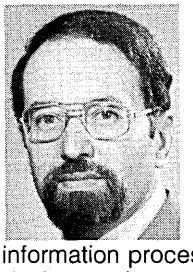

Mr. Weizer is a senior member of the consulting staff at Arthur D. Little, Inc., Cambridge, Mass., where he specializes in technology forecasting, information processing system design, and strategies for participants in the information processing industry. During his 20 years in the dp industry, he has designed and worked with many operating systems including RCA's TSOS (later VMOS) operating system.

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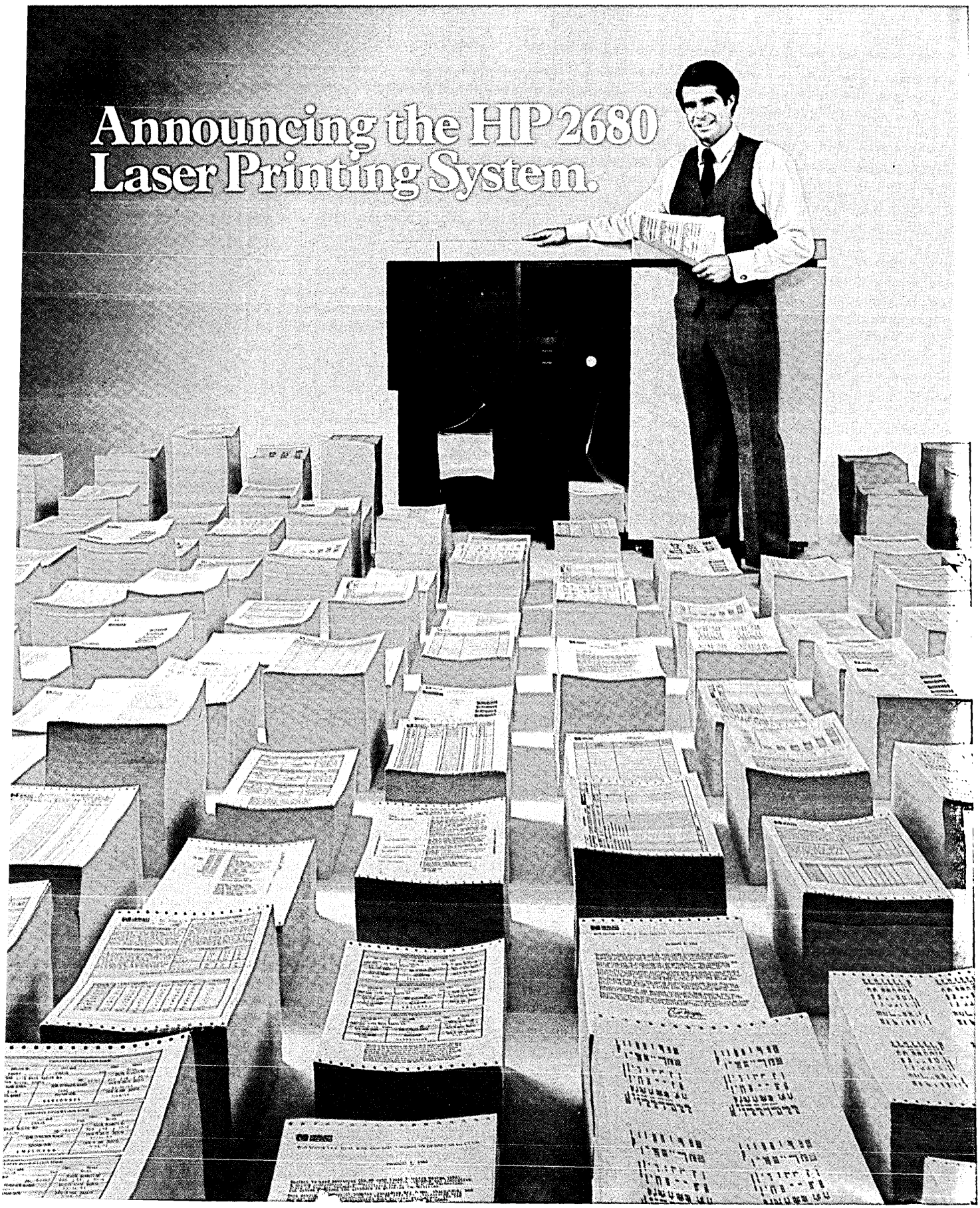

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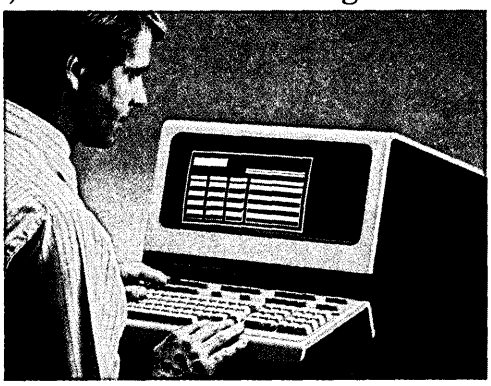

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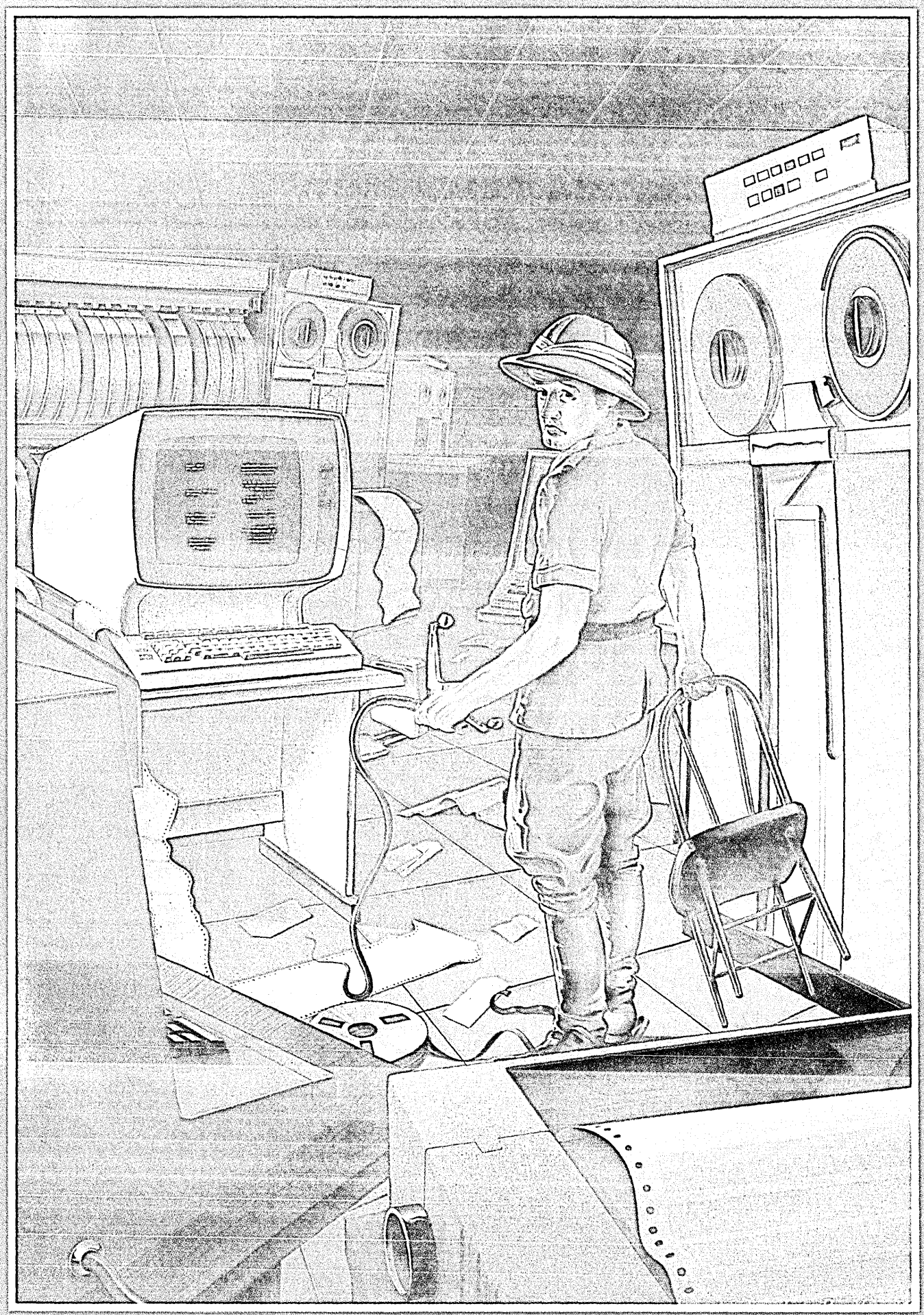

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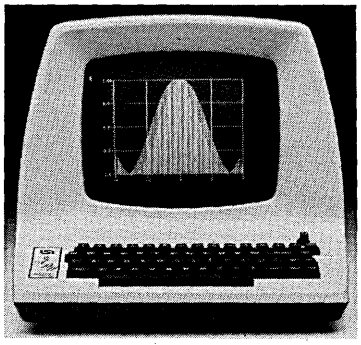

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A visit to the Alabama Space and Rocket Center in Huntsville.

BUSMAN'S HOLIDAY

by Marvin Grosswirth

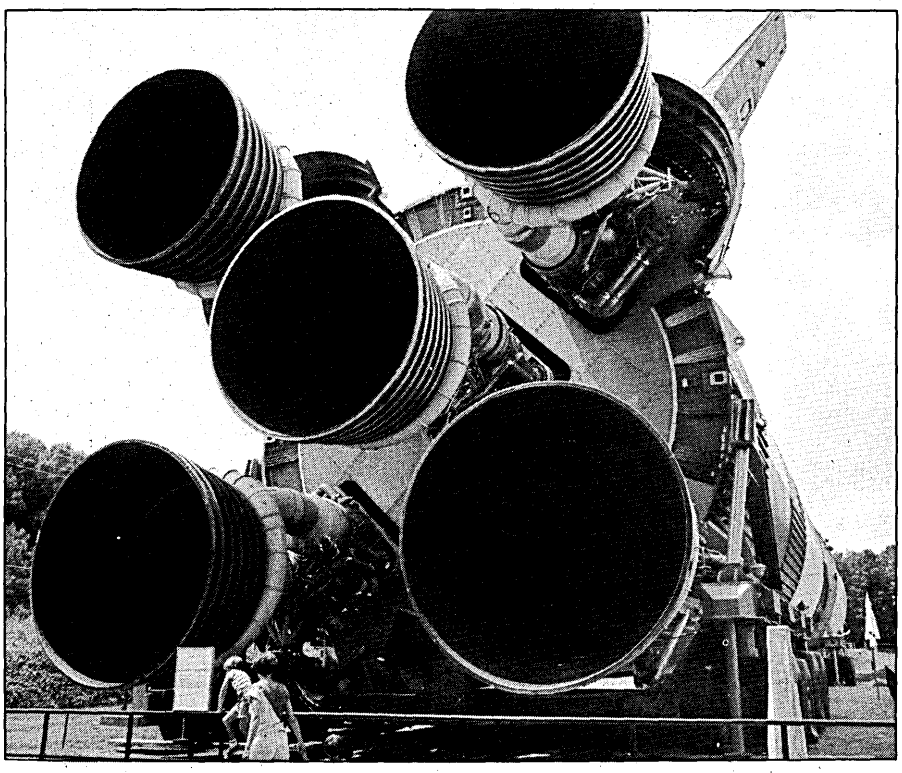
Scott Osborne has an honest face, a clear eye, a sincere expression, and a soft, pleasant, Southern drawl. You want desperately to believe him. But when he tells you that this . . . this . . . *thing* looming over you is a computer, credibility begins to gap.

You are looking at what is known as an Instrument Unit (IU) Ring. A five-foot-wide band (of which 24 inches are support rings), looped to form a ring some 22 feet in diameter, it is the mechanical brain of the Saturn V rocket. The IU Ring, explains Osborne, "controlled everything related to the launching and staging of the rocket. The computers you see gave the signal and programmed the flight. There were some commands that could havebeen overridden by the engineer, but primarily, the IU Ring handled everything on its own.

"Once the launch was under way," he continues, "the IU Ring carried the rocket through until the astronauts in the spacecraft took over. It took the rocket through its staging sequences, controlled the separation, the trajectory, the path. . . ." He then points to various protuberances along the inside of the ring: data adapter, command decoder, control distributor, flight control computer—and a glimmer of awareness appears. What you are looking at is a data processing and communications system, complete with the capability of transmitting data, via radio, to Houston and Cape Kennedy. The gray and blue boxes with the corporate logos are gone, as is the mental image of a dp system being, somehow, linear. But it is a dp system nevertheless.

There is, however, a limit to how much Osborne can explain about the IU Ring. He is not a computer expert. Nor is he, exactly, a space and rocketry expert. He is a museum expert whose speciality is exhibitry, and that makes him, perforce, an expert on whatever it is he is exhibiting—up to a point. In this case, he is exhibiting "the world's greatest collection of space and rocketry hardware" and all that goes with it. Scott Osborne is the associate director of the Alabama Space and Rocket Center (ASRC), in Huntsville, a 10-minute ride from the U.S. Army's Redstone Arsenal and NASA's Marshall Space Flight Center, where most of the major research and development for America's space program is conducted.

PHOTOGRAPHS BY MARVIN GROSSWIRTH



The Saturn V rocket, as big as a football field, dominates Rocket Park.

Osborne knows enough about space, rocketry, and computers, however, to hold some firm opinions. Of all the commercial/industrial spin-offs from the space program, he contends, computers have benefited the most.

"While we were launching those little Mercury capsules weighing a few pounds," he explains, "the Russians were putting up tons. We had to find ways of getting around this, so we began to look at miniaturization, shrinking everything down as small as we could make it. The smaller the payload, the more payload we could get up for the amount of fuel used. Miniaturization became a real concentrated effort through the 1960s. Computers came from that, and computers themselves began to be reduced. And all of that has led to the technology we have today. That technology started with the space program."

To be sure, there is considerable room for chicken-and-egg argument. After all, before the space program could begin to miniaturize, computers had to be available for shrinkage. Still, it is difficult to be argumentative in the admittedly awesome presence of "the world's greatest collection of space and rocketry hardware," especially when so much of that hardware has a look of familiarity and offers the temptation of hands-on participation: over 60 of the ASRC's exhibits do nothing until you make them work.

Subminiaturization, for example, is represented by a two-inch television screen that glows with your own minuscule image. By flicking a switch, you can bend light in a fiber optics display, or turn on a hologram, and try to convince yourself that what you see is the result of technology, not sorcery.

The Military Preparedness Game can help release pent-up hostilities—but it can also lead to frustration and dismay. The game consists of two consoles at which the participants sit. Above them hangs a huge, vertical ellipse of a screen. "We have a series of eight components that are factors of rocketry," Osborne explains. "The participant can select five of them to build his army. Then we

have this mock battle situation and you play your capabilities against the other guy's to see who has developed the better army." The release comes from the opportunity to zap your opponent out of the cosmos. The frustration comes from losing. The dismay comes from losing to a kid, most of whom are depressingly adept at the Military Preparedness Game.

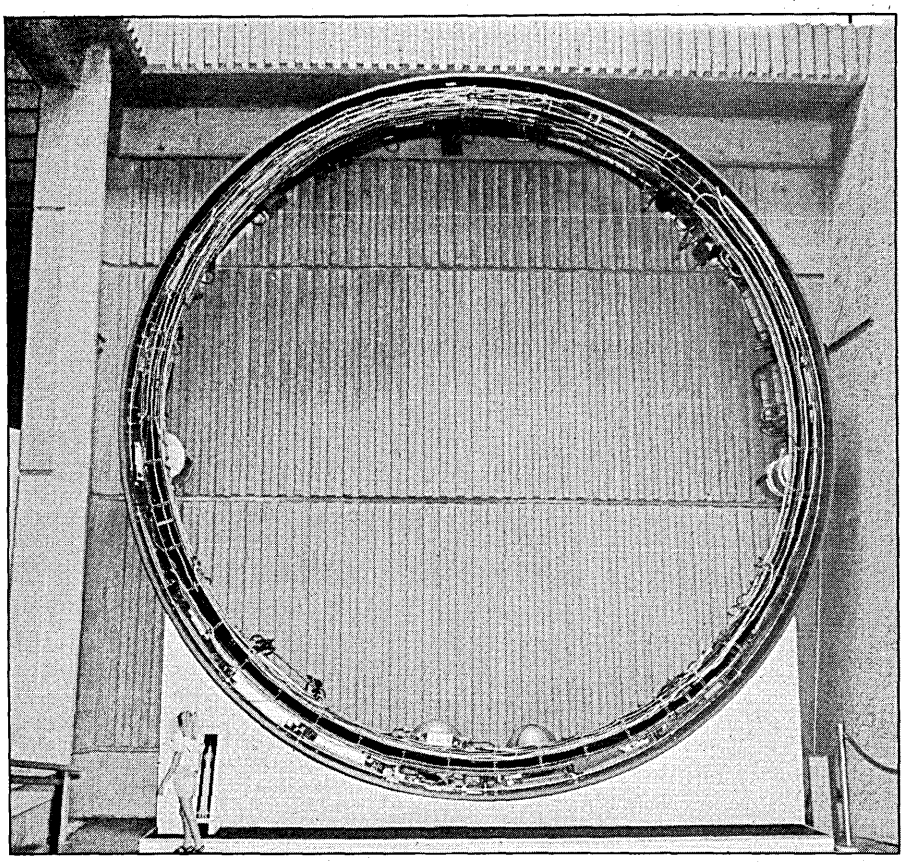
PLAYING WITH PET POPULAR

There is yet another computer at the ASRC. In response to a request from state authorities, the museum has mounted, in a quiet corner, an energy conservation exhibit which, although only remotely related to space (there are, for example, demonstrations of the uses of solar energy), is both respectable and popular. Part of that popularity no doubt arises from the presence of a Commodore PET 2001 microcomputer, programmed to test the visitor's knowledge of energy sources and conservation. The computer communicates informally and cheerily, and even throws in some relatively simple graphics in the form of charts. For many visitors, especially the younger ones, it is their first opportunity to operate a computer and they do so with surprisingly little intimidation. It is another tribute to computer technology that, although over 50,000 visitors have enthusiastically pounded the PET's keyboard, there have been no breakdowns or maintenance problems.

The wonders of modern technology are all over the place. It is possible, for example, to attempt to guide a spacecraft through an asteroid field. One can control the blast-off of a "live" rocket engine. A subminiature transmitter displays one's pulse rate on the Astronaut Heart Monitor.

If that display is satisfactory and you are free of cardiac trouble—as well as middle-ear problems and pregnancy—you can take a trip to the moon on the Lunar Space Odyssey, a simulated flight that demonstrates, almost too graphically, what an astronaut goes through. Hardy souls strap themselves into an almost-vertical divan, one of many mounted in a circular room that turns out to be a centrifuge. As the whirling wall picks up speed and g-force begins to double and nearly triple, one understands why heart problems, middle-ear disorders, and pregnancy militate against taking the trip. So does a hearty lunch just before embarking. The "voyage" is enhanced by a dome that convincingly simulates the effect of plummeting through outer space.

There is also the so-called Weightless Machine, a device used to train astronauts. It resembles a giant amusement-park seesaw, with a seat at one end, a counterweight at the other, and a complete absence of machinery. By pressing down gently with the feet, the visitor goes soaring into the air, in one complete axis of zero gravity, "somewhat," says the museum guidesheet, "like an astronaut tethered to his spacecraft during an EVA [extravehicular activity]." It is a momentarily heart-stopping, but rewardingly exhilarating, experience.



Instrument Unit Ring carries computers and peripherals on Saturn V rocket.

More timid souls may prefer the somewhat less thrilling but equally effective Gyro Chair. It is, as its name suggests, "a gyro hooked up to a chair," Osborne points out, "to show the energy that can be created by spinning disks. Gyrocscopes were used to stabilize the rockets. As it went through space, without any up or down, it had a set path . . . and if the rocket began to veer, the gyro platform sensed it and sent the word down to the engines to kick over and push the rocket to one side or the other, to put it back in its proper pattern." The technique is demonstrated to the visitor, who sits in the chair and moves a handle. As the gyroscope's position is changed, the chair moves accordingly.

Would-be space travelers unable to avail themselves of the Lunar Odyssey can obtain some compensation by journeying forth in the Shuttle Spaceliner. Although the actual reusable space shuttle is not scheduled to take flight until 1982 (at the optimistic earliest), the ASRC's version is nevertheless billed as a realistic, life-size, "people pod" payload, of the sort that is expected to occupy the shuttle's cargo bay. Here, too, space travel is convincingly simulated.

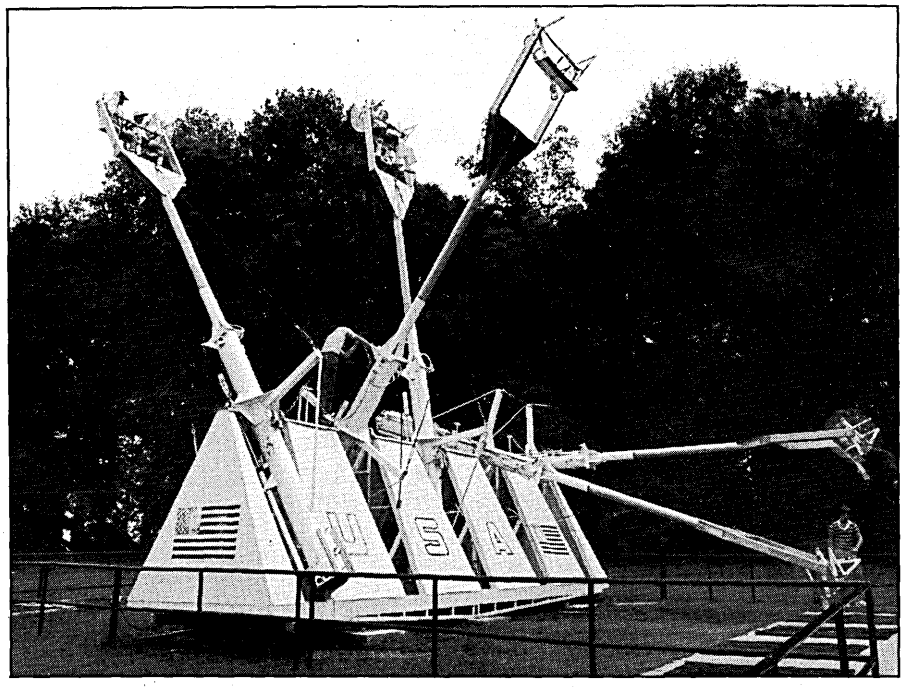
For the entirely passive, there are, of course, exhibits merely to be looked at: chunks of hardware recovered from space, astronauts' gear, lunar rocks, and the Wernher von Braun Room, an alcove crammed with the professional artifacts, personal belongings, and multitudinous awards of the rocket expert who spent so much of his time, talents, and energies working for NASA in Huntsville.

BRISTLES WITH ROCKETRY

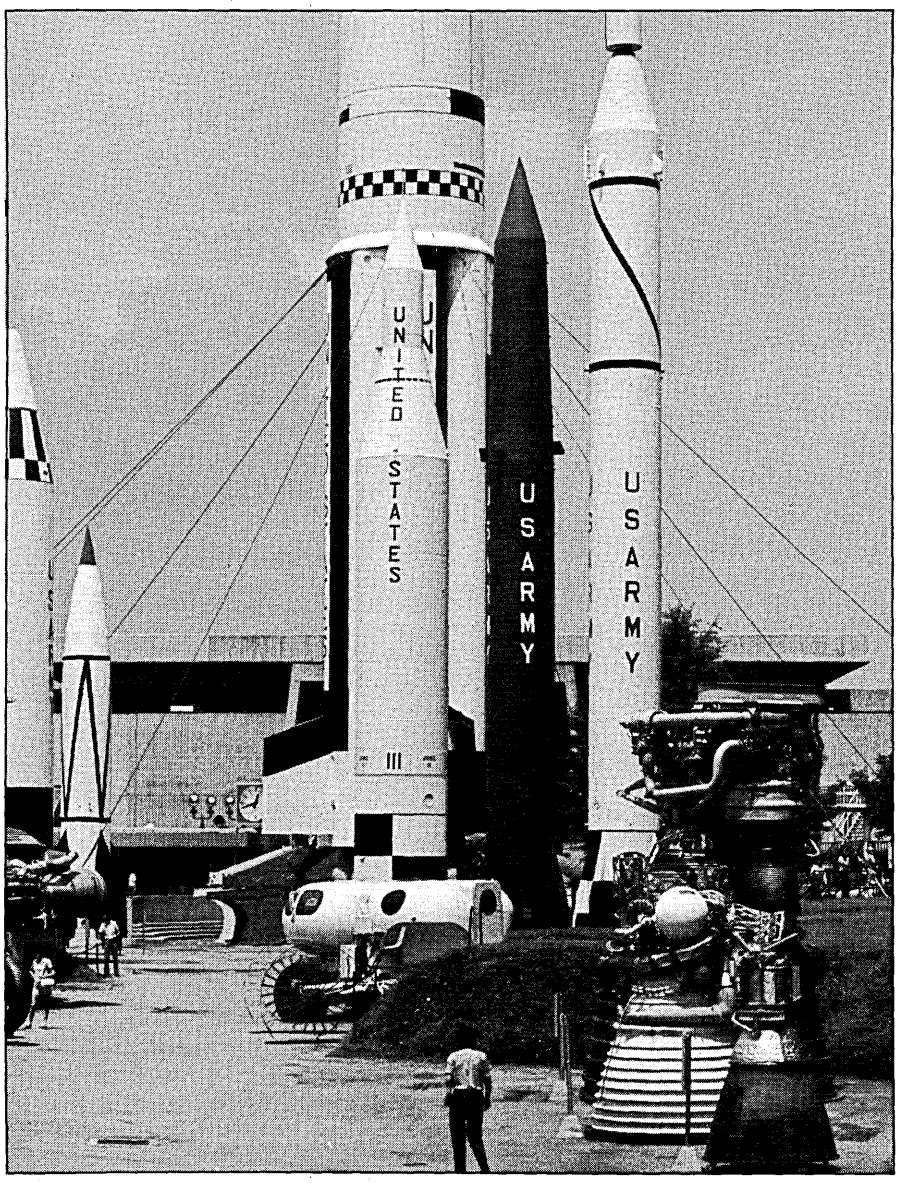
The ASRC's backyard is appropriately called Rocket Park. It bristles with rocketry, most of which point skyward, in seeming readiness to ascend at a moment's notice. Among them are the V-1 and V-2 rockets, the buzz bombs that rained terror and destruction on London during World War II. These, too, attest to the skills and talents of Dr. von Braun, who developed them during his tenure as an employee of the government of Nazi Germany.

Perhaps the most awesome spectacle in Rocket Park is the Saturn V rocket. To walk from its tail to its nose is to traverse the length of a football field. Its appearance quickly dispels any vague remaining doubts about the IU Ring: obviously, it would take nothing less than a complex computer system, in an odd configuration, to get the thing off the ground and keep it there.

While the ASRC may provide sources of amazement, amusement, speculation, and contemplation for its transient visitors, it seems to have little effect on its single permanent resident. She is Miss Baker, a one-pound monkey who paved the way for mankind by soaring into space aboard a Jupiter rocket in 1959. The tiny creature scratches contentedly in her glassed-in cage, apparently oblivious to all around her, including Norman, her current mate. She has successfully survived two consorts and is working on her third. Whether



Visitors experience weightlessness on same machine used to train astronauts.



Rocket Park is the backyard of the Alabama Space & Rocket Center.

that is a result of her voyage or the fact that she lives in a climate-controlled, pollution-free environment is open to question—one that it is probably wiser not to dwell on, especially since there are other mysteries at the ASRC.

There is, for example, the "Singing Flame." According to Osborne, during engine-testing procedures, it was discovered that flame could produce and amplify sounds. "It's just some fluke that evolved," Osborne admits, gazing at the demonstration with unconcealed bewilderment. "We don't know any practical use for it, but who knows? Maybe some visitor coming through will find a way to use it." He seems to enjoy the mystery as much as he does the carefully detailed explanations that surround him.

There is, after all, considerable mystery beyond the earth's atmosphere. Inevitably, amidst the proliferation of all that space hardware, the conversation turns to space operas.

"*2001* is still my favorite space movie," Osborne says. "That ending, even though you don't understand it, is symbolic. I think when we get into what space is all about, it's going to be just that big a mystery: 'What the hell is all this?' "

Indeed. *

Marvin Grosswirth is a freelance writer in New York City. He is a frequent contributor to DATAMATION and other science and technology publications.

FOR YOUR INFORMATION ...

The Alabama Space and Rocket Center is located just off State Highway 20, about 15 minutes from I-65, which runs between Nashville, Tenn., and Birmingham, Ala. From June through August, it is open from 8 a.m. to 6 p.m.; from September to May, it opens an hour later and closes an hour earlier. It is open every day but Christmas.

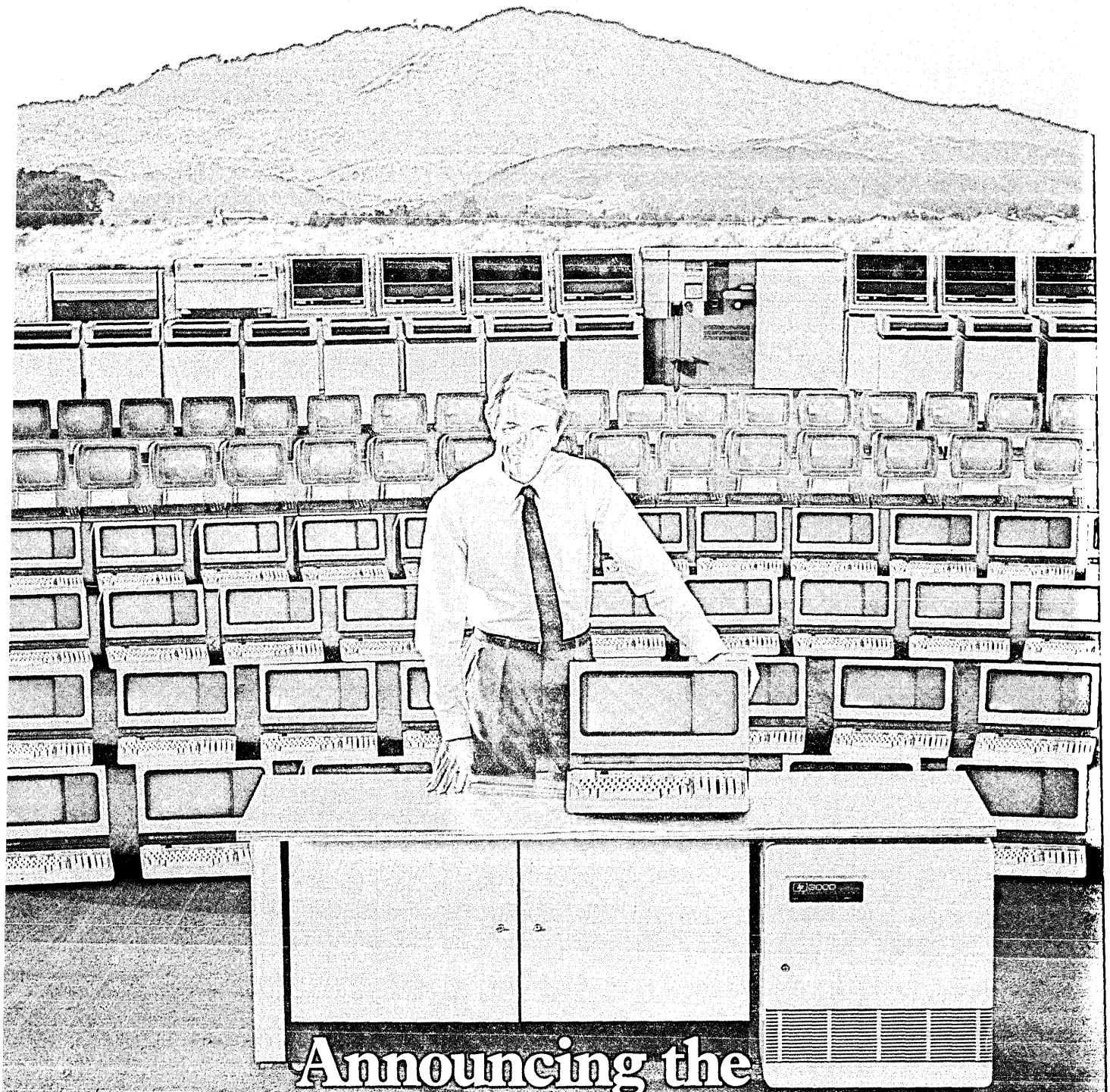
Admission, $5 for adults and $2.25 for children, includes the museum, Rocket Park, the various rides (Lunar Odyssey, Weightless Machine, etc.), and a bus tour of nearly two hours of the Marshall Space Flight Center.

Facilities include parking, a well-stocked cafeteria, a gift shop, and rest rooms containing exhibits of how astronauts dispose of waste materials in orbit. (Visitors are expected to use more conventional appliances.)

For more information, call toll-free 800-633-7280 (in Alabama, 800-572-7234), or write to the Alabama Space and Rocket Center, Tranquillity Base (we don't make these things up—we just report them), Huntsville, AL 35807.

—M.G.

Mainframe power.



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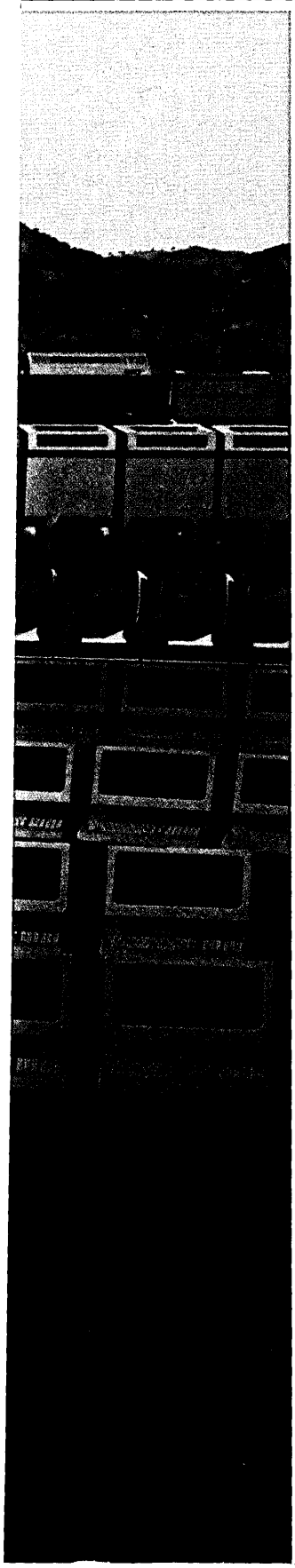

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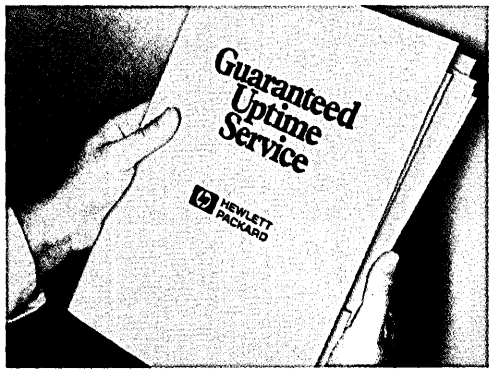

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An analysis of the United Nations' preliminary international trade statistics.

THE WORLD'S TOP 50 COMPUTER IMPORT MARKETS

by Bohdan O. Szuprowicz

In 1978, the U.S. became the world's largest computer and office equipment import market, displacing West Germany and France (which alternated in holding the top spot during recent years). Even more significant is the fact that the U.S. found itself among the *fastest growing* computer and office equipment import markets, ranking 11th among such rapidly growing dp import leaders as China, Saudi Arabia, Mexico, South Korea, and Brazil. U.S. imports in this product category reached almost $2 billion in 1978, accounting for 13% of global computer and office equipment trade.

These are some of the findings from a set of preliminary international trade statistics released by the United Nations in September 1980 for 113 countries. These statistics show imports of computers, peripherals, spare parts, and office equipment traded throughout the world under the common Standard International Trade Code (SITC) 714. Under this code, about 85% of all equipment traded consists of computers, data processing equipment, and parts, but does not include software or other computer services. In 1978, this global trade amounted to nearly $15 billion, up a healthy 28% from the previous year.

While the U.S. is the largest importer of computers and office equipment in the world, it is an even larger exporter of such products. In 1978, total dp exports of the U.S. were over $4.6 billion, giving the country a $2.7 billion surplus in this trade. U.S. exports alone amount to 31% of all the computers and office equipment traded in world markets. However, this market share remains virtually unchanged since 1977 while exports of Japan in this category increased during the period to 11.0% from 9.7% in 1978.

Nevertheless, West Germany still remains the second largest exporter and importer of computers and office equipment, although its export market share dropped to 13.4% from 15.6% in 1978. West Germany, the U.S., and Japan are the only three major countries that show a positive trade balance in this category. West Germany's surplus is very small in comparison with that of the U.S., only $126 million. However, Japan's surplus is over $1.1 billion, up by almost 76% from the $631 million surplus of 1977. On the other hand, much of Japan's SITC 714 trade is still dominated by office equipment rather than computers or peripherals hardware, although this situation is changing rapidly.

At the same time, imports of computers and office equipment to Japan increased to only $544 million from $499 million in 1978, amounting to a mere 8.9% growth, well below the average world increase of 28%. It means that although Japan is the second largest user of computers, it remains among the slowest growing markets for imported computers and office equipment.

This only confirms Japan's policy of controlling the largest possible share of its domestic computer market and restricting imports by various tariff and nontariff trade barriers despite the much publicized gradual introduction of trade "liberalization" measures. Many industry observers now believe that Japan will continue these policies until it is well established as a leading exporter of computer hardware manufactured by its domestic computer firms. At present, a large proportion of Japanese exports are products of IBM Japan, which is not regarded as a domestic firm despite the fact that it contributes to that country's positive trade balance.

IMPORTS HEAVY IN W. EUROPE

Western Europe continues to be the largest computer import region and in 1978 accounted for 59% of all such trade, a slightly smaller share than in previous years. Much of this trade in Western Europe is between the countries of the region, but overall Western Europe remains a net importer of computers and office equipment to the tune of over $1.6 billion in 1978, up by almost 60% from the previous year. This means that imports to Western Europe from North America, Japan, and other offshore manufacturing countries increased dramatically because overall imports within the region as a whole rose only by 26%.

Other than West Germany, the leading importing countries in Western Europe are the U.K. and France, both of which are in the $1.5 billion per year import league. Following those huge markets are Italy, the Netherlands, Belgium, and Switzerland, which are among the 10 largest computer import markets. Except for West Germany, none of the other top Western European importing countries enjoys a surplus in this trade. Some, in fact, run trade deficits well over $100 million per year. Among the smaller European countries, only Sweden and Ireland can boast a trade surplus in computers and office equipment.

It is important to keep in mind that much of the trade to and from Western Europe consists of hardware manufactured by European subsidiaries of IBM, DEC, Honeywell, Control Data, Univac, and other American firms. Ireland in particular has become an important offshore hardware manufacturing country because of its relatively low labor costs, attractive tax incentives, and membership in the Common Market. This explains Ireland's relatively high imports of $175 million, which are comparable to those of much larger countries like Mexico or South Africa. Much of the equipment imported into Ireland is assembled for reexport to other countries; as a result, Ireland now ranks among the top 10 computer exporting countries, surpassing such traditional offshore areas as Hong Kong, South Korea, and Singapore.

Once again, the Middle East has shown the fastest growth in computer imports. Much of this growth is due to rapidly increasing imports to the Arab countries which are flush with petrodollars and lack any high-tech domestic manufacturing capabilities. Iraq and Saudi Arabia rank among the three fastest growing import markets.

TABLE I

TOP 50 COMPUTER AND OFFICE EQUIPMENT IMPORT MARKETS

(IN MILLIONS OF $U.S.)

Country	1978 Rank	1978 Imports	1977 Rank	1977 Imports	Percent Change 1977-1978	Percent Change 1976-1977
World Total	—	14,983.2	—		+ 28.2	+ 10.9
United States	1	1,961.5	2	1,369.8	+ 43.2	+ 15.9
West Germany	2	1,875.4	1	1,382.9	+ 35.6	+ 18.0
United Kingdom	3	1,533.1	4	1,159.8	+ 32.2	+ 18.6
France	4	1,531.3	3	1,335.4	+ 14.7	+ 11.3
Canada	5	787.4	5	669.5	+ 17.6	+ 10.2
Italy	6	782.1	6	620.0	+ 26.1	+ 8.7
The Netherlands	7	640.1	8	483.3	+ 32.4	+ 17.8
Japan	8	544.1	7	499.6	+ 8.9	+ 15.4
Belgium/ Luxembourg	9	436.3	9	341.7	+ 27.7	+ 29.6
Switzerland	10	366.9	13	261.4	+ 40.3	+ 16.3
Sweden	11	362.5	10	302.7	+ 19.7	+ 15.2
Australia	12	361.9	11	281.7	+ 28.4	+ 21.7
Spain	13	296.2	12	273.9	+ 8.1	+ 7.8
Denmark	14	219.1	14	173.6	+ 26.2	+ 32.3
Austria	15	210.7	15	169.0	+ 24.6	+ 20.3
Brazil	16	193.7	17	135.2	+ 43.3	+ 0.9
Hong Kong	17	180.4	21	111.4	+ 61.9	+ 10.6
Ireland	18	175.3	16	156.8	+ 11.7	+ 66.1
South Africa	19	167.4	20	113.0	+ 48.1	+ 8.1
Mexico	20	160.8	22	106.8	+ 50.6	− 27.1
Soviet Union	21	152.8	18	115.6	+ 32.2	− 63.4
Norway	22	132.7	19	114.3	+ 16.1	+ 38.7
Czechoslovakia	23	113.5	25	82.7	+ 37.2	− 34.7
Argentina	24	99.8	26	81.0	+ 23.2	+107.1
Finland	25	99.8	24	88.6	+ 12.6	+ 4.9
Venezuela	26	97.2	23	89.3	+ 8.8	+ 28.6
Yugoslavia	27	96.9	27	76.2	+ 27.1	+ 62.5
South Korea	28	96.2	28	64.6	+ 48.9	+ 41.3
Saudi Arabia	29	80.1	36	39.0	+105.3	+ 51.2
Iran	30	63.3	33	44.2	+ 43.2	− 3.0
Singapore	31	61.3	30	49.9	+ 22.8	+ 24.7
Israel	32	58.7	35	41.6	+ 41.1	− 1.6
East Germany	33	57.3	31	49.1	+ 16.7	+ 14.7
Hungary	34	53.4	32	48.9	+ 9.2	− 37.3
Poland	35	49.8	29	53.0	− 6.0	− 62.3
Iraq	36	47.0	50	14.7	+219.7	+ 58.1
Portugal	37	45.8	37	35.9	+ 27.5	+ 42.5
New Zealand	38	41.1	34	42.2	− 2.6	− 0.7
Philippines	39	35.3	39	30.2	+ 16.8	− 1.6
Algeria	40	29.7	42	21.0	+ 41.4	+ 7.7
Greece	41	29.5	43	20.7	+ 42.5	+ 23.2
Nigeria	42	29.4	38	34.6	− 15.0	+ 38.9
Chile	43	26.7	45	19.5	+ 36.9	+ 65.3
Bulgaria	44	25.9	40	23.4	+ 10.6	− 46.9
Romania	45	24.7	47	16.5	+ 49.7	− 40.2
Panama	46	23.8	41	22.4	+ 6.2	+ 27.3
Colombia	47	21.6	46	18.0	+ 20.0	+ 71.4
Thailand	48	21.0	—	13.2	+ 59.1	—
China	49	20.9	—	7.9	+164.5	—
Kuwait	50	20.9	48	16.1	+ 29.8	+ 62.6

A newcomer to the top 50 import markets and already ranking as the second fastest growing country market is China, with computer imports reaching $21 million in value during 1978. While China is committed to developing its own computers, it is not in a position to build advanced equipment for military modernization without massive Western assistance. This means exports of products and technology to a Communist country, but the initial stage was set when China was reclassified in early 1980 by the Export Controls Administration to permit shipments of the so-called "dual technology" products to that country. This means that the U.S. has formally abandoned the principle of "evenhanded" treatment of trade with China and Soviet Bloc countries and opens up tremendous new opportunities for computer exports to China.

SOVIET IMPORTS SLUGGISH

Growth of computer import markets within the Soviet Bloc appears to be sluggish. Given the United Nations data, COMECON imports—including those of Cuba, Mongolia, and Vietnam—have grown by about 24% in 1978. Romanian computer imports, however, have increased by almost 50%, faster the any other Soviet Bloc country. The Soviet Union and Czechoslovakia also show imports growth above average for the COMECON countries, but all these increases are following very significant import reductions that occurred in Soviet Bloc countries during 1977.

In Poland, import declines continued into 1978, although at the much slower rate of only 6%. Bulgaria and Hungary both had moderate imports growth reversing sizable declines during 1977. It must be understood, however, that such Soviet Bloc countries as Bulgaria, Hungary, East Germany, Poland, and Romania do not provide the U.N. with detailed statistics at the SITC 714 level. This fact distorts the data available for those countries, each of which has a domestic computer manufacturing industry that contributes exports to other COMECON member states. As a result, the actual computer import markets of Soviet Bloc countries are probably larger and faster growing than would appear at first glance from the U.N. data.

Also significant within the Soviet Bloc is the production of the RIAD 2 computer series (believed to parallel the IBM 370 systems). At the same time, R&D on RIAD 3 computers has been announced in the Soviet Bloc's technical press. Initial models of the RIAD 3 series are planned for introduction during 1982-1983 period, and the basic concepts stress their compatibility with the RIAD 1 and RIAD 2 computers. Specific models have not yet been announced, but the overall objective is to make RIAD 3 machines seven times more cost-effective than the RIAD 2 computers. These developments and increasing political tensions suggest that Western exports to those countries are not likely to grow at all in the future.

Latin America as dp import market shows growth only slightly above the world average. Brazil is the leading importing country, moving up to the 16th largest import market in the world, despite its government's determination to develop a domestic computer industry and restrict imports in recent years. Mexican imports, although somewhat smaller, have shown an even more dramatic growth in 1978, reversing the trend of the previous period during which the Mexican market declined. Argentina and Venezuela, the next two largest Latin American import markets, have slowed their previously rapid imports growth.

Computer imports of Oceania, which primarily includes Australia and New Zealand, have not increased as fast as the world

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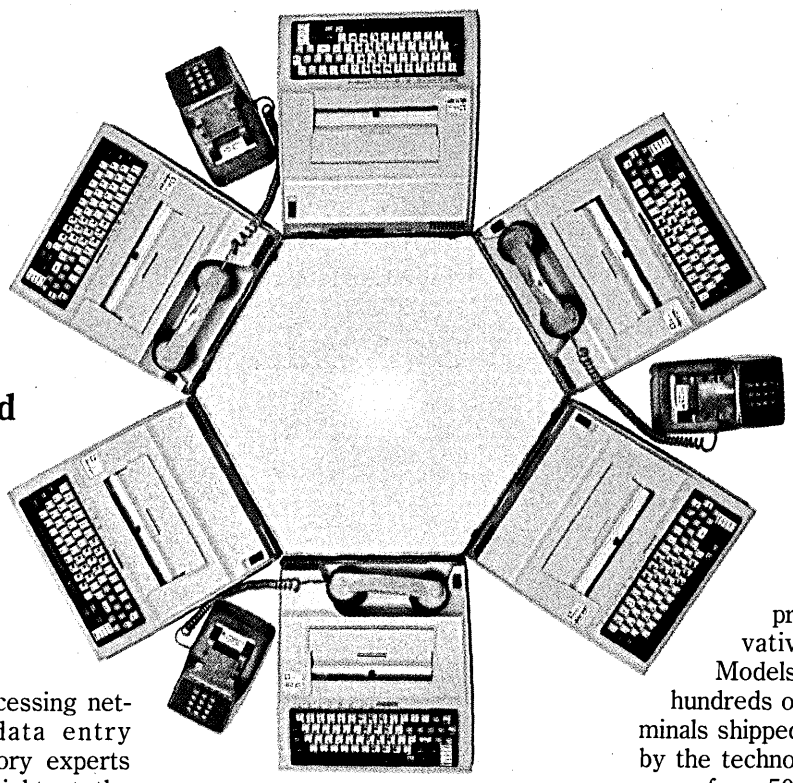
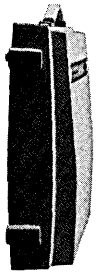


TI's Bubble Memory Data Terminals extend distributed data entry for business.

TI's *Silent 700** Models 763 and 765 Bubble Memory Data Terminals bring an added dimension to conventional distributed processing networks with off-line data entry capabilities. These memory experts can collect information right at the source to optimize your communications costs.



The lightweight Model 765 Portable Bubble Memory Data Terminal has increased cost efficiency for utilities by allowing them to conduct off-line energy audits for their residential customers. In remote sales order entry applications, salesmen are speeding up sales turnaround time and improving productivity with the Model 765's built-in acoustic coupler for instant data access during sales demonstrations.

The Models 763 and 765 data terminals are ideal for paperless health care claims processing which optimizes office productivity for physicians, dentists and insurance companies, and reduces mailing time delays to increase customer support. Automotive parts manufacturers and distributors are using the Models 763 and 765 for fast, accurate parts ordering, and for managing parts inventories.

Both models offer up to 80,000 characters of reliable bubble memory data storage and a file management system, and can execute user-developed programs to meet individual application requirements.

In a variety of businesses, TI's Models 763 and 765 Bubble Memory Data Terminals are providing powerful, economical extensions to data processing networks.

TI is dedicated to producing quality, innovative products like the Models 763 and 765. And, TI's hundreds of thousands of data terminals shipped worldwide are backed by the technology and reliability that come from 50 years of experience.

Supporting TI's data terminals is the technical expertise of our worldwide organization of factory-trained sales and service representatives, and TI-CARE†, our nationwide automated service dispatching and field service management information system.

For more information on the Model 763 and 765 Bubble Memory Data Terminals, contact the TI sales office nearest you, or write Texas Instruments Incorporated, P.O. Box 1444, M/S 7884, Houston, Texas 77001, or phone (713) 373-1050.

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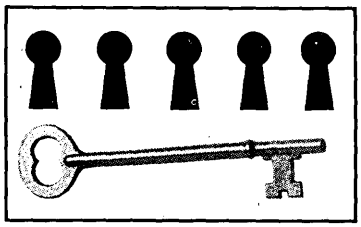
CIRCLE 96 ON READER CARD

MAKING THE TOUGH DECISIONS



A budget-management report from United Way

At United Way, volunteers carefully review the budgets, operating patterns and track record of agencies asking to become part of the United Way organization.

They scrutinize the various functions performed by the agency, look at the kinds of people it helps, and evaluate its success in delivering its services.

But what happens when a new service agency wants to become a United Way organization—especially when there may be two or more equally qualified organizations equally in need of United Way support? Who chooses? And on what basis?

The answer to this question is often complex. And sometimes it can be an agonizing decision to admit one agency instead of another.

The people decide

But the bottom line is that volunteers do make the decisions after carefully weighing all the pros and cons. It's sometimes a hard process, but it's as fair as we know how to make it.

Volunteers work free of charge doing everything from collecting money to deciding how it will be used, so administrative costs are kept low.

And that's how United Way works so well. And why.

United Way

Thanks to you, it works. For all of us.

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TABLE III

THE FASTEST GROWING IMPORT MARKETS

RANK	RANK AMONG TOP 50	COUNTRY	PERCENT GROWTH 1977-1978	MARKET SIZE IN MILLIONS OF $U.S.
1	36	Iraq	+219.7	47.0
2	49	China	+164.5	20.9
3	29	Saudi Arabia	+105.3	80.1
4	17	Hong Kong	+ 61.9	180.4
5	48	Thailand	+ 59.1	21.0
6	20	Mexico	+ 50.6	160.8
7	45	Romania	+ 49.7	24.7
8	28	South Korea	+ 48.9	96.2
9	19	South Africa	+ 48.1	167.4
10	16	Brazil	+ 43.3	193.7
11	1	United States	+ 43.2	1,961.5

TABLE IV

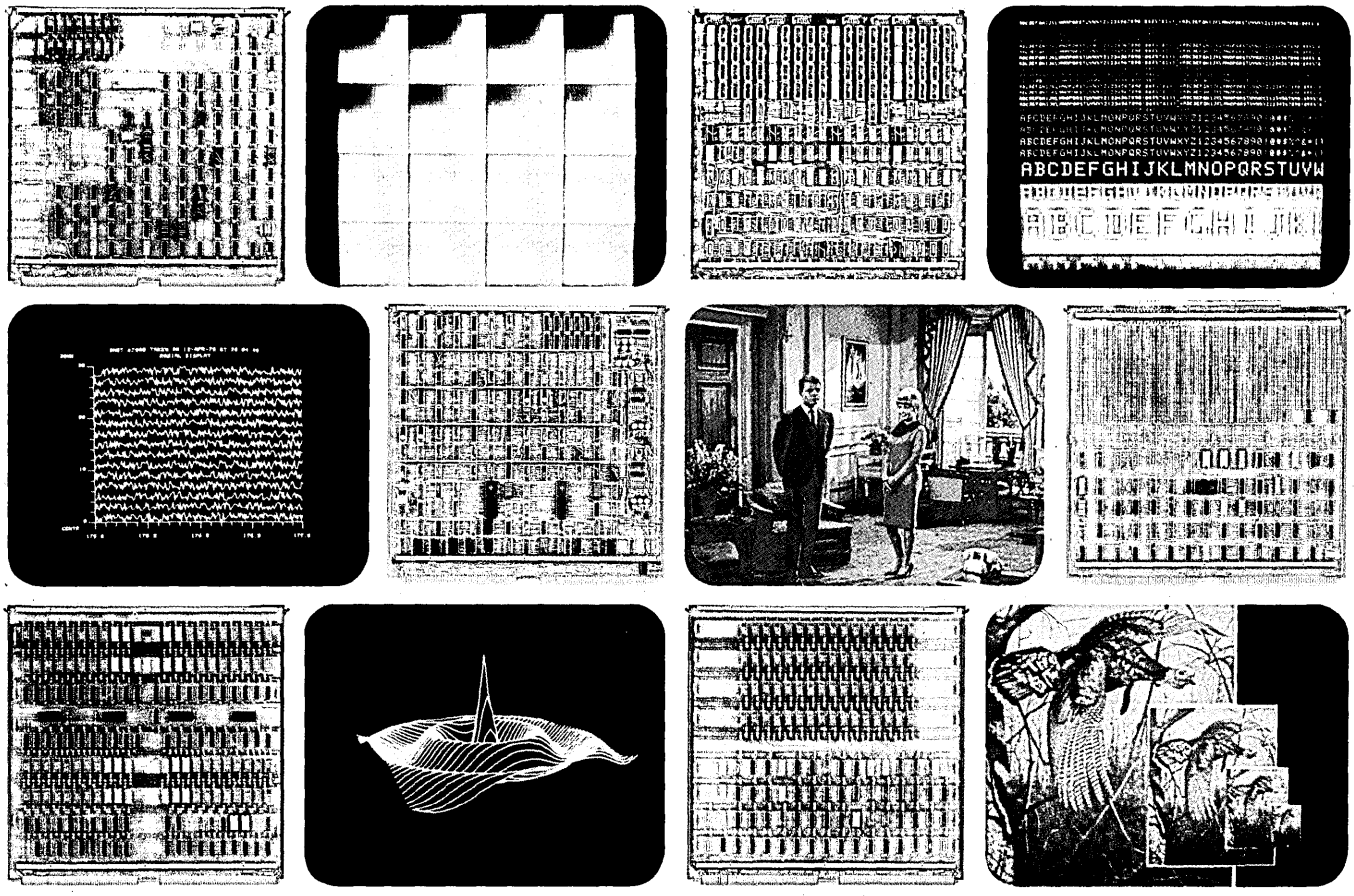
MAJOR EXPORTING COUNTRIES AND IMPORT/EXPORT RATIOS

COUNTRY	1978 EXPORTS IN MILLIONS OF $U.S.	1978 IMPORTS IN MILLIONS OF $U.S.	IMPORT TO EXPORT RATIO
United States	4,682.8	1,961.5	0.42
West Germany	2,001.9	1,875.4	0.93
Japan	1,654.3	544.1	0.33
United Kingdom	1,478.9	1,533.1	1.04
France	1,238.9	1,531.3	1.23
Italy	756.1	782.1	1.03
East Germany	500.0(E)	57.3(E)	0.11
Canada	483.7	787.4	1.63
The Netherlands	469.6	640.1	1.36
Sweden	434.3	362.5	0.83
Ireland	253.7	175.3	0.69
Hong Kong	237.1	180.4	0.76
Switzerland	204.5	366.9	1.79
Belgium/ Luxembourg	198.5	436.3	2.19
Soviet Union	166.8	152.8	0.91
Brazil	129.2	193.7	1.49
Czechoslovakia	94.5	113.5	1.20
Spain	91.2	296.2	3.25
Singapore	82.7	61.3	0.74
South Korea	69.6	96.2	1.38
Denmark	59.3	219.1	3.69
Argentina	42.9	99.8	2.32
Austria	41.8	210.7	5.04
Portugal	28.7	45.8	1.59
Yugoslavia	13.9	96.9	6.97
Israel	13.3	58.7	4.41
Finland	11.7	99.8	8.53

E= Estimate by 21st Century Research because East Germany stopped publishing SITC 714 trade data in 1977. Nevertheless, East Germany is one of the leading computer manufacturing and exporting countries in the world.

average. Although Australia's import market grew to $362 million, imports to New Zealand declined for the second year in a row. Poland and Nigeria also had a '78 decline, but this was a marked improvement in overall global computer trade compared with 1977, when computer imports declined in 11 countries.

There are now 40 countries where some manufacturing of computer hardware and office equipment is taking place. Most countries are eager to develop products for export markets to offset the expenditures for imports of computers and peripherals that cannot be manufactured domestically, due to inadequate skills or technology. Some countries, like Ireland, present unusual opportunities for offshore hardware manufacture and assembly. Such countries enjoy a surplus in this trade and exhibit import-to-export ratios lower than 1.0. Other countries, like Australia, Belgium, Spain, Denmark, and Austria, have relatively high import-to-export ratios, which means that they may become more significant computer manufacturers and exporters in the future, given more favorable political and fiscal conditions. Spain, a possible future member of the Common Market,



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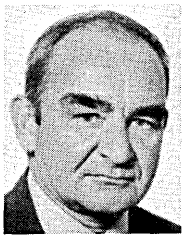
CIRCLE 97 ON READER CARD

Leading importing countries in Western Europe are West Germany, the U.K., and France.

looks particularly attractive from this point of view.

It is probably no accident that the Japanese computer manufacturers have already made such significant investment inroads in Spain and Australia. The future of the world computer trade will be increasingly influenced by Japan's growing dedication to becoming a global computer manufacturing and trading power. ❋

BOHDAN O. SZUPROWICZ



Mr. Szuprowicz is president of 21st Century Research, an international market research firm specializing in strategic materials and high technology trade. His past experience includes engineering and management posts at Boeing, General Dynamics, IBM, CEIR-Control Data, and High Technology West.

TABLE II

REGIONAL TRENDS IN COMPUTER IMPORTS 1977-1978
(IN MILLIONS OF $U.S.)

REGION	TOTAL IMPORTS IN 1978	TOTAL IMPORTS IN 1977	PERCENT CHANGE 1977-1978
World Total	14,983.2	11,683.9	+ 28.2
Western Europe	8,856.6	7,019.5	+ 26.2
North America	2,751.8	2,041.2	+ 34.8
Asia (including Far East)	1,106.7	882.2	+ 25.4
Latin America	731.3	566.9	+ 28.9
Soviet Bloc[1]	482.3	389.5	+ 23.8
Oceania	407.6	330.8	+ 23.2
Africa	333.7	263.6	+ 26.6
Middle East	317.7	189.9	+ 67.3
Arab States only[2]	277.8	169.4	+ 63.9
China	20.9	7.9	+164.5

Source: Compiled by 21st Century Research from international trade statistics preliminary published by the United Nations in September 1980 for Standard International Trade Code (SITC) 714, which includes computers and office machinery.

1. Soviet Bloc includes all COMECON countries, and now also includes Cuba, Mongolia and Vietnam.
2. Arab States are a group of 20 Arab countries located in the Middle East and Africa. The totals for Africa and Middle East also include their constituent Arab countries in these statistics. These figures are developed by region for comparative purposes. They do not add up to the world total, since some duplication and overlap will occur.

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"Oh, my God! Somebody got into the computer room last night."

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As well they should be.

Without an RES CARDENTRY system to protect your data processing facility, it can be subject to information security breaches, as well as damage to your expensive computers.

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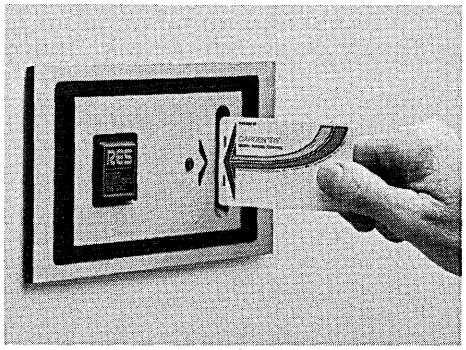

What's more, a central printer immediately tells your security guard where and when an unauthorized entry has been attempted – in easy-to-read English text.*

It's that easy to account for (and control) unauthorized access and activities. And it's that easy to save money.

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So if your computer isn't already protected by our system, it should be. After all, do you know who's using it right now?

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CIRCLE 99 ON READER CARD

PEOPLE

HE WROTE THE SCRIPT

In 1962, W. Robert Widener received an assignment he now calls "the turning point of my life."

Widener's occupation at the time was a combination of advertising and entertainment. As he puts it, "I was a dramatizer of business messages." For example, one of his presentations for AT&T was a musical comedy for a florist show pointing out the advantages of ordering flowers by telephone rather than by telegram.

The assignment that turned Widener's life around also came from Bell. This time the point was not just a new ad gimmick; the phone company wanted Widener to help it alleviate an image problem.

The report of a three-year task force on data communications had just been released by AT&T. It predicted that by the year 1970, data traffic over phone lines would surpass the volume of voice traffic. Bell's portrayal of itself as a mover in an exciting new technology, however, backfired. Visions of Big Brother were conjured up by reporters who had no frame of reference for computer communications, Widener recalls. And they were asking to whom these machines would be talking, and why.

To combat this negative impression of future information technology, Bell decided to read out to the business community with a positive scenario and a serious investment. The company asked Widener to create something lasting—not just a show, but also a room to house a technology presentation and give it life. The room and the presentation together would make up the Bell System Business Communications Seminar (still in use today). The seminar room was designed to make attendees feel they were actually in the boardroom of tomorrow watching the future unfold.

In Widener's scenario for AT&T, the executive of the '80s would require no paper. In the modern world, business decisions would be made from financial and operating information available at the press of a button. Corporate leaders, freed from the primitive constraints of manual information collection, would gather to make decisions by consensus in a comfortable communications center where data from the corporate information system could be displayed on demand. Even the geographic dispersal of corporate entities would pose no problem to the information-rich leaders of the future.

W. ROBERT WIDENER: "Systems designers think management needs more information. That's wrong; management needs less."

When the show was complete, recalls Widener, "I did what no screenwriter should ever do—I believed my own script. I had a preview of the whole exciting future then, and I was right there on the ground floor."

Widener has indeed built his present career on this vision. The systems element of information access that Bell had asked him to imagine was key to his next moves, but so was the management element of information presentation. "The ceos who attended Bell's opening [of the center] all commented on the excitement and power of that room and the way it worked," recalls Widener. For the fast-paced presentation, the room was equipped with three movie projectors and 16 slide projectors. "This was pre-multimedia," explains Widener. "There weren't any controllers then. The whole thing had to be done with relay boxes. I had a real wizard out in Queens [N.Y.] who created these electromechanical monsters. He pieced them together without ever drawing a diagram."

Known to some as the "War Room King" (although he doesn't like the war room term, preferring his own "management communications center"), Widener has since designed over 60 briefing rooms for major corporations. Until recently, the only automation involved was the storage and retrieval of charts and graphs. Present technology has enabled real-time systems that bypass the art department through data base access and stored formats. Widener's work in the interim has been on the formats themselves—no small task.

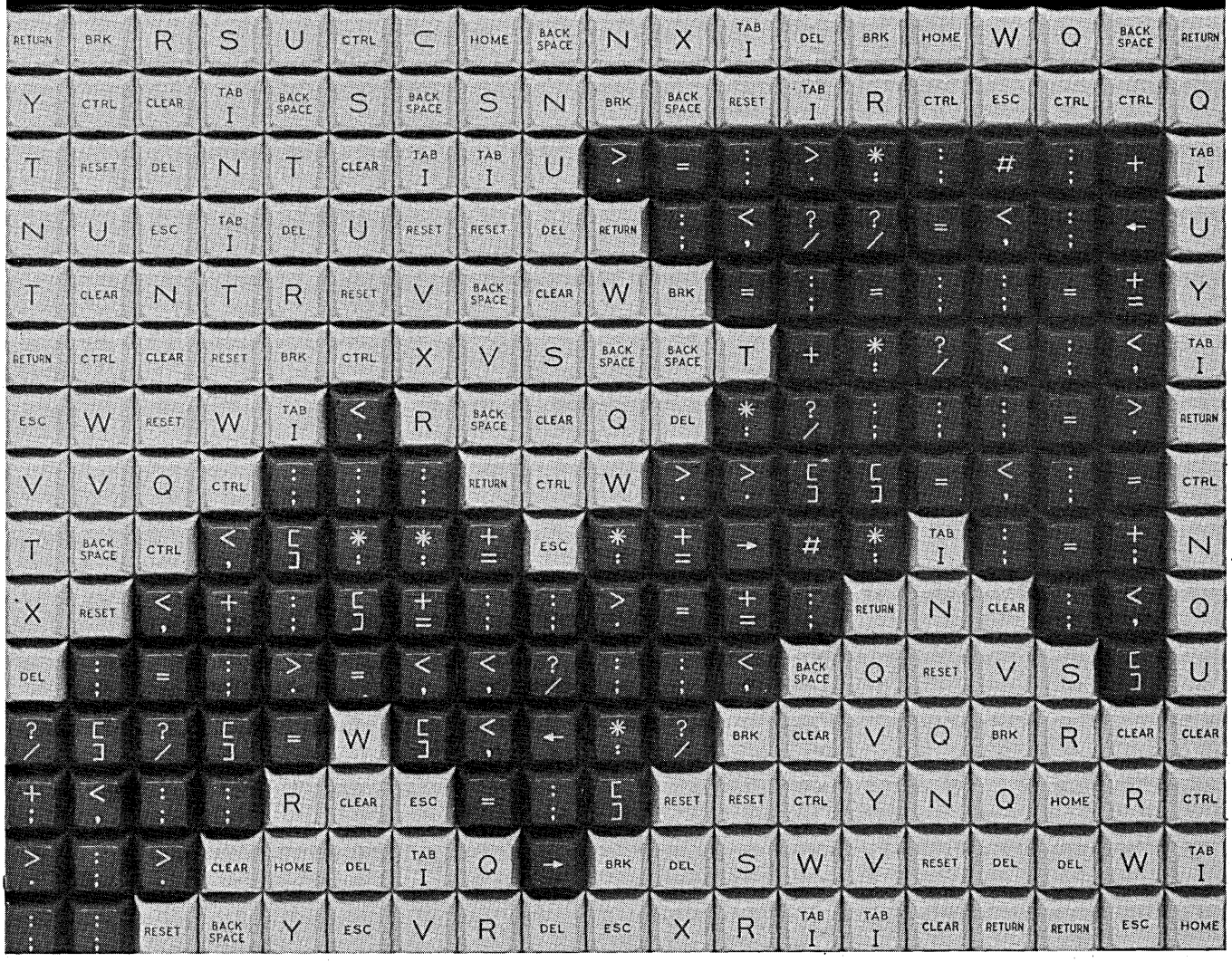
"Understanding the system and believing in it is the true man-machine interface," Widener stresses. For years he has researched and refined a credible charting system based on the relationships that interest chief executives. "Ceos view the company differently," says Widener. "They need specialized systems." The charting system Widener now uses is based on "key variances," actual performance compared to plans.

"The computer graphics industry offers too much," says Widener. "Systems designers think management needs more information. That's wrong; management needs *less*. Graphics should condense, filter, and summarize. And there is no way to use more than seven colors in management graphics."

Widener is presently offering a decision support system known as CompuChrome through his New York-based company, Intelligence Interlink Corp. Using the same charting discipline he developed for presentation graphics, the menu-driven system has a touch screen. The standalone unit is built around a souped-up Chromatics smart color terminal and is said to be useful for teleconferencing.

"There are a lot of goodies being grabbed by technical people that are not being accepted by management," Widener warns. "They're just new toys. My system

KEYS TO PRODUCTIVITY



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NCC '81

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is behaviorally driven and technology supported, rather than the other way around.

"The world moves slowly," he adds. "I've been laboring in this vineyard now for 16 years. Sixteen years in the history of man is just a blip on the radar screen of time, but it's an eternity in the life of an entrepreneur."

—Sarah Rolph

COMMON SENSE SELLING

"The computer industry is maturing a lot. It's less of a club," says John M. Ludutsky, new director of marketing for Lear Siegler's Data Products Div.

Ludutsky acknowledges that "technology is still a central element in computer industry marketing," but believes "there now are common, garden-variety products." All of this leads him to believe that the industry needs a new breed of marketeer (new to the industry, anyway), and he believes he's one of this breed. He feels that computer industry marketing today fits into common slots of all industrial marketing: "There is a need for a generic match between what the customer needs and what technology can provide."

Ludutsky was named to his present post last March. While it's his first job in computer industry marketing, it's not his first brush with computers.

New York City-born Ludutsky grew up on Long Island and received an engineering degree from MIT and an MBA from Harvard. His first job in 1966 was with Industrial Nucleonics, which was a user of minicomputers in industrial control systems. "We purchased minis to be integrated into systems for control of processing. They were used for things like measuring product parts and automatic adjustments to machines used to control thickness."

When he joined Industrial Nucleonics, it was in sales in New York. He next went to the firm's Columbus, Ohio, headquarters as an industrial marketing manager for rubber and plastics. He recalls that the technology "went from analog to minibased systems" while he was there and that when he left, "we were making our initial thrust into micros. We were working on the first micro system for the metals industry based on an Intel 8080." Ludutsky left Industrial Nucleonics to "broaden my horizons. When I joined IN it was a small, privately held company. It grew from $12 million in sales to $60 million. It was about to regroup for its next growth stage."

JOHN M. LUDUTSKY: "More and more we in the computer industry are selling to 'Joe Average.' "

Ludutsky wanted to get into new beginnings and he joined Abbott Laboratories in North Chicago, Ill., in 1975. Abbott was bigger in terms of sales than Industrial Nucleonics, but not Ludutsky's part of the business. "I was in charge of hospital products. Our customers were hospitals. The plateau was still ahead of us."

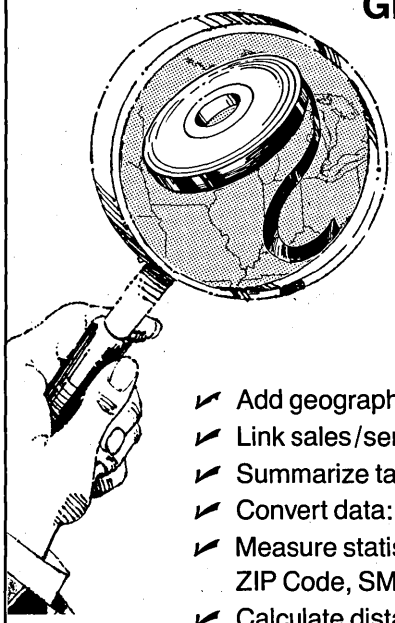
He says this marketing was very similar to what he's doing now, with two exceptions. "We had more government regulations to deal with, and we had constraints due to the fact that we were dealing with life-threatening systems."

His next job dealt with even more sensitive systems. He went to work in 1977 for American Hospital Supply Corp. for a then new division called Edwards Pacemaker in Irvine, Calif. "They made me an offer I couldn't refuse." Once again he was dealing with hospitals and doctors. But the parent company chose to withdraw from the pacemaker market at the end of 1979 "and I found myself with a new product to sell—myself."

He wanted to stay in California, particularly in Orange County, and "Lear Siegler seemed about to organize for the next plateau." He felt that his "generic approach to marketing" was just right for the product and the timing.

"More and more we in in the computer industry are selling to 'Joe Average.' It's time for profitable marketing common sense . . . to concentrate on how to position a product in the marketplace . . . to give it its own distinctiveness. Data processing is no longer dominated by engineering and technology. Those companies that are can find their version number one leapfrogged by somebody else's version number two, and they're suddenly dead in the water."

—Edith Myers



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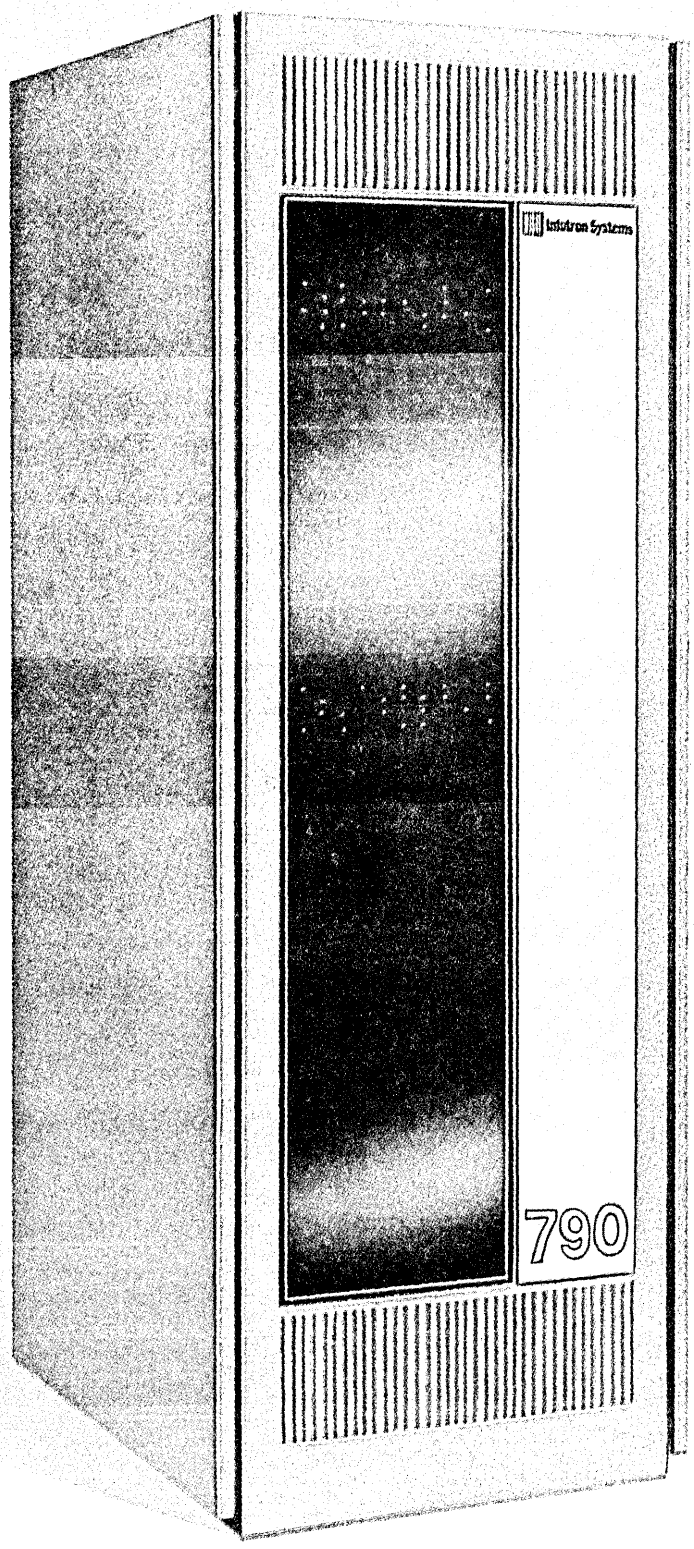

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The Supermux 790 is an intelligent network concentrator with incredible power — power that makes data transmission more economical, more reliable and more manageable than ever before.

The Supermux 790 gathers data from over four hundred inputs, concentrates it for economical transmission at speeds as high as 72,000 bps, and distributes it through as many as eight remote nodal locations to literally hundreds of destinations. The Supermux 790 also ensures that the data is error-free *and* keeps you up-to-the-second on everything that has happened every step of the way.

The Supermux 790 offers incredible control over the entire network. From your console you can reroute traffic, monitor and reconfigure any local or remote input or output and initiate powerful diagnostic routines to pinpoint problems—even problems in remote, unattended locations.

The Supermux 790 Network Concentrator talks to Infotron Supermux 480, 680 and 780 Statistical Multiplexers and, of course, other Supermux 790 units. This allows you to build multipoint networks using the most economical equipment in each location—without sacrificing data integrity.

For more information on how the Supermux 790 can cut your data communications costs, call or write today.

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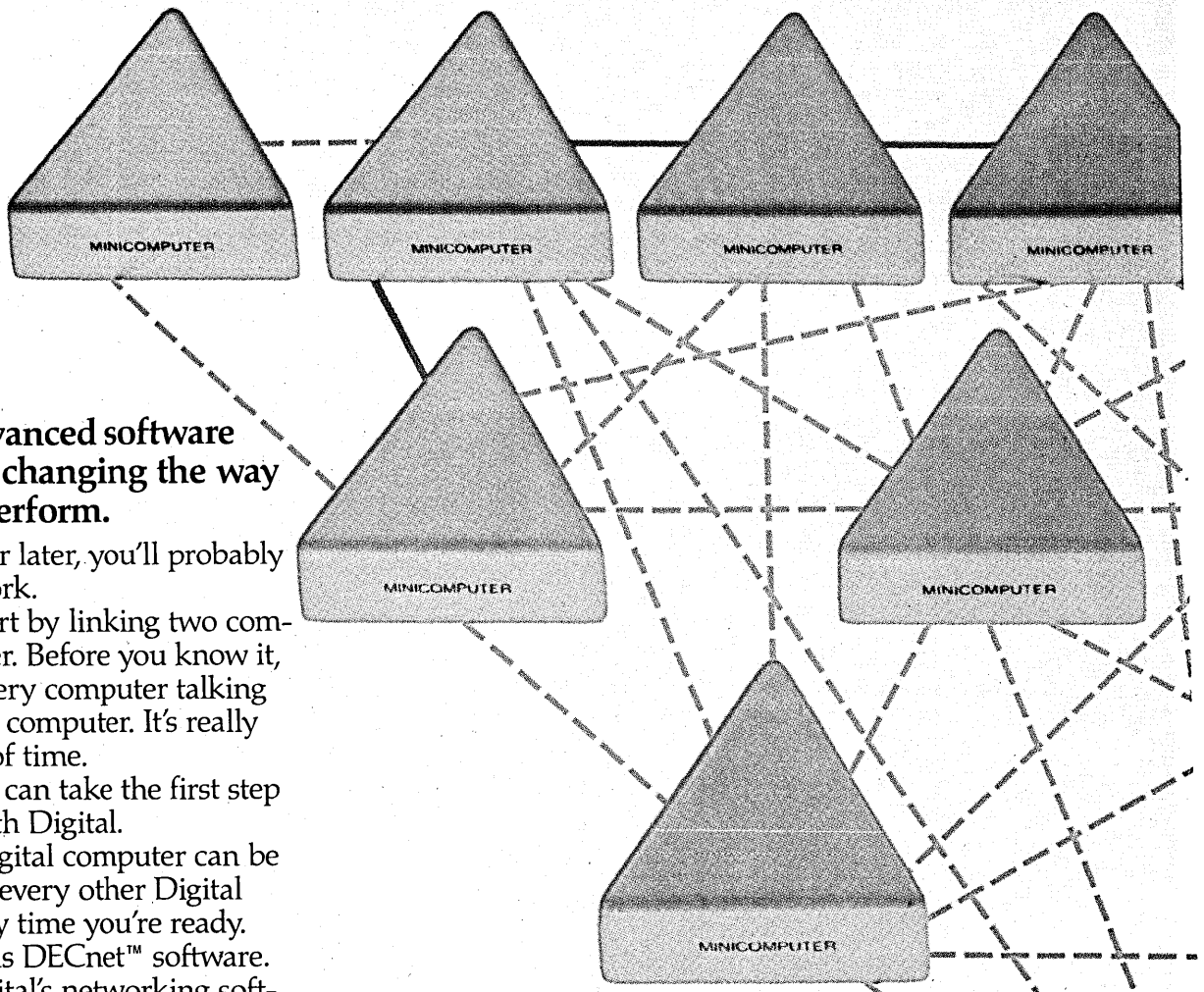

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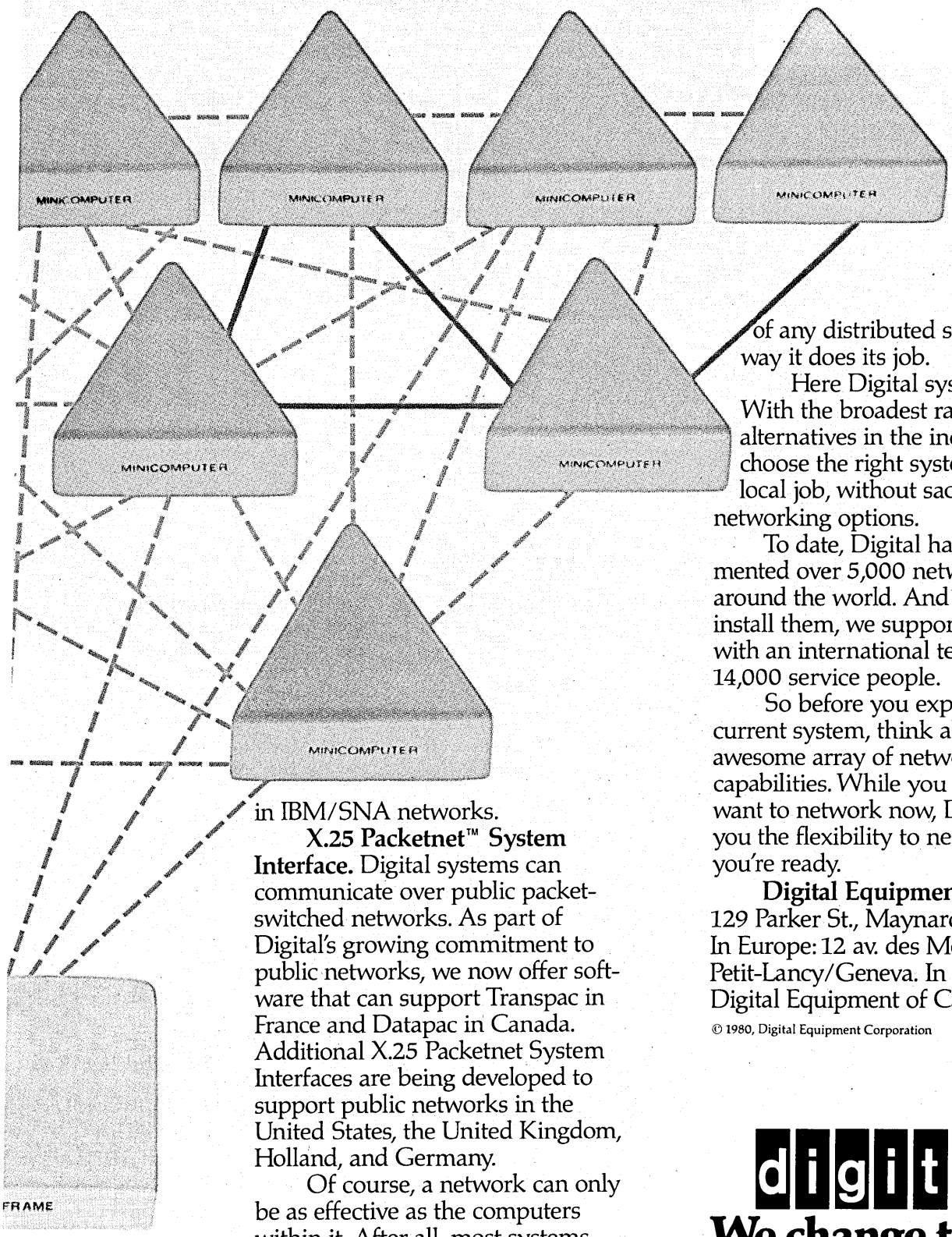
Advanced Protocol Emulators. In addition to supporting Batch BISYNC, Interactive BISYNC, and other standard mainframe communications protocols, Digital offers an advanced SNA protocol emulator, so Digital systems can participate

like Digital.



in IBM/SNA networks.

X.25 Packetnet™ System Interface. Digital systems can communicate over public packet-switched networks. As part of Digital's growing commitment to public networks, we now offer software that can support Transpac in France and Datapac in Canada. Additional X.25 Packetnet System Interfaces are being developed to support public networks in the United States, the United Kingdom, Holland, and Germany.

Of course, a network can only be as effective as the computers within it. After all, most systems only use their networking capability 20 percent of the time. The real test of any distributed system is the way it does its job.

Here Digital systems excel. With the broadest range of systems alternatives in the industry, you can choose the right system for each local job, without sacrificing any networking options.

To date, Digital has implemented over 5,000 network nodes around the world. And we don't just install them, we support them, too, with an international team of over 14,000 service people.

So before you expand your current system, think about Digital's awesome array of networking capabilities. While you may not want to network now, Digital gives you the flexibility to network when you're ready.

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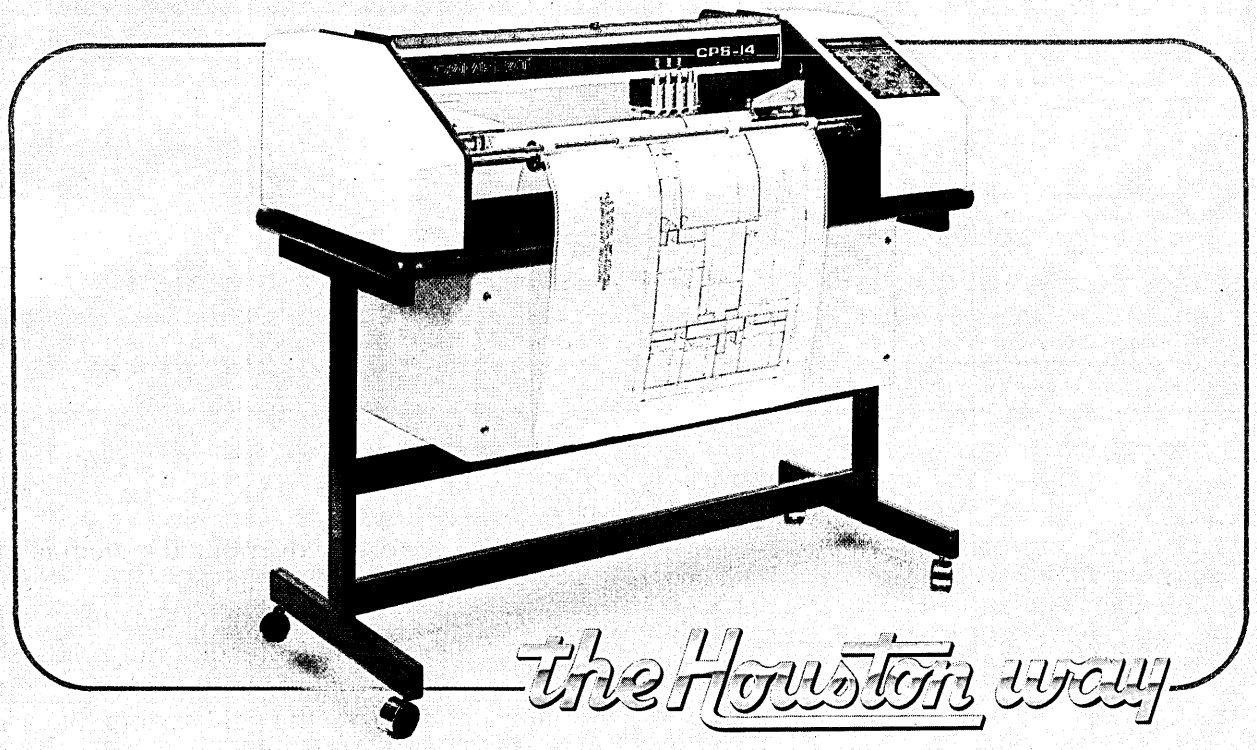
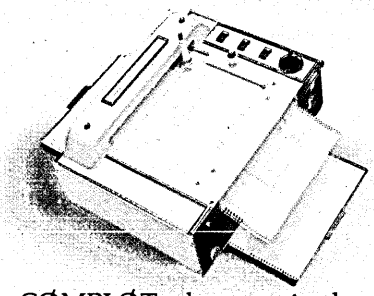
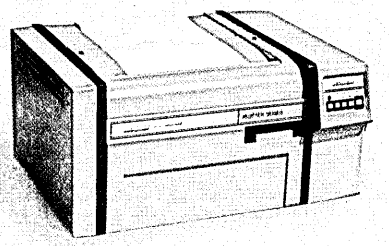


Different plotting, and printing applications often require different instruments. At Houston Instrument we're aware of your computer graphics needs. We listen to your evaluation and then recommend the plotter, printer, or plotter/printer that's exactly tailored to your specific application. Nobody else can do it, because nobody has such a broad selection of graphic output devices.

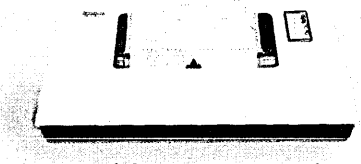
CØMPLØT® pen plotters are available in fourteen different models with X-Y plotter sizes of 8½ x 11" (DIN A4) or 11 x 17" (DIN A3) and drum plotter sizes of 11" (28 cm) to 42" (107 cm). Pen speeds range from 240 to 4,000 steps/sec. Prices begin at a low $1,085.*



CØMPLØT electrostatic plotters and plotter/printers are available with models for printing (up to 2,400 lines per minute), plotting (up to 2" per second), or simultaneous plotting and printing.



CØMPLØT electrostatic CRT copiers provide fast, quality hardcopies from Hewlett Packard Series 2640 terminals or Tektronix® 4010 family terminals for just a few cents per copy. Prices for the Houston Instrument electrostatic products range from $3,950 to $6,550.*



Our Model 6000 TISPP (Thermal/Intelligent/Strip/Plotter/Printer) allows superior quality graphics output from either an analog or digital source and provides the continuity and clarity of a continuous trace with alphanumeric annotations under intelligent control. It's the versatile graphic output device for the new generation of microprocessor controlled instrumentation. Available in one or two pen versions. Prices start at $1,795.*

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Circle #113 on pen plotters Circle #114 on electrostatic products Circle #115 on thermal plotter printer

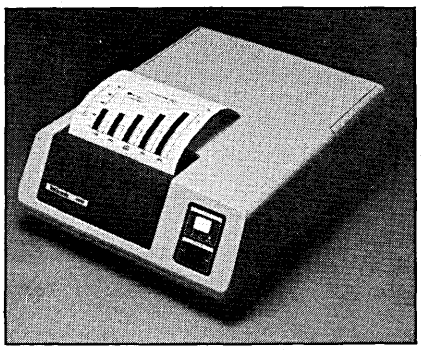
HARDWARE

OFF-LINE

Researcher Dennis L. Rogers, of IBM's Thomas J. Watson Research Center in Yorktown Heights, N.Y., has designed and built a single-chip experimental optical receiver. Said to be relatively inexpensive to fabricate, the receiver operates at data rates high enough to take advantage of the high (200Mbps) bandwidth of optical fibers. Anticipated advances in technology should allow data rates of up to 1,000Mbps, according to a paper presented by Rogers at the 6th European Conference on Optical Communication, held in York, England. One potential application for the chip would be in data channels connecting large cpus and their peripherals; another application would be in distributed processing networks. IBM says the chip lends itself to implementation using master slice technology. Honeywell's Solid State Electronics Center in Minneapolis has completed its initial wafer run of a bipolar Very High Speed Integrated Circuit (VHSIC) that proves the feasibility of the Department of Defense's VHSIC Phase I speed and density goals. The chip reportedly achieves gate delays of less than 0.6nsec for the high speed logic family, and less than 2nsec on the high density family, which is capable of 74,000 gates per cm^2. The VHSIC chip uses 1.25 micron geometries, and packs about 7,000 gates onto a die measuring 200 mils by 250 mils.

ELECTROSTATIC PRINTER

Tektronix has come up with a pair of electrostatic hardcopy units for use with terminals and desktop computers. The 4611 Electrostatic Hard Copy unit works with storage tube displays, while the 4612 produces copies from raster scan video signals. Instead of using a fixed row of styli (or two rows offset to overlap dots), the 4611 and 4612 use a moving band with six styli; at any given time, two styli are in contact with the paper. The moving styli allow both horizontal and vertical overlapping of points. Resolution is 256 points per inch horizontally, and 171 points per inch vertically. Both printers use roll paper (each roll makes about 540 copies 8½ by 11 inches, with an image size of roughly 7½ by 5¾ inches).



Dry toner is used; cost per copy, including paper and toner, is quoted at about 3 cents. The 4611 and 4612 sell for $4,400 each; oem discounts are offered. TEKTRONIX, INC., Beaverton, Ore.

FOR DATA CIRCLE 302 ON READER CARD

SMALL COMPUTER

Sharp Electronics Corp., a wholly owned subsidiary of the Sharp Corp. of Japan, best known for its wide line of calculators, has entered the small business computer market with the introduction of the YX-3200 Business Computer.

The YX-3200 speaks BASIC and also sports an Automatic Program Generator, said to design the user's desired program after leading the user through a question and answer dialog.

A desktop system, the YX-3200 has a Z80 microprocessor, 32KB of ROM, 64KB of RAM, keyboard, display, two dual-sided, double-density 5¼ inch floppy drives, and an impact printer. At present, the quote for this system is given as "under $6,000." The YX-3200 can grow, with a maximum of 72KB of ROM, 128KB of RAM, and a total of eight floppy drives. The unit's 12 inch crt displays upper- and lower-case characters in a 24 line by 80 column format. Oversized characters can be displayed in a 40 character by 15 line format. Test marketing of the YX-3200 occurred this past fall, and nationwide availability is planned for early this year. SHARP ELECTRONICS CORP., Systems Div., Industrial Equipment Div., Paramus, N.J.

FOR DATA CIRCLE 301 ON READER CARD

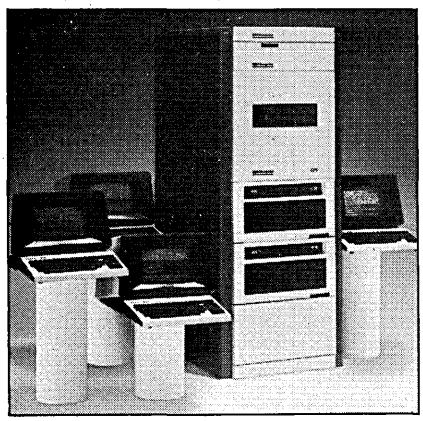
COMPUTER

The Bolt Beranek and Newman (BBN) Computer Corp. C/70 computer system was specifically designed to execute the C programming language and run under a fully supported version of Western Electric's UNIX time-sharing operating system. There's also a memory-only real-time operating system—C/MOS (pardon the pun)—for machines sans disk.

The C/70 is microcoded to execute C as its native language. Its enhanced

implementation of the UNIX operating system (version 7) has been coded entirely in C and C/70 microcode routines. To complement C and provide compatibility, a FORTRAN 77 compiler has been written in C for the C/70. An ARPANET-compatible Network Control Program has been added, including support for TELENET access.

A 20-bit word size was selected for the C/70 to provide a large address space. Control memory consists of 8K of 32-bit words; main memory can expand to 1M 20-bit words. The C/70 also has 1K of 12-bit dispatch memory, and another 1K by 20-bit scratchpad. Many C functions, including



constant handling, fetching of structure elements, function calling, and data type conversion, are implemented in microcode. About 3K of the micromemory is available for user microprogramming.

A typical C/70 with 256K words of main memory, 32 asynchronous lines, storage module disk controller, and cabinetry, sells for $47,500. BBN Computer expects the average system to price out around $60,000. Oem discounts are offered. BOLT BERANEK AND NEWMAN COMPUTER CORP., Cambridge, Mass.

FOR DATA CIRCLE 303 ON READER CARD

EIGHT-INCH WINCHESTERS

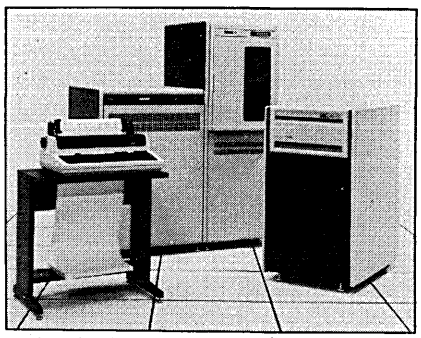
Quantum, founded less than a year ago by alumni of Shugart and System Industries, has entered the 8-inch Winchester disk market with three drives targeted directly at the market Shugart currently enjoys for its SA1000 Winchesters. Quantum's Q2000 series initially offers drives with three capacities: 10MB, 20MB, and 30MB. Each is said to have full compatibility with the SA1000 interface, mounting, and power supply requirements. Recognizing the SA1000 as a de facto industry standard, Quantum casts itself both as a second source and as an alternative for users needing larger storage capacities (the SA1000 comes in 5MB and 10MB versions).

The Q2000 series uses a proprietary moving coil rotary head actuator, and a temperature compensation technique that uses reference data stored at the end of each track, between the last interrecord gap and the index pulse, and accessible only by the microprocessor that controls all drive logic functions. The Q2000's transfer rate is in the neighborhood of 500Kbps (specced at 4.34Mbps), its track-to-track access time is 15msec, 100msec maximum, and between 50msec and 60msec average. Soft sectoring is offered, and Quantum recommends using a 32-sector (256 bytes per sector) format, yielding formatted capacities of 8.4MB (Q2010), 16.8MB (Q2020), and 25.2MB (Q2030). Without controllers, the drives sell for $1,200 (Q2010), $1,500 (Q2020), and $1,800 (Q2030) each, in oem quantities of 500 per year. QUANTUM CORP., San Jose, Calif.

FOR DATA CIRCLE 304 ON READER CARD

32-BIT MINI

DEC's 32-bit minicomputer line now has two members: the new VAX-11/750 complements the existing 11/780, providing a new entry point to the 32-bit bandwagon. The Massachusetts mini maker says the smaller machine has 60% the performance of its larger counterpart at 40% the price (at the cpu level). Users with heavy I/O requirements should take the 60% figure with a



grain of salt, as the 750's I/O bandwidth is 5MBps, compared to the 780's 13.3MBps.

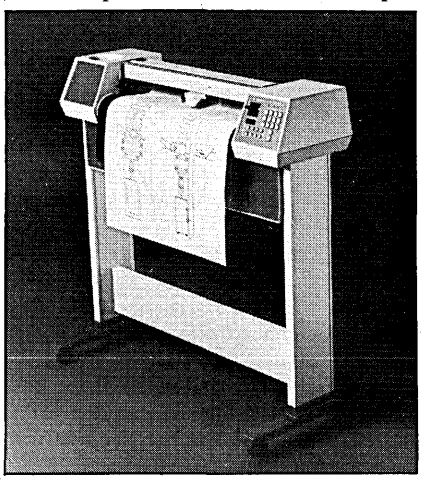
Both of DEC's 32-bit machines provide a virtual address space of 4.3 gigabytes, and a maximum program size of 2 gigabytes. The two machines use the same instruction set of 244 operations; both have nine addressing modes and six data types. As with the VAX-11/780, the smaller 11/750 controls access through four hierarchical protection modes. The VAX-11/750 differs from its predecessor technology (its cpu is built of low power bipolar Schottky custom gate array logic—philosophically akin to the master slice technique used by IBM in its

HARDWARE SPOTLIGHT

PLOTTER

Hewlett-Packard's 7850A is the firm's largest multiple pen plotter to date, and the company's first plotter that doesn't use a flatbed design. The 7850A accepts media ranging from 8 by 10.5 inches to 24.5 by 46.85 inches. HP feels that the new plotter will appeal to users with applications in engineering, CAD/CAM, drafting, mapping, and other fields. According to Brian Moore, general manager of HP's San Diego Div., the 7850A "represents [HP's] first major commitment to the large-format plotter market."

Instead of a flatbed or drum design, HP developed what it calls "micro-grip drive," in which two rubber pressure wheels hold the medium pressed against the micro-grip, textured drive wheel. The micro-grip drive moves the medium over an airfoil-shaped bed, while the low-mass pen



carriage operates in a perpendicular direction.

The plotter can use up to eight pens, but the pen carrier only carries one at a time (that helps keep the mass down). The pens are loaded into a carousel, where the pen carrier picks up the selected pen. When a pen change is called for, the carrier returns to the carousel, replaces and caps the pen currently in use, and picks up the newly selected pen.

Performance characteristics are said to compare favorably to plotters costing twice as much. Repeatability—the ability to return to a predefined point—is within 0.002 inches, resolution is specced at 0.001 inch, and the maximum plotting speed of 24 ips is attained within a fraction of an inch (acceleration is 4Gs).

An Intel 8086 microprocessor controls the plotter. It can execute more than 60 plotting commands, including character generation from multiple character sets and fonts. It can also handle such functions as scaling a dotted line to fit between two given end points.

The 7580A can accept data and commands through a variety of interfaces—virtually all HP desktop computers, the personal HP 85, and HP 1000 and HP 3000 systems. RS232 and HP-IB (HP's implementation of the IEEE-488 interface bus standard) interfaces allow connection to non-HP devices.

The HP 7580A sells for $15,450, with deliveries estimated at eight to 15 weeks. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 300 ON READER CARD

The Idea:

To take the DEC™ VT100™ terminal and turn it into a sophisticated, yet economical graphics terminal.

Will wonders never cease? Not if Digital Engineering has anything to do with it. We're the pioneers in retrofit graphics. And this time we've turned DEC's VT100 alpha-numerics terminal into a full-fledged graphics terminal that features multiple character sizes, dot-dash lines, point plotting, vector drawing and selective erase for quick, easy updating of the graphics display.

We call this transformation The Retro-Graphics™ Enhancement. And while it begins with complete emulation of Tektronix® 4010 Series terminals—and compatibility with most existing graphics software, including Tektronix Plot 10™ and ISSCO's® DISSPLA® and TELLAGRAF®—there is much more to be said for this breakthrough. First, graphics are displayed on a 12″ (diagonal) green-toned screen at 640 x 480 resolution. Refresh raster scan technology insures a bright, easy-to-read display. And all of the features that the DEC VT100 terminal begins with remain intact, including 96 upper/lower case ASCII characters, up to 132 characters per line, numeric and function keypads, detachable keyboard and a wide variety of screen customizing features.

The Retro-Graphics Enhancement for the DEC VT100 terminal. Whether you are looking for continuity with existing DEC products, or for a high-quality graphics terminal at hundreds less than the competition, ours is the right idea. For more information, write or call.

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CIRCLE 116 ON READER CARD

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HARDWARE

4300—where circuits are formed on a common "blank," in this case consisting of six layers comprising the transistor level of the chip). DEC's method creates 488 logic gates on a chip. Roughly 90% of the 750's cpu is contained in 55 chips customized into 27 distinct types. Other differences between the new machine and the 780 are found in memory capacity: the 750 supports a maximum of 2MB of real memory, compared to the 780's 8MB (or 12MB in a multiprocessor), and the 750 has 4KB of cache, compared to 8KB in the 780. The 750's I/O system also differs from the 780: a 750 has a Unibus for low and medium speed devices, and provision for up to three Massbuses for high speed devices (the 780 can have four Unibuses and four Massbuses, maximum).

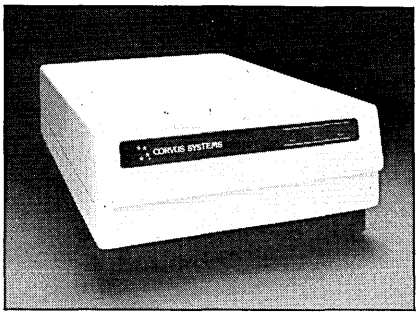
The 750 runs the same VAX/VMS virtual memory operating system as the 780, and it supports the same software packages—both 32-bit native mode programs, and PDP-11 16-bit code in compatibility mode.

Oem pricing for the VAX-11/750 starts at $47,000 for a 512KB cpu and an LA38 DECwriter IV terminal. System prices start at $89,900, for a 512KB cpu, LA38 terminal, two 28KB disks, and VAX/VMS. Volume deliveries are to begin in April. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 305 ON READER CARD

MICROCOMPUTER DISK

Corvus now offers a 20MB 8-inch Winchester disk for use with 15 popular microcomputers, including those from Radio Shack, Apple, Commodore, and Atari. The 20MB subsystem includes an IMI-7720 disk drive, a Z80-based Corvus disk controller capable



of supporting four drives, and an intelligent personality module tailored to a specific microcomputer. A 20MB subsystem, including disk, controller, and personality module, sells for $6,450; additional 20MB drives go for $5,750. CORVUS SYSTEMS, INC., San Jose, Calif.

FOR DATA CIRCLE 307 ON READER CARD

COMMUNICATIONS ALARM PANEL

The 5977 digital alarm panel can detect carrier failures in point-to-point networks and streaming modems in multipoint networks. The unit can monitor up to 16 circuits or modems with RS232 interfacing. The user can select a separate time out period—ranging from 1msec to six minutes—for each of 16 circuits; the 5977 will sound an alarm and light an indicator lamp for any circuit with a fault condition. The 5977 sells for $1,295, and a complementary remote unit, the 5977R, sells for $395. The 5977R allows alarm indication to be forwarded to other operator locations. Both units are rack mountable. T-BAR INC., Wilton, Conn.

FOR DATA CIRCLE 310 ON READER CARD

X.25 COMMUNICATIONS

Tran Telecommunications, a subsidiary of Amdahl Corp., has developed the M3216 X.25 Packet Processor (XPRO) for switching packet transmissions between X.25-compatible computers, terminals, and other digital devices. Implemented with three levels of processors corresponding to the three levels—electrical, link level, and packet level—of the CCITT X.25 recommendation, the XPRO functions as an attached processor with Tran's M3201 Network Processor. Up to three XPROs can attach to a single M3201. Each XPRO can support up to eight trunks to remote XPROs, with data rates to 64Kbps and interfacing complying with RS232, V.24, or V.35 standards. The XPRO has a maximum data rate of 300Kbps, and a maximum packet rate of

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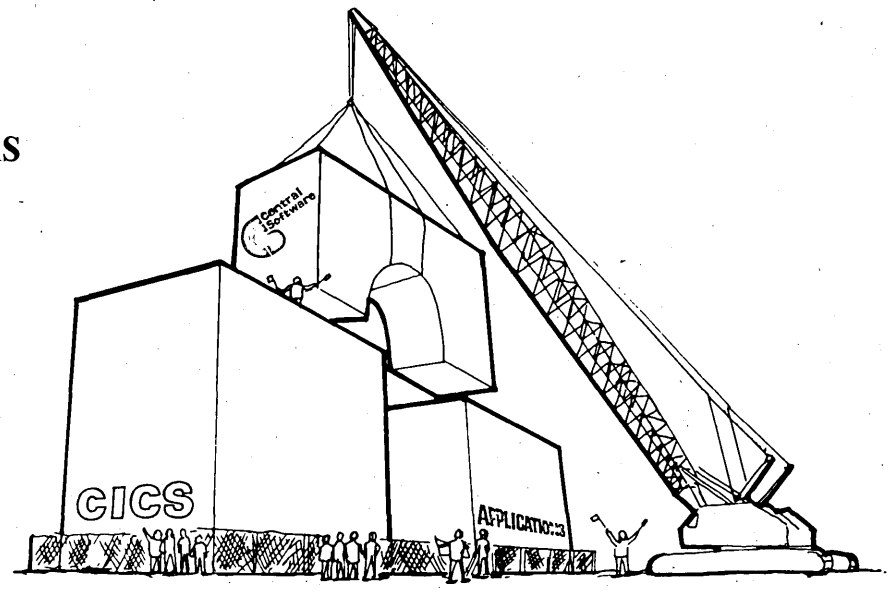
In minimum time: Central Software eliminates the complex, time-consuming programming usually associated with CICS applications. Repetitive routines are called forth by concise COBOL, PL1, or Assembly commands.

At minimum cost: The Central Software package comes with a reasonable price tag. And that's just the beginning. You'll be using less specialized programmers and putting more applications up faster.

Using minimum space: The smaller, more efficient applications made possible by Central Software make optimal use of machine core—and machine time.

With total data security: "Before image" processing assures data integrity during application usage. Added to controls inherent to CICS, that's security.



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CIRCLE 117 ON READER CARD

D.P. Documents... organize and control them in any environment with the DOCU-MATE® filing system.

A single filing method for all documentation, records and reports.
Think about the time and expense involved in the creation of data processing documentation, records and reports and you'll see the importance of organizing these vital information assets so they are under the control of management. Until recently, this problem of organization was compounded by the many sizes and shapes of documents which created an almost impossible filing, retrieval and referencing problem. Now, the DOCU-MATE filing system solves the problem by providing a single filing method for all documents regardless of their size, shape or location within the information network.

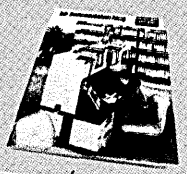
Combine DOCU-MATE filing with open office plan.
If your existing or planned office is designed with panel supported work surfaces, a wide range of DOCU-MATE filing components designed to coordinate with most popular panel systems is available. You can get the advantages of functional organization with filing capability that enhances the aesthetics of your design.

Combine DOCU-MATE with contemporary office furniture.
DOCU-MATE work station filing equipment including: cabinets, documentation organizers and mixed media open shelf files coordinate beautifully with furniture from leading manufacturers. You can plan work stations that provide both a modern crisp appearance and the functional efficiency of organized filing and referencing.

Build total DOCU-MATE filing environments.
While you can integrate DOCU-MATE filing into your existing office plan; you can also create total DOCU-MATE filing environments. A full line of specialized filing work stations, chairs, documentation organizers, cabinets and open mixed media files lets you plan environments that precisely meet the needs of the people involved.

Coordinate work station and library filing.

With the DOCU-MATE center hook filing and drop filing principle, you can build a total filing network involving group libraries and files and central libraries. Every imaginable type and size of document can be filed interchangeably at every location. You can even intermix sizes and shapes in the same filing equipment. And, since DOCU-MATE filing is designed for both high density, high security filing and high reference filing you can plan filing areas to meet the needs of the people who must work with them.



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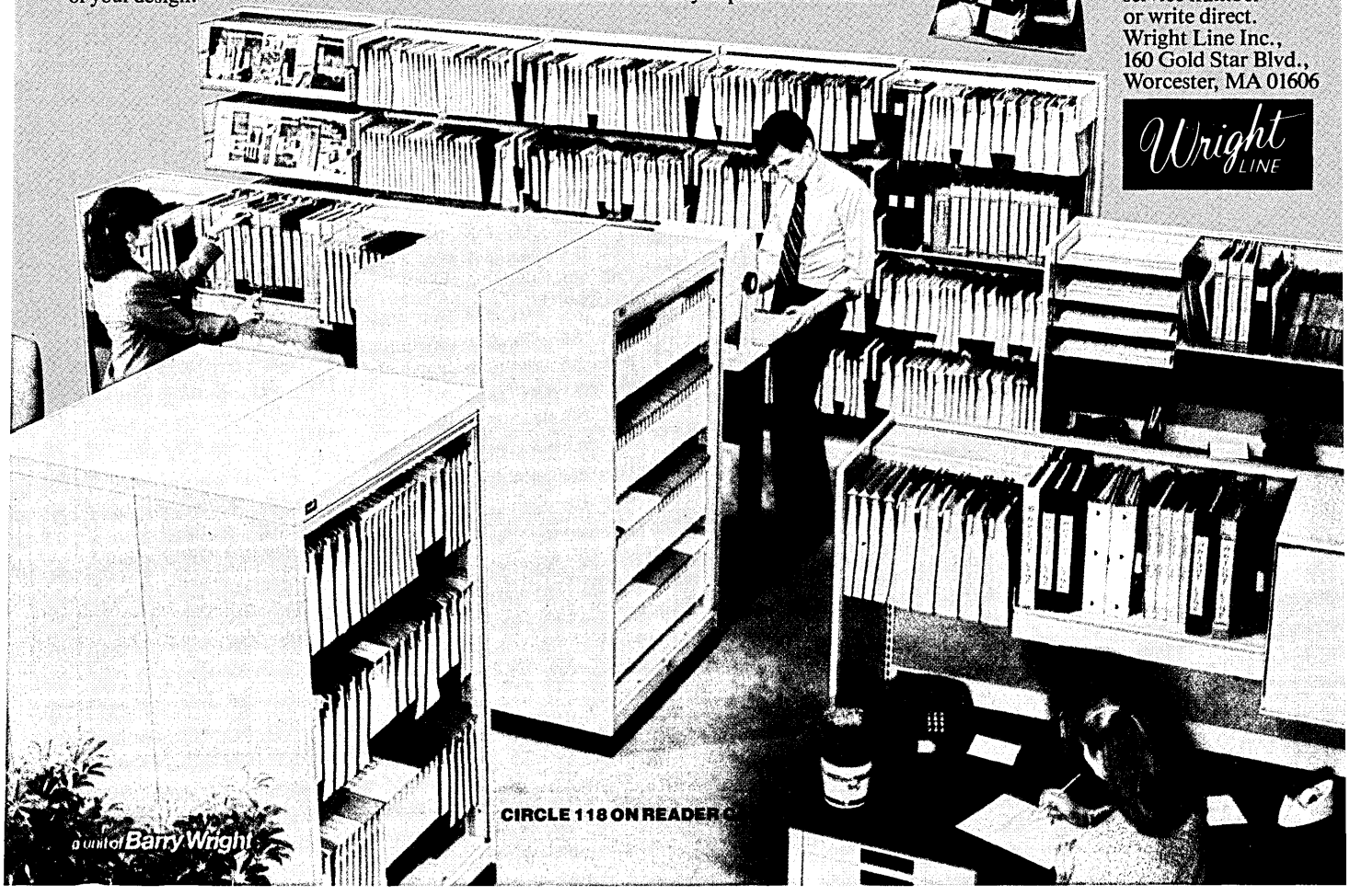


a unit of Barry Wright

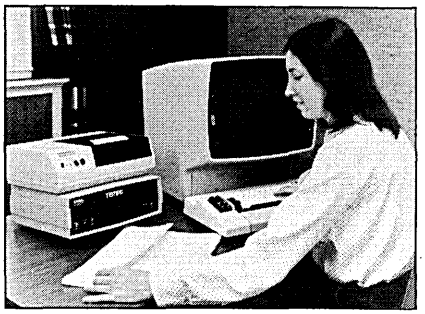
CIRCLE 118 ON READER C

800 per second. Each XPRO can support up to 64 physical circuits, and a maximum of 1,024 simultaneous virtual circuits. Auxiliary Packet Assembly/Disassembly units support asynchronous devices and IBM-compatible bisync devices. Asynchronous terminals can run to 9600bps, and synchronous devices can operate at speeds of up to 64Kbps. XPRO pricing starts at less than $50,000, and is dependent upon configuration. TRAN TELECOMMUNICATIONS CORP., Marina del Rey, Calif.

FOR DATA CIRCLE 306 ON READER CARD

RESPONSE TIME MONITOR

The Tempo response time monitor from DTSS records system response times in 3270 networks. Attaching directly to the 3270 terminal, Tempo intercepts signals between the keyboard and the host. Response time is measured as the time elapsed between



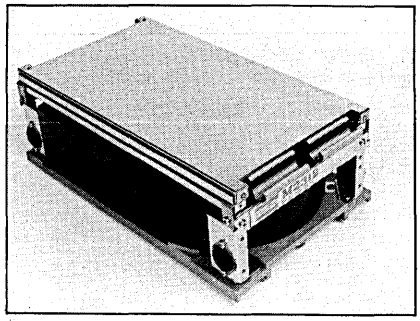
pressing any enter-related key at the terminal until the host unlocks the keyboard for the next transaction. Tempo measures the time the terminal is unavailable for entering a transaction, not the short lock-to-unlock intervals caused by transactions creating multiple locks and unlocks while processing data and writing it to the tube. Tempo installs without tools, and can print response time reports locally on its own printer, on the screen where the data can be sent down line to the host, or both. Tempo sells for $2,450, including printer. DTSS INC., Hanover, N.H.

FOR DATA CIRCLE 308 ON READER CARD

EIGHT-INCH WINCHESTERS

A pair of relatively large capacity 8-inch Winchester disk drives with SMD interfacing, and a pair of smaller capacity 8-inch Winchesters with floppy-compatible interfacing, mark Fujitsu's entry into the 8-inch disk market; here in the States, Fujitsu America has marketing responsibilities.

The model 2311 has a capacity of 48MB, while the model 2312 packs away 84MB. Both drives come with SMD interfaces, complete with data separation circuitry. The two drives are said to have the same physical mounting requirements as floppy drives. Track-to-track head positioning time is 5msec, average head position time is 20msec, and maximum positioning time is



quoted at 40msec. Both units transfer data at 1.229MBps. The two-platter 48MB model 2311 sells for $3,195 in oem quantities of 100, and the four-platter 84MB model 2312 is priced at $3,795 (based on a stair-step oem schedule). Production quantities are expected to reach our shores by April.

For applications requiring smaller capacities, the 2311 and 2312 are complemented by the 11.7MB model 2301 and the 23.4MB model 2302. Both use standard floppy interfacing and power levels. The 2301 sells for $1,660 in quantities of 100, and the 2302 goes for $2,095 in the same quantities. Controllers are optional. Fujitsu says it has already shipped 600 units in Japan since June. Evaluation units are available here now; production will be increased over 1,000 units a month by April. FUJITSU AMERICA, INC., Santa Clara, Calif.

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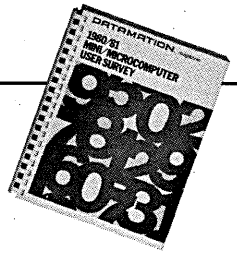

The fourth annual DATAMATION magazine Mini/Microcomputer User Survey has just been completed. Encompassing small business systems, intelligent terminals, microcomputers and data entry systems as well as traditional minicomputers, this analysis is an invaluable marketing tool and essential reading for industry watchers, market planners, sales executives and end-users.

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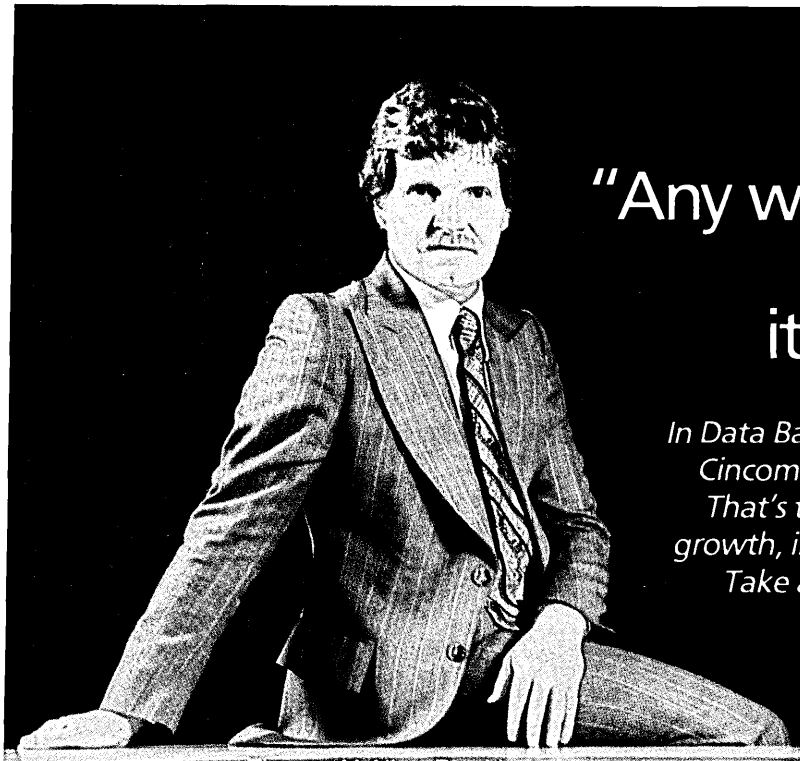

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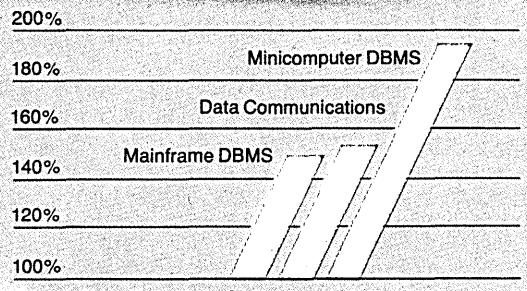
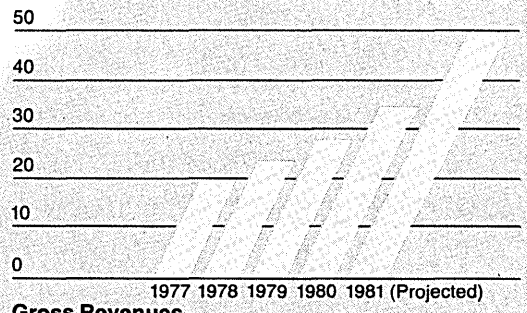
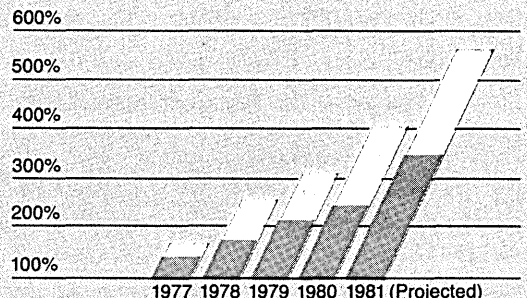
Thomas M. Nies, President



Percentage increase in DB/DC unit sales over 1979.



Gross Revenues (in millions)



Comparison of R & D expenditures to gross revenue.*

R & D Revenue

*1976 Base 100% for R & D and Revenue.

- ☐ Unit software sales increases over 1979: Mainframe DBMS—154%; Data Communications—157%; Minicomputer DBMS—195%.
- ☐ Revenues up from $28-to-$35 million.
- ☐ R&D growth rate continued to exceed sales growth. R&D investment up 560% from 1976; sales up 350%.
- ☐ Rapid increase in number of IMS/DL-1 and CICS users successfully converting to Series 80 TOTAL® and ENVIRON/1®.
- ☐ Cincom's share of the independent DBMS market increased to 64%*—that's eight times the share of our closest independent competitor.
- ☐ Almost 67% of Fortune's top 100 and 50% of Fortune's top 500 now use Cincom DB/DC software.
- ☐ Dramatic growth in new sales of our manufacturing and financial application systems.
- ☐ Client base expanded to 3,500 plus—worldwide.

Today's leaders in every imaginable industry are improving productivity through the use of Cincom DB/DC and application software. Shouldn't you consider joining the leaders?

*Based on IDC Report—August, 1980

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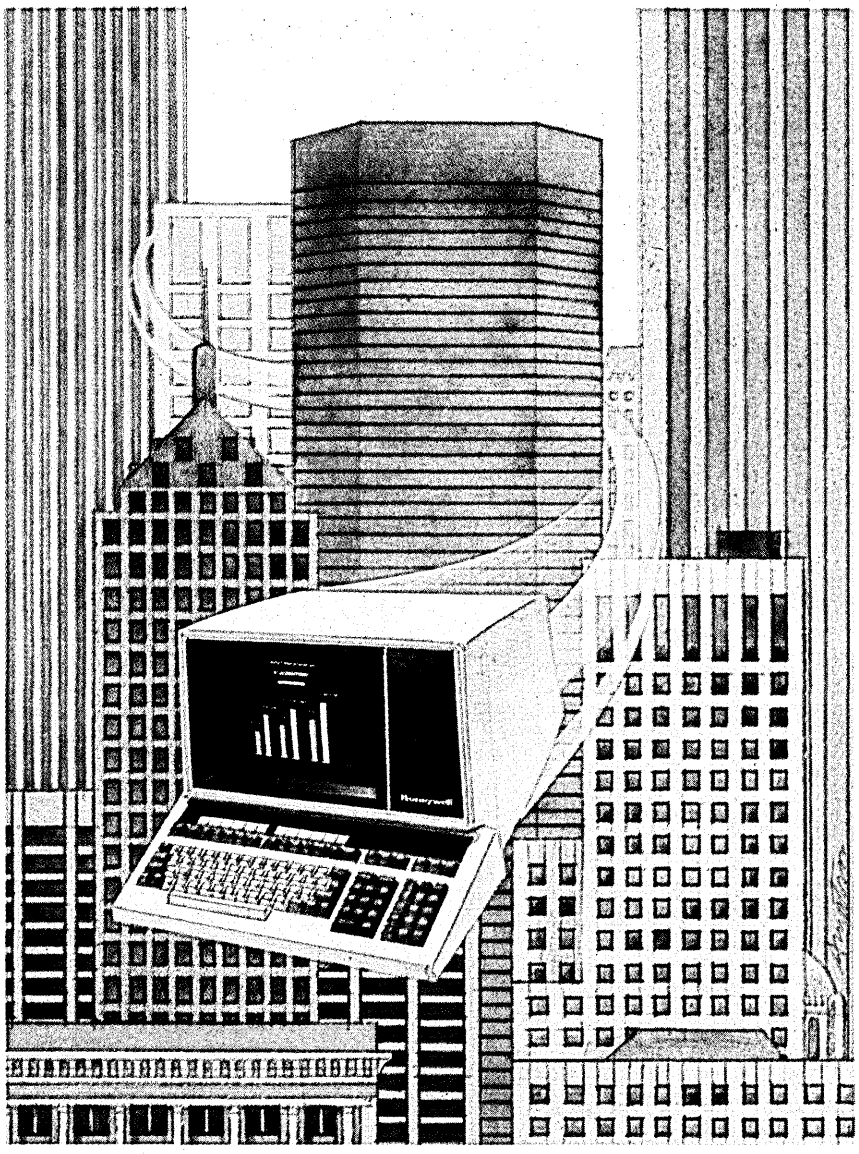
HERE'S DPS 6.



The small computer system that grows and grows and grows...

DPS 6 is our new family of small computer systems, and it has just about everything you could ask for.

Altogether there are 10 models. At the low end, there are 16-bit systems that offer a range of power and capability that used to come only with much larger systems. In fact, these systems probably have the best price/performance ratio in the industry.

At the top end, DPS 6 includes 32-bit systems that we think are the most powerful small systems ever announced for business applications. (They're also pretty tough to beat in a scientific environment.)

And in between there are systems that keep adding incremental value to support different kinds of growth.

Most important, these systems are compatible – programs that run on the smallest 16-bit model can be run without changes on the largest 32-bit model. Also, the larger 16-bit models can be easily converted to 32-bit models when you need more power and capacity.

Naturally, there's software too. The best business-oriented software in the business. COBOL, transaction processing, word processing, data entry and communications. We call this combination of hardware and software Businessware. You'll call it the most efficient system you've ever seen.

And DPS 6 systems work especially well in distributed networks. Providing the up-to-date data that can mean greater productivity in executive suites, offices, factories and warehouses. Wherever people need facts and figures to do their jobs.

You'll find DPS 6 systems easy to install and easy to maintain. Best of all, they're so easy to expand you won't have to worry about growing too fast. Their built-in expansion capability means they'll keep on working – doing the future applications you haven't even dreamed of yet.

Power and flexibility, growth potential, and cost effectiveness. Those are only some of the reasons we think DPS 6 systems are special. To discover how they'll work for you, write Honeywell, 200 Smith Street (MS 487), Waltham, Massachusetts 02154.

Honeywell

CIRCLE 121 ON READER CARD

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Precision Tube Company, Inc.
Mr. John Thompson, Vice President

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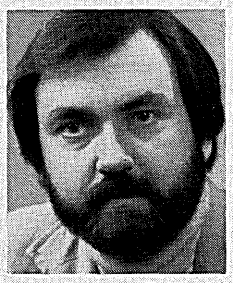
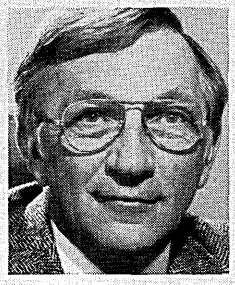


Magnode Corp.
Mr. John M. Bidwell, DP Manager

"In an intensive 17 month search for hardware, the SPERRY UNIVAC SYSTEM 80 best met our three major criteria—cost effectiveness, growth compatibility and ease of use."



GENUARDI Supermarket Chain
Arden Stover, Director of Operations

"One of the major features we like about the System 80 is that it offers capabilities normally found only in large processors. And it can be used as a stand-alone system or as a part of a distributed processing network."

Skidmore College
Mr. John Butler, Comptroller

"A major factor in our decision was the high priority we gave to service. We were advised to be sure to make this a prime consideration. Everyone of your customers confirmed his satisfaction with your equipment."

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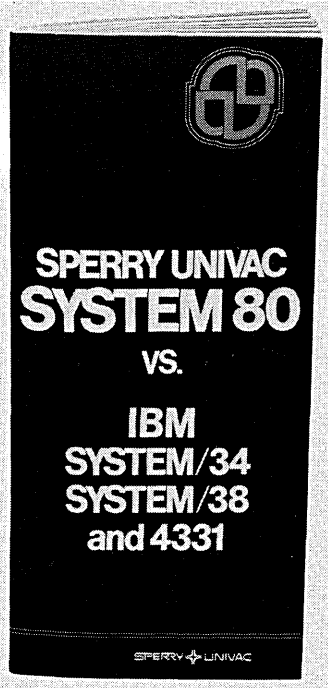

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CIRCLE 122 ON READER CARD

HARDWARE

OCR PAGE READERS

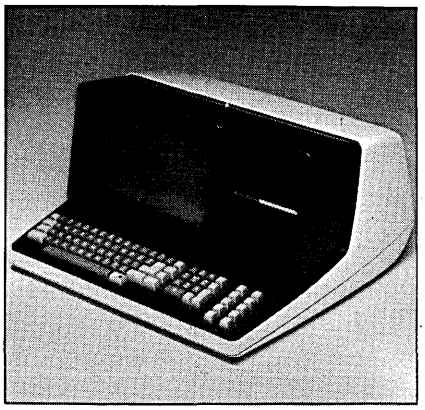
Hendrix has added two OCR units to its Typereader family of page readers, and cut the price of the current TR2 model by nearly 30%. The existing dual-font, dual-pitch TR2 model has a new base price of $11,495, reduced from $15,900. The newly announced TR2S has the features of the TR2, but lacks the TR2's automatic sheet feeder, which isn't considered a necessity in low volume applications. Both read OCR-B and Hendrix Gothic type fonts in either 10 or 12 pitch. Options for both include the ability to read OCR-A, OCR-B with accented characters, recognition of underscored copy, and dual output, allowing connection to multiple communications devices, computers, or word processors. The TR2S is priced at under $10,000.

The TR3 can be configured with up to four type styles; it automatically determines font and pitch without operator intervention. Type fonts available include OCR-A, OCR-B, Courier 12, Courier 72, Letter Gothic, Prestige Elite, Prestige Pica, and Hendrix Gothic. The TR3 can recognize font variations, for example, Courier 72 variants such as Correspondence, Fractional, Legal, and American Standard. TR3 base pricing starts at $18,900, with a single font; additional fonts go for $500 apiece. HENDRIX ELECTRONICS, INC., Manchester, N.H.

FOR DATA CIRCLE 312 ON READER CARD

SMART WORKSTATIONS

Data General's MPT family of intelligent workstations consists of three models that differ only in the amount of minifloppy storage provided. Each of the three workstations includes a microNova microcomputer with 60KB of RAM in the same cabinet that houses a 12-inch, 25-line by 80-character



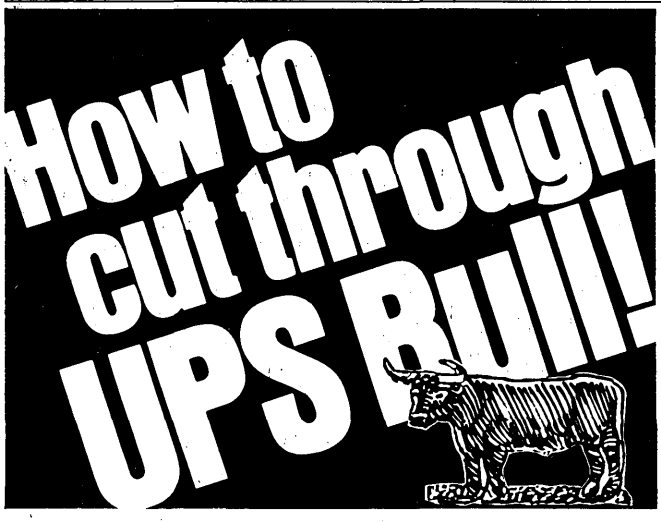
display screen, 83-key keyboard, and minifloppy drives (if present). The MPTs run under a run-time version of the MP/OS real-time, multitasking operating system. Programs for the MPT can be developed on any of the vendor's systems supporting program development (the MPT doesn't) using PASCAL, FORTRAN IV, or assembler; the resulting object code can execute on the MPT.

The MPT/80, priced at $4,800, comes with no diskette storage. The MPT/83 includes a single 358KB mini diskette drive and carries a price of $6,000. At $7,100, the MPT/87 includes two floppy drives, for a total capacity of 716KB of storage. All three come with two programmable RS232 ports capable of operating synchronously or asynchronously at up to 19.2Kbps. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 311 ON READER CARD

MULTILANGUAGE SMART TERMINAL

Computer Systems Consultants has developed a multilingual (32-language) smart crt terminal with editing capabilities. Available in black-and-white and color versions (ML-32 and CML-32, respectively), the terminal allows the user to select a language by using soft keys; languages may be intermixed as desired. The ML-32 and CML-32 display 34 lines of 80 characters, and the terminals include enough memory so users can scroll through several pages without interrupting the host computer. Languages supported include English, Greek, Arabic, Hebrew, Russian, Chinese, Japanese, Korean, Tagalog, and Serbian, to name half a score. A ruling character set is provided for forms definition. Communications are supported through RS232, IEEE-488 (GPIB), and IBM 3270 ports. Pricing for the mono-



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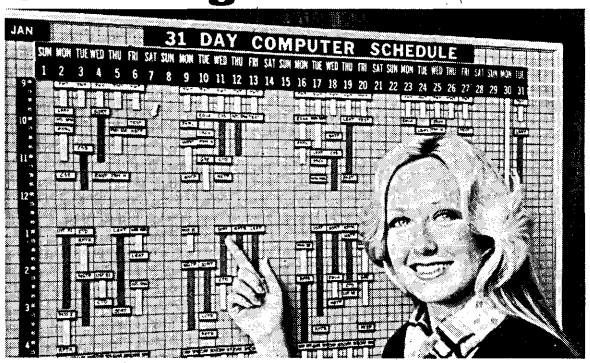

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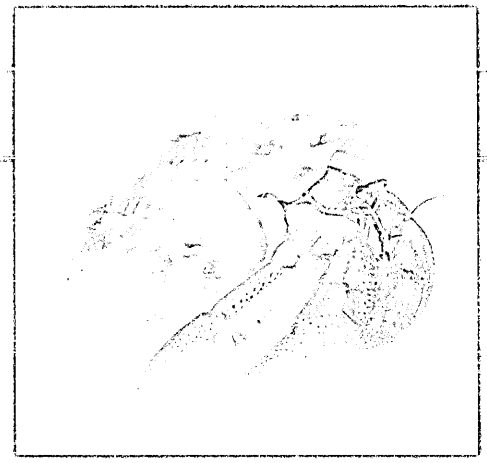

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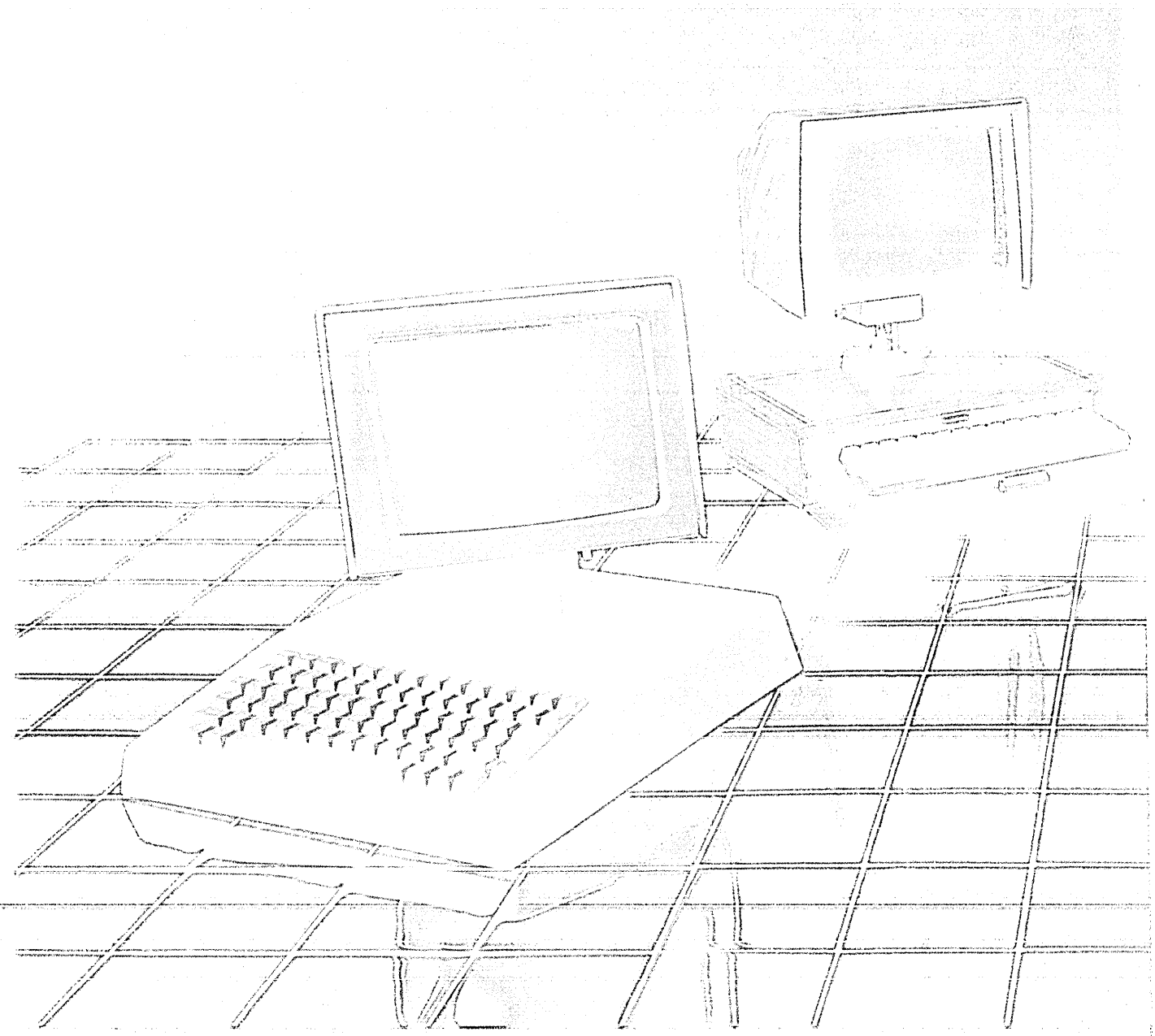

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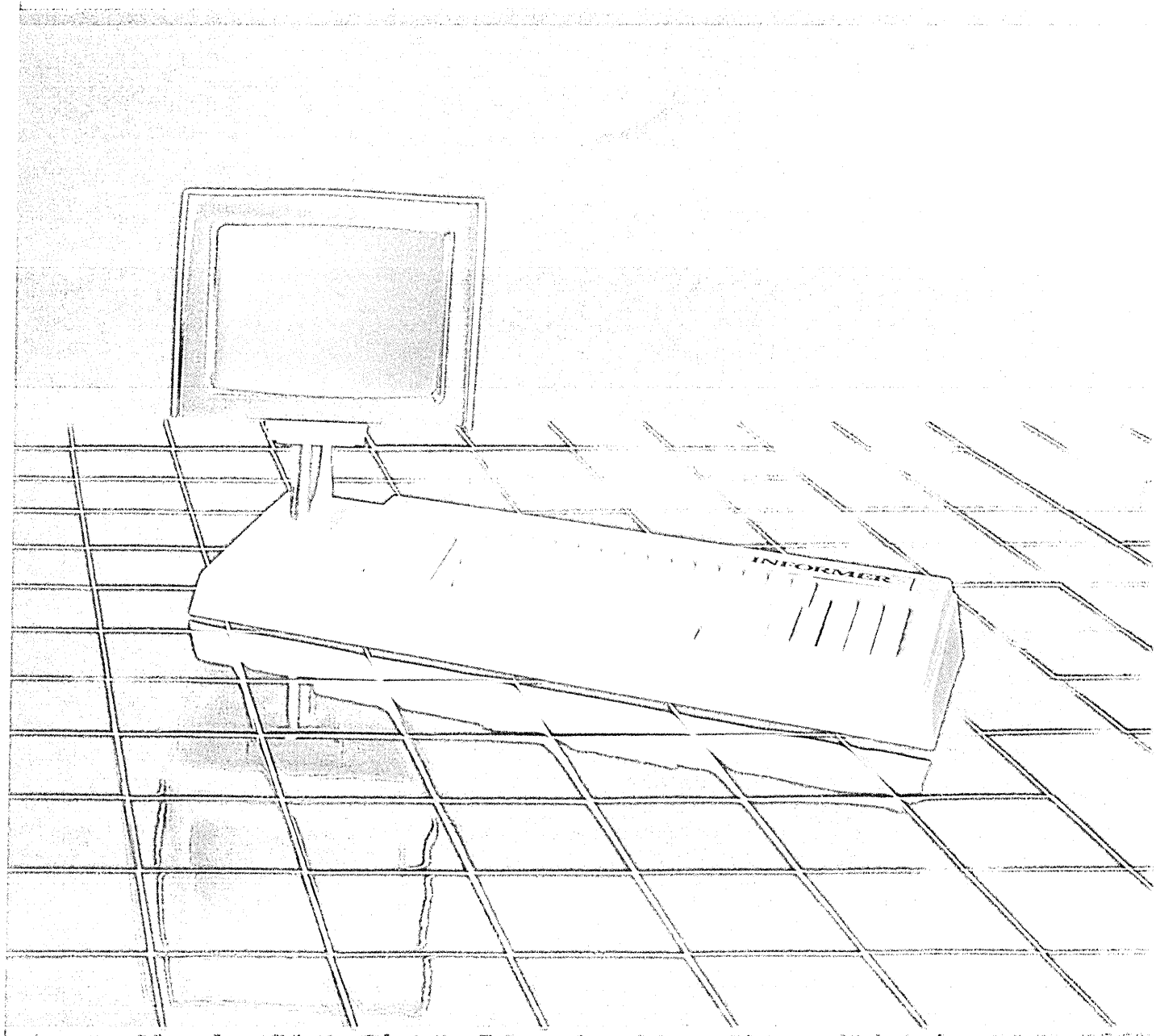


Left to right: Model 401 Computer Terminal 13" Wx 14" Hx 16" D 14 lbs. Model 1304 Data Inquiry Terminal 13" Wx 14" Hx 13" D 17 lbs. Model D304 Data Entry Terminal 26" Wx 14" Hx 11" D 17 lbs.

CIRCLE 126 ON READER CARD

HARDWARE

chrome ML-32 is $17,500, and $26,000 for the color CML-32. COMPUTER SYSTEMS CONSULTANTS, INC., Chelmsford, Mass.
FOR DATA CIRCLE 313 ON READER CARD

NETWORKING

Honeywell announced its distributed Systems Architecture (DSA), said to conform to the ISO reference model for open systems architecture, including support for X.25 packet switched and X.21 circuit switched communications. DSA reportedly provides flexibility, allowing users to configure networks using a variety of equipment (and vendors), and interconnection to other networks; DSA networks can be configured as hierarchies or as horizontal peer-type networks, as appropriate to the application. With the announcement of DSA, Honeywell released its first set of system and hardware products for network implementation.

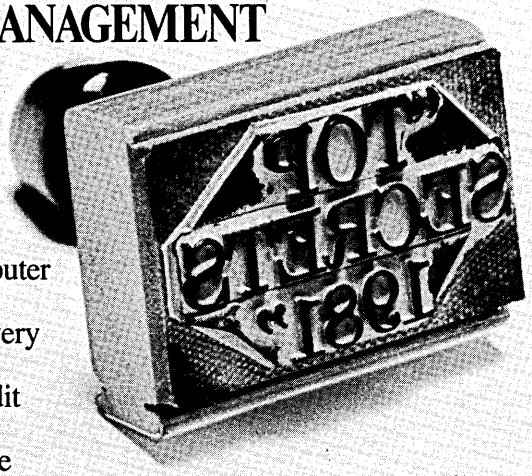
The initial product set consists of a front-end processor, the Datanet 8, the Distributed Network Supervisor (communications software for the Datanet 8),and the Distributed System Satellite, a hardware and software system that functions as a satellite processor within a DSA network. The firm also is developing products that will allow interconnection to computers functioning under SNA.

Based on the Honeywell Level 6 minicomputer, the Datanet 8 and the Distributed Network Supervisor (DNS) software handle communications in a DSA net for a DPS 8 or Level 64/DPS host running GCOS 8 or GCOS 64, respectively. Central to the Datanet 8 is a high-speed (6MBps) bus connecting console and network processor diskette controller, host interface adaptor, and channel interfaces to the network and remote devices. Two, eight, or 16-channel interface bases can be connected to a Datanet 8. Each channel interface base accepts up to four communications channel interfaces (in a combination of any two transmission types): RS232 dual synchronous to 9600bps; RS232 dual asynchronous to 9600bps; HDLC RS232 single channel to 9600bps; HDLC wideband to 56Kbps; and HDLC wideband CCITT V.35 to 56Kbps. A full-blown Datanet 8 can be configured with up to 128 lines. Two Datanet 8s can be configured on a single host. A basic Datanet 8 with a 120cps console and support for up to 16 communications lines sells for $45,000. A system that can handle up to 128 lines sells for $88,000.

The DNS software provides DSA-compliant communications interfaces between the elements of a network or distributed system. It handles communications facilities for RJE, file transfers to and from a distributed satellite system (DSS), time-sharing, and transaction processing. It also supports public data networks and value added nets, including X.25 packet switched and X.21 circuit switched networks. DNS licenses for roughly $600 per month; expanded software support service starts at $150 per month; connection to value added nets is available for about $80 per month.

Distributed System Satellite is the monicker Honeywell has assigned any of its Level 6 minicomputers running the appropriate software that allows it to function as a satellite processor and communicate with hosts in a DSA net. A DSS also can control a local network. DSS provides full DSA communications between satellite applications and Level 64/DPS or DPS 8 mainframes via leased lines and HDLC. As a DSS, the Level 6 mini runs under GCOS 6 MOD 400/DSS, which includes the separately priced GCOS 6 MOD 400 executive and DSA primary network support software. The various DSS software components (and their initial license fees) are: Primary network software ($1,800), Node administration ($450), Network operator interface ($450), file transfer facility 64/DSS ($990), remote batch facility 8/DSS ($990), distributed transactional facility/DSS ($3,375), and distributed concentration facility/DSS ($1,350). Optional expanded software support ranges from $30 to $250 per year. Value added network connection software is $5,000. HONEYWELL INFORMATION SYSTEMS, Waltham, Mass.
FOR DATA CIRCLE 314 ON READER CARD

ADVANCES IN COMPUTER SECURITY AND PRIVACY MANAGEMENT



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- Advances in Computer Crime Prevention
- New Directions in Computer Security Technology
- Trends in Disaster Recovery Planning
- Distributed Systems Audit and Control

These are some of the topics that will be covered at the Seventh Annual Honeywell Computer Security and Privacy Symposium to be held April 7-8, 1981 at the famous Pointe Resort, Phoenix, Arizona.

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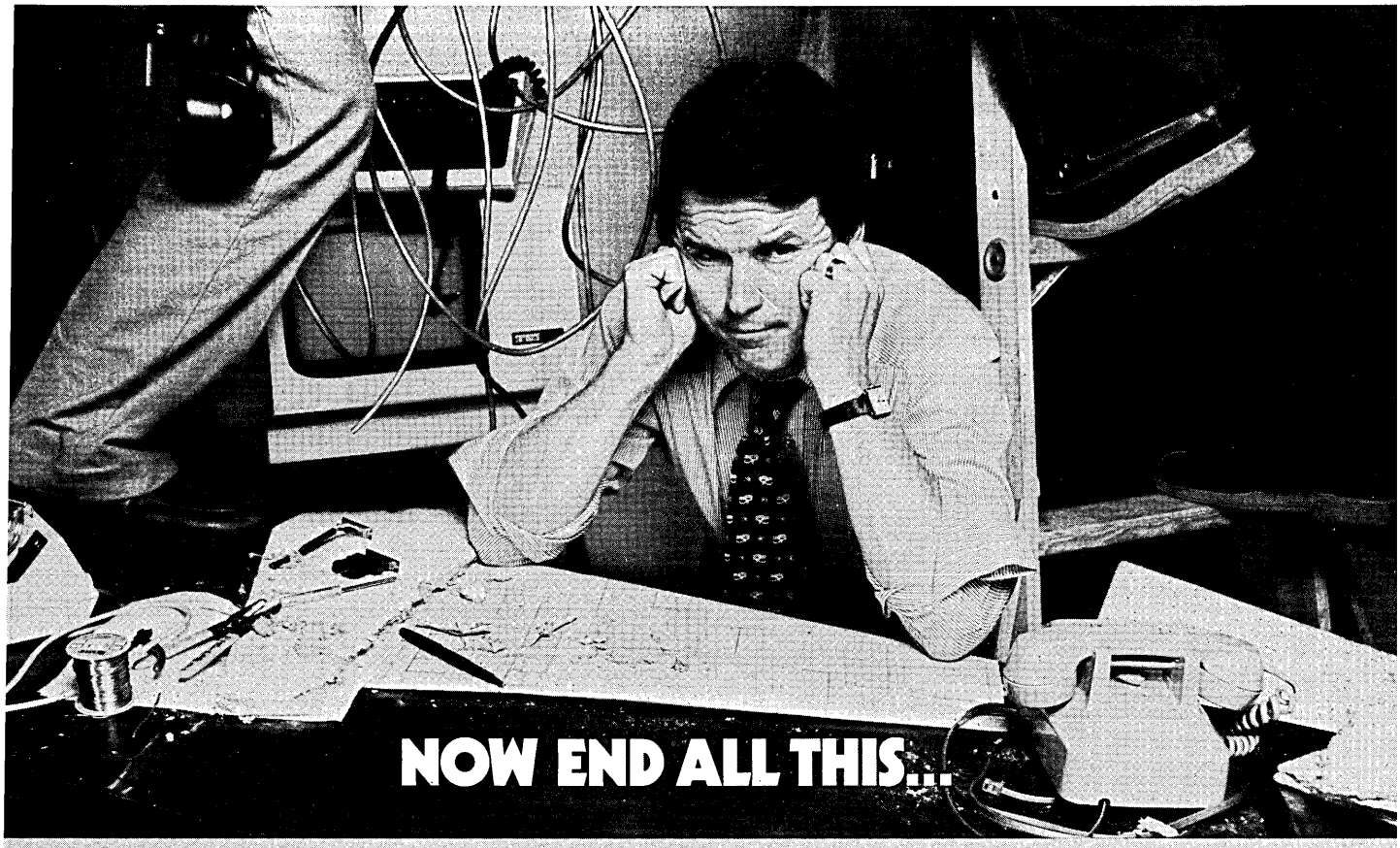

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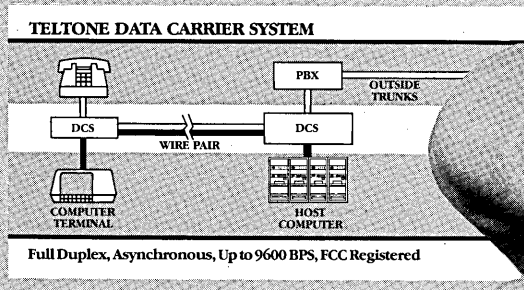

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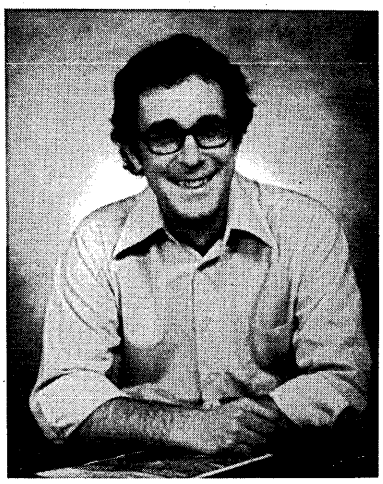

David Ahl, Founder and
Publisher of Creative Computing

creative computing

"The beat covered by Creative Computing is one of the most important, explosive and fast-changing."—Alvin Toffler

You might think the term "creative computing" is a contradiction. How can something as precise and logical as electronic computing possibly be creative? We think it can be. Consider the way computers are being used to create special effects in movies—image generation, coloring and computer-driven cameras and props. Or an electronic "sketchpad" for your home computer that adds animation, coloring and shading at your direction. How about a computer simulation of an invasion of killer bees with you trying to find a way of keeping them under control?

Beyond Our Dreams

Computers are not creative per se. But the way in which they are used can be highly creative and imaginative. Five years ago when *Creative Computing* magazine first billed itself as "The number 1 magazine of computer applications and software," we had no idea how far that idea would take us. Today, these applications are becoming so broad, so all-encompassing that the computer field will soon include virtually everything!

In light of this generality, we take "application" to mean whatever can be done with computers, *ought* to be done with computers or *might* be done with computers. That is the meat of *Creative Computing*.

Alvin Toffler, author of *Future Shock* and *The Third Wave* says, "I read *Creative Computing* not only for information about how to make the most of my own equipment but to keep an eye on how the whole field is emerging.

Creative Computing, the company as well as the magazine, is uniquely lighthearted but also seriously interested in all aspects of computing. Ours is the magazine of software, graphics, games and simulations for beginners and relaxing professionals. We try to present the new and important ideas of the field in a way that a 14-year old or a Cobol programmer can understand them. Things like text editing, social simulations, control of household devices, animation and graphics, and communications networks.

Understandable Yet Challenging

As the premier magazine for beginners, it is our solemn responsibility to make what we publish comprehensible to the newcomer. That does not mean easy; our readers like to be challenged. It means providing the reader who has no preparation with every possible means to seize the subject matter and make it his own.

However, we don't want the experts in our audience to be bored. So we try to publish articles of interest to beginners and experts at the same time. Ideally, we would like every piece to have instructional or informative content—and some depth—even when communicated humorously or playfully. Thus, our favorite kind of piece is acessible to the beginner, theoretically non-trivial, interesting on more than one level, and perhaps even humorous.

David Gerrold of *Star Trek* fame says, "*Creative Computing* with its unpretentious, down-to-earth lucidity encourages the computer user to have fun. *Creative Computing* makes it possible for me to learn basic programming skills and use the computer better than any other source.

Hard-hitting Evaluations

At *Creative Computing* we obtain new computer systems, peripherals, and software as soon as they are announced. We put them through their paces in our Software Development Center and also in the environment for which they are intended—home, business, laboratory, or school.

Our evaluations are unbiased and accurate. We compared word processing printers and found two losers among highly promoted makes. Conversely, we found one computer had far more than its advertised capability. Of 16 educational packages, only seven offered solid learning value.

When we say unbiased reviews we mean it. More than once, our honesty has cost us an advertiser—temporarily. But we feel that our first obligation is to our readers and that editorial excellence and integrity are our highest goals.

Karl Zinn at the University of Michigan feels we are meeting these goals when he writes. "*Creative Computing* consistently provides value in articles, product reviews and systems comparisons . . . in a magazine that is fun to read."

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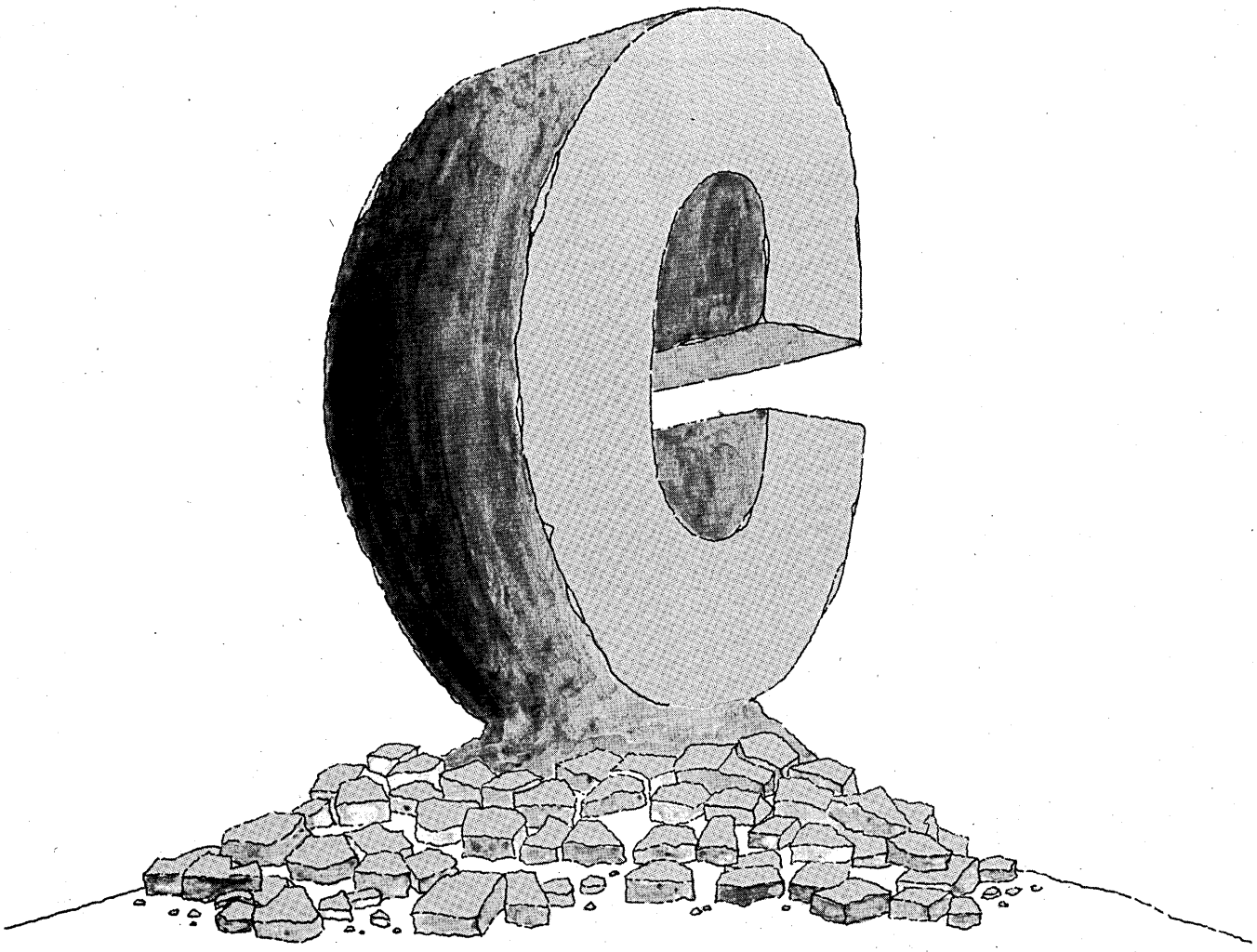

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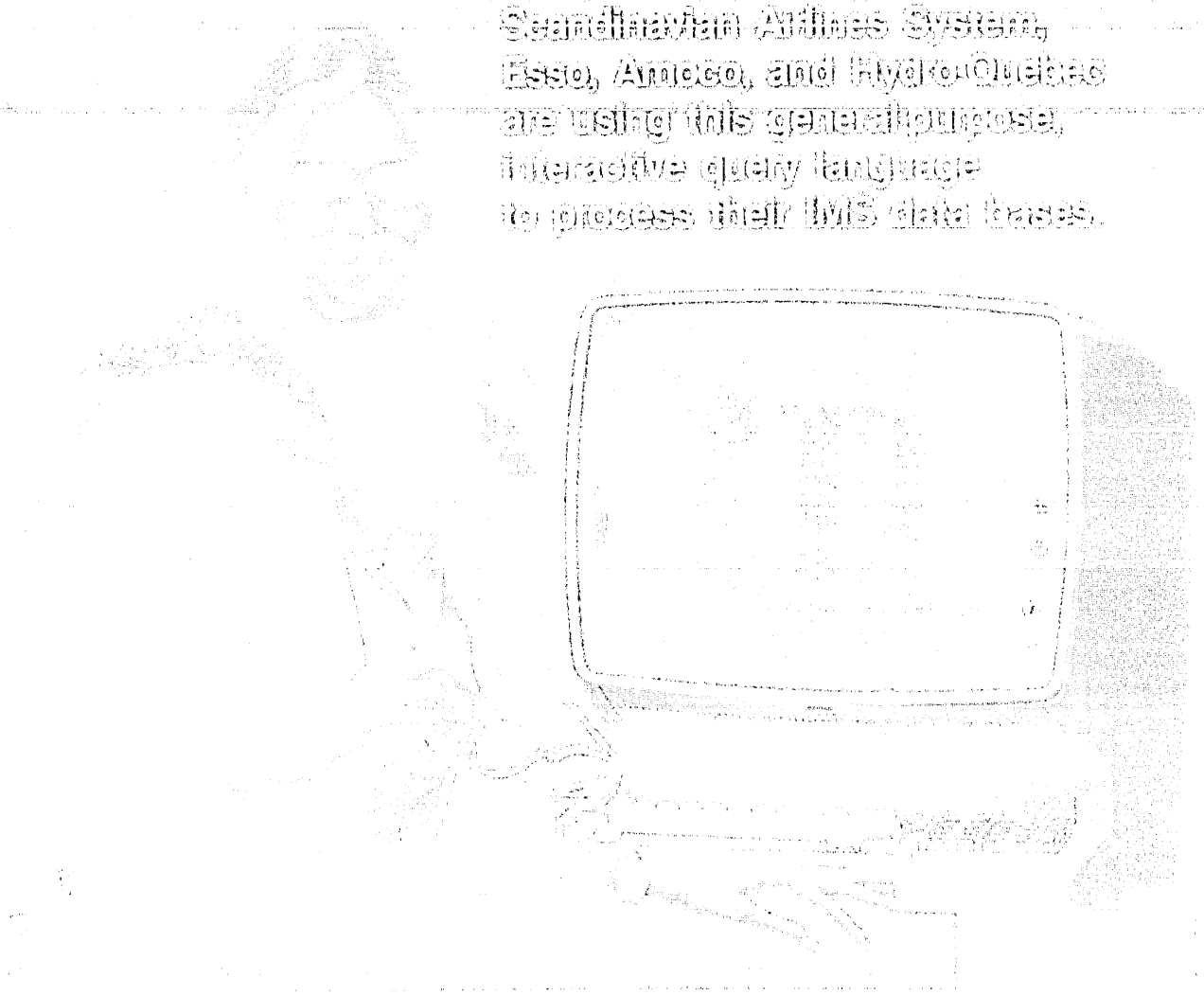

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SOFTWARE AND SERVICES

UPDATES

Most European vendors will offer remote diagnostics within the next two years, according to a study conducted by Input, of Palo Alto. "Remote Diagnostics in Western Europe" shows that vendors providing remote diagnostics rate the concept even more highly than those companies planning to introduce the service.

Mini-Computer Business Applications, Inc., a Glendale, Calif., software house, says it has won a final judgment and permanent injunction against Business Information Systems, Inc., and Ronald J. Petty of Hillsborough County, Florida. The suit, part of a three-year battle, concerned misappropriation of MCBA software. MCBA offers a license for one of its packages to anyone reporting unauthorized use of its software, upon successful prosecution.

Independent minicomputer line printer supplier Digital Associates Corp., of Stamford, Conn., took on more than sales responsibilities when it signed a marketing agreement to sell Data Printer Corp.'s product line last spring: it agreed to set up a dozen service centers nationwide to support the Data Printer line and the remainder of DAC's offerings. The firm will provide service both for printers it sells and for Data Printer products installed by others. Service orders are accepted over a toll-free phone line and dispatched from a central site. DAC says the arrangement makes it the first national independent printer supplier to offer a single contract for printer systems and service.

APL

For Prime computers, a pair of APL interpreters—APL/LW (Large Workspace) and APL/LWSF (Large Workspace Shared Files)—are said to provide the functionality of IBM's VSAPL and APLSV, respectively. Both interpreters include all APL operators, system variables, system commands, I Beam functions, and system functions. APL/LWSF's shared file system is said to be compatible with the file systems of most major APL time-sharing services; on the Prime, APL/LWSF supports binary sequential and ASCII sequential files, providing file compatibility with programs developed using other Prime language processors. The two interpreters are marketed by the developers, the Prime sales force, and Prime dealers and distributors. APL/LW sells for $8,900, while APL/LWSF sells for $11,500. MIPS SOFTWARE DEVELOPMENT, INC., Pontiac, Mich.

FOR DATA CIRCLE 326 ON READER CARD

DRAFTING PACKAGE

The Drafting Package-1 (DP-1) from Com-Code Corp. is a two-dimensional Computer Assisted Design (CAD) package for Tektronix 4050 Graphics Systems. The package, which carries a five-year, single user license fee of $9,500, features five types of lines, circles, arcs, fillets and rounds, automatic dimensions, manufacturing note input, and a set of drawing modifications.

The system uses terminology familiar to the primary users of the package—engineers, designers, and draftsmen. Lines may be entered through the joystick or graphics tablet, or by supplying coordinates from the keyboard. Line functions are available for generating parallel, perpendicular, horizontal, and vertical lines, as well as right angles. Circles can be defined by supplying center and radius, or the endpoints of a diameter, or three points on the circumference. The user has control over the placement, angle, and size of engineering notes. Windowing is also provided. Drawing modifications available to DP-1 users include transposing, rotation, sizing, scaling, filing images in scratch files, and merging previously filed images. The output system includes code to drive Tektronix plotters; software support for other plotters is available at an added cost.

The minimum hardware required to support DP-1 includes a Tektronix 4052 (plus 4952 joystick, Option 2) or 4054 graphics computing system with 64KB of memory, 4907 file manager, 4956 graphics tablet with four-button cursor, and 4662 plotter. COM-CODE CORP., Ypsilanti, Mich.

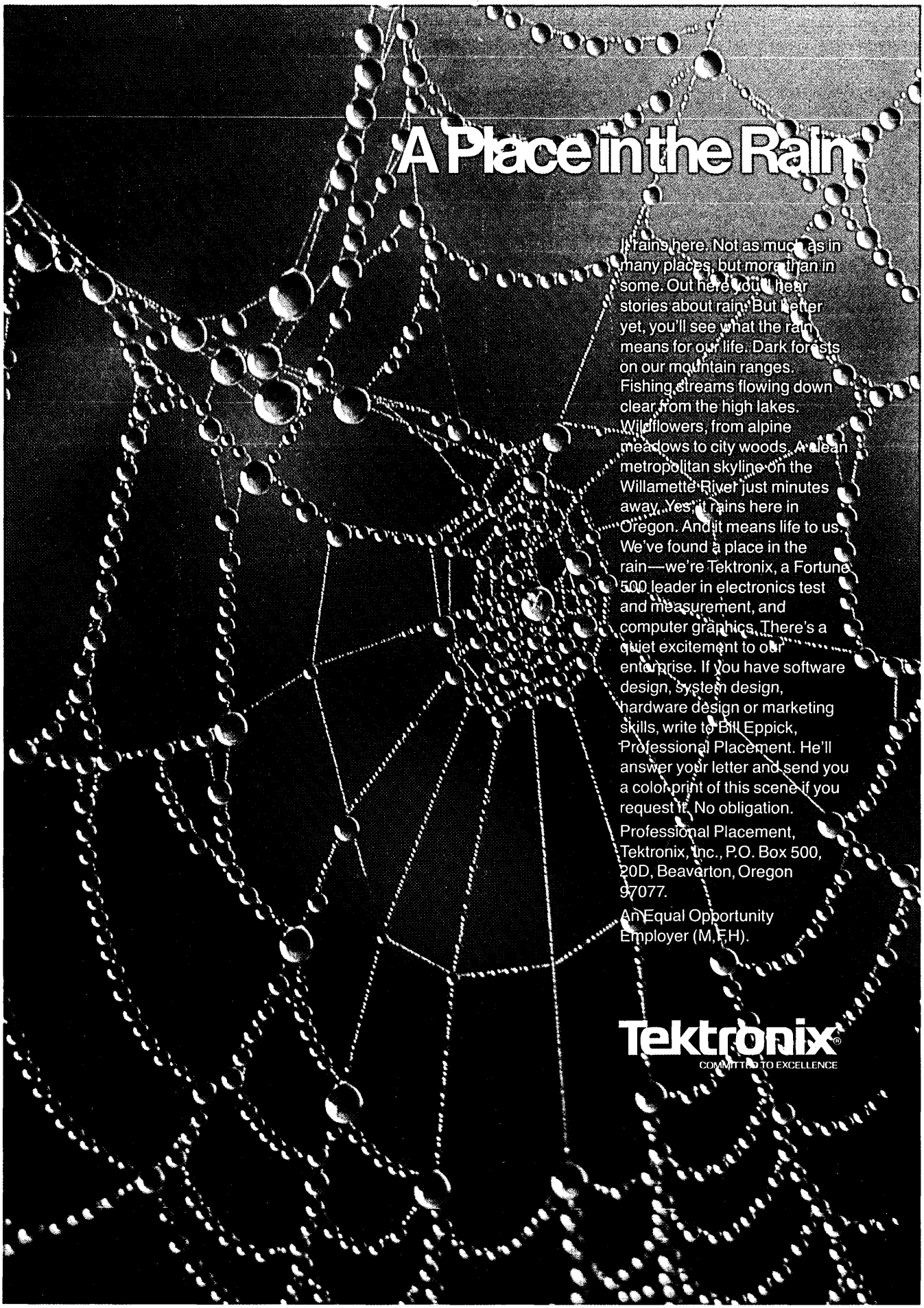
FOR DATA CIRCLE 327 ON READER CARD

GRAPHICS INPUT

Andromeda Systems' LABEX7 graphic digitizing pad support subroutines provide a software interface between DEC's PDP-11 processors and Houston Instruments' HI-PAD digitizer. The package provides both an interrupt-driven subroutine and an RT-11 device handler, allowing input of digitizer x-y coordinates and control information through a serial interface. The device handler provides compatibility with memory-mapped and multiuser systems, while the interrupt-driven service routine provides high-speed input for single user systems. Both routines are written in Macro-11, and use DEC-standard argument passing protocols for compatibility with applications written in FORTRAN, BASIC, Macro-11, and OMSI Pascal.

GD.SYS, the device handler routine returns on coordinate pair and control parameter per inquiry; the routine is for use in memory-mapped and multiuser operating environments. In single user systems, GDINP bypasses the operating system to provide faster data transfers than possible with GD.SYS. If more than about 20 coordinate pairs are generated each second, it will probably take GDINP to keep up with the input.

Test and demonstration programs are supplied with the package, allowing the display of digitized points on a Tektronix 4010 compatible terminal. LABEX7 is normally distributed on an RX-01 compatible diskette written in RT-11 format. Source code is included. The package licenses for



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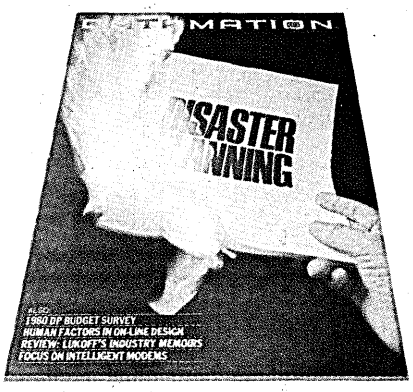

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$100 for a single cpu, and includes a one-year warranty and update privilege. ANDROMEDA SYSTEMS, INC., Canoga Park, Calif.

FOR DATA CIRCLE 328 ON READER CARD

COMMUNICATIONS

BLAST (Blocked ASynchronous Transmission) is a communications software package for transmitting data files, programs, and commands between Data General minis running under DOS or RDOS. Capable of simultaneously sending and receiving transmissions, BLAST's blocking/deblocking technique is said to maximize communications capabilities; cyclical redundancy checking ensures data integrity. The package runs on minimal systems—either disk or diskette-based—and supports communications at rates of up to 9600bps through ULM, ALM or single line asynchronous interfaces. BLAST can run in either foreground or background. The package carries an initial license fee of $1,100, plus a 10% royalty for subsequent installations. DATA SYSTEMS OF BATON ROUGE, Baton Rouge, La.

FOR DATA CIRCLE 330 ON READER CARD

JCL UTILITY

For IBM mainframe users running under OS, JCLSAFE provides two major capabilities: documenting JCL, and identifying errors in JCL. The package preprocesses JCL, locating potential operational problems, conditionally queueing jobs for execution, and optionally providing system documentation. While checking JCL, JCLSAFE identifies syntax errors and inconsistencies between the JCL and the host installation. In the process, JES control statements, OS commands, and special JCL statements are checked.

Documentation capabilities allow reporting by job and application system, with reports ranging from summary to detail, providing reports that combine the edited JCL with data taken from the operating system. Reports include a Job Step Map, Job Flow Control, Symbolic Cross Reference, Data Set Cross Reference, Embedded Documentation List, Program Cross Reference, Job Accounting Statistics, Input Job Control Language, and JCLSAFE Diagnostics. A perpetual license for JCLSAFE goes for $8,000. SAFE SOFTWARE SYSTEMS, Florissant, Mo.

FOR DATA CIRCLE 329 ON READER CARD

SOFTWARE SPOTLIGHT

DBMS MICROCODE ASSIST

With the current interest in back-end database machines, specialized functional processors, and microcoded system tailoring, all considered likely components of any new (read that nonmonolithic 370 architecture) system that IBM may someday—maybe before 1991, but don't bet on it—introduce, it's promising to see a PCM like Magnuson develop a microcoded assist to speed the execution of the widely used IDMS DBMS. Developed in conjunction with IDMS originators Cullinane Corp., the IDMS:MA feature adds several new ECPS-type instructions to the 370 instruction set, which increase cpu throughput by replacing frequently used IDMS routines with microcode. The microcode is expected to improve performance by 5% to 10%; it is priced at $5,000. The IDMS:MA microcode assist feature will be available to Magnuson users during the first quarter of this year. MAGNUSON COMPUTER SYSTEMS, San Jose, Calif.

FOR DATA CIRCLE 325 ON READER CARD

PET DISKETTE CATALOGER

Disk Master is an inexpensive ($10 on tape or $12 on diskette) utility for Commodore PET users with 2040 diskette drives. It can maintain a catalog for as many as 140 diskettes. Disk Master automatically collects the data it needs from the directory blocks of each diskette cataloged. Diskettes may be referred to by name or ID. Disk Master has five major functions. The update master directory function adds a new diskette directory (or replaces an existing directory

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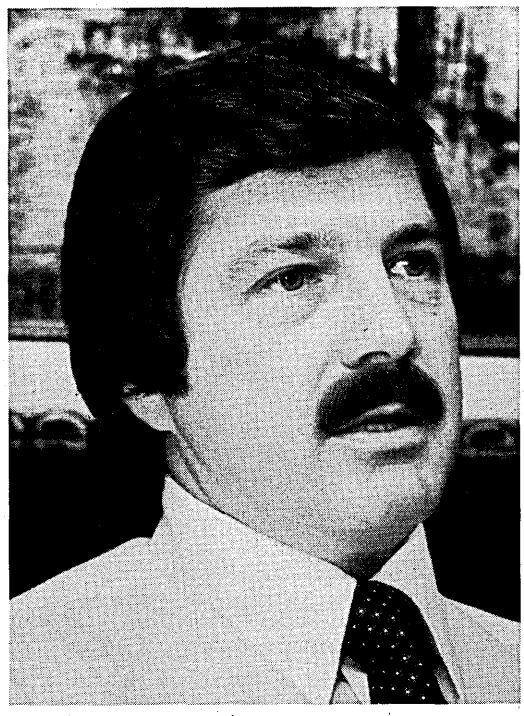

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"The beauty of the Pitney Bowes system is that it does the work of so many people and saves so much money in the process. Right now, we have five divisions on line, processing 6,000 letters a day. One man handles the entire job. The same man will be able to handle the output from 16 divisions—36,000 letters a day!

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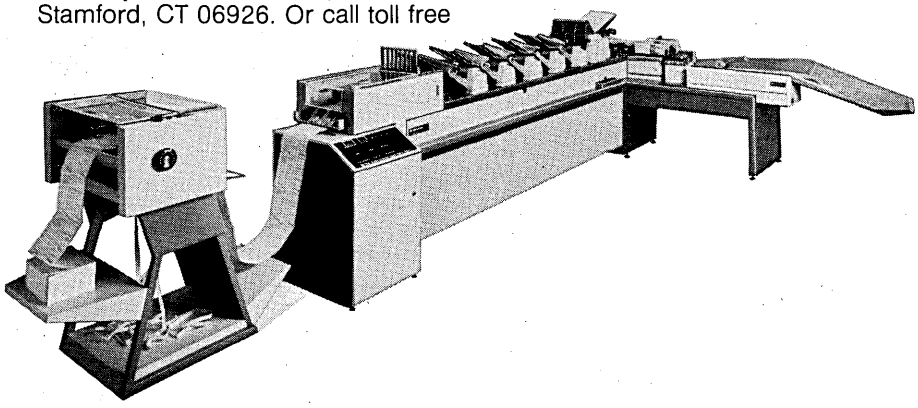

CIRCLE 135 ON READER CARD

with new information) to the master directory. Conversely, the delete diskette entry function removes a diskette from the master. The display directory operation shows the alphabetized directory for any specified diskette; information displayed includes diskette name, ID, format, number of blocks free, file names, types and sizes, and total number of files. A fourth function locates diskettes containing specified files or groups of files. Finally, it allows listing of diskette IDs and names currently catalogued. BAKER ENTERPRISES, Atco, N.J.

FOR DATA CIRCLE 331 ON READER CARD

MICROCOMPUTER ACCOUNTING

Compumax, a California microcomputer software vendor, has adapted its general ledger package (currently running on the three most popular personal computers) to run on the Atari 800. Microledger handles trial balances, profit and loss statements, balance sheets, and easy reviewing and updating of records in the journal or chart of accounts; journal listings can be produced with a running total, showing whether or not the journal balances. The Microledger program sells for $140 and runs on Atari 800s with 24KB of memory, at least one disk, and an optional printer. Compumax says it is in the process of converting five more business packages—accounts payable, accounts receivable, inventory control, payroll/personnel, and order entry—to the Atari machine. COMPUMAX, INC., Palo Alto, Calif.

FOR DATA CIRCLE 332 ON READER CARD

SYSTEM/34 GENERAL LEDGER

McCormack & Dodge's G/L Plus General Ledger/Financial Analysis System for the IBM System/34 reportedly duplicates the functionality of the software house's mainframe general ledger. G/L Plus System/34 includes on-line data entry and editing, journal processing, and flexible reporting. The package can operate standalone on an S/34, or in a network environment with a number of S/34s tied into a mainframe. Written in COBOL, G/L Plus System/34 executes in a 64KB partition. The package is priced at $29,500. MCCORMACK & DODGE CORP., Needham Heights, Mass.

FOR DATA CIRCLE 334 ON READER CARD

PASCAL

PASCAL/I, available for the 16-bit Motorola 68000 or Zilog Z8000 microprocessor, is an implementation of PASCAL tailored for use by oems in the industrial market. Supporting PL/M-like functions, but using PASCAL syntax, PASCAL/I is expected to find much of its use in process-control and other controller applications. Its features include I/O port support, 32-bit arithmetic, memory access on a byte or word basis, and the ability to call assembler language subroutines for time-critical operations. The entire set of PASCAL control structures reportedly are included. Interrupt and real-time operations are supported, as is separate compilation. Object code is said to be efficient, fast, and ROMable. The compiler produces true native code. The compiler runs under either the vendor's SP/68000 or SP/Z8000 operating system; object code produced can run standalone. The single end-user price for PASCAL/I is $400. HEMENWAY ASSOCIATES, INC., Boston, Mass.

FOR DATA CIRCLE 333 ON READER CARD

CICS UTILITY

The CICS Transmission Optimizer (CTOP) is now in release version 2. CTOP compresses data streams destined for remote terminals running under CICS 1.4 or above. CTOP is said to allow applications programs to approach the transmission efficiency of well-written assembly language programs making use of native mode 3270 conventions. Blanks and redundant sequences are automatically removed by CTOP, which goes on to insert 3270 control characters for a compatible screen or print line. Users can set parameters for controlling the compression algorithms. CTOP defaults to compress traffic to all remote 32XX terminals running under BTAM, TCAM, or VTAM on mainframes running DOS or OS. Compression ratios are

New portable * BAR CODE * reader from Intermec

Superior reading performance
Excellent first read rate saves time. Less than one substitution error per several million characters to safeguard your data.

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Using the handy wrist keypad, both hands are free. Simple controls and easy-to-read alphanumeric display.

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DEC VT100® Compatible Plus

- Advanced video package is standard
- Non-glare, tiltable screen
- Detached solid state keyboard, n-key rollover
- CRT saver feature
- Serial buffered printer interface option
- Hewlett-Packard protocol compatibility option

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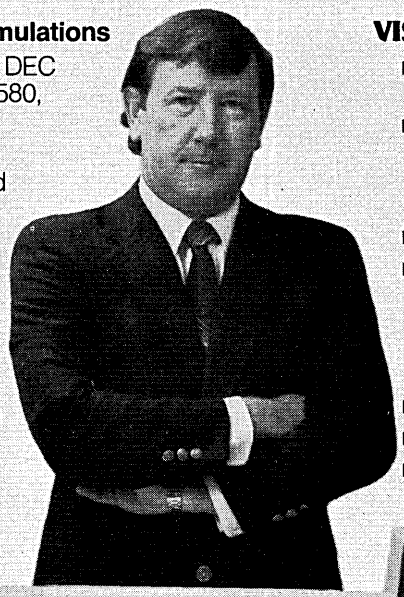

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- Transmit line, field, page
- User programmable message framing including start of message, end of line, field separator and end of message codes
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- Suspend/resume transmit
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CIRCLE 137 ON READER CARD

SOFTWARE AND SERVICES

said to range from 12% to better than 60%. A site license for CTOP is $1,900. INFORMATION CONCEPTS, INC., Dallas, Texas.

FOR DATA CIRCLE 338 ON READER CARD

SOFTWARE MONITORS

Three software packages, two for CICS and one for MVS, represent Candle Corp.'s "new generation of software monitors." The three packages are Omegamon/CICS, a program that monitors CICS activity through 3270 terminals; the Response Time Analyzer option to Omegamon/CICS that monitors CICS transaction response time; and DEXAN, the Degradation Exception Analyzer for MVS.

Providing information for operations, systems programmers, and managers, Omegamon/CICS displays on-line information at a crt in either of two modes of operation. In transaction mode, the monitor functions as a CICS transaction; in dedicated mode, an EXCP level of communication is used to provide a higher mode of availability. More than 20 commands are available to display information on CICS tasks. Additionally, the system displays monitor transaction rate, VSAM and file data, enqueues, and internal CICS control blocks. An exception analysis feature diagnoses CICS for problems, and automatically displays warning messages. A degradation analysis feature helps locate the cause of CICS slowdowns. The package goes for $15,000 ($12,500 until the end of this year, and $9,500 for the first 25 customers).

FOR DATA CIRCLE 335 ON READER CARD

The Response Time Analyzer (RTS) is a $5,000 option to Omegamon/CICS. Displaying data in real time, RTA can monitor either transactions or user-defined groups of transactions. Response times can be displayed in two dimensions: most recent time interval (last 10 seconds, last 20 minutes, etc.), and user-defined time slots (9:30 to noon, noon to 5, etc.).

FOR DATA CIRCLE 336 ON READER CARD

The Degradation Exception Analyzer (DEXAN) is a $5,000 optional add-on to the vendor's Omegamon/MVS software monitor (in the field for more than two years). DEXAN helps a performance analyst locate the causes of system bottleneck, determining the cause of poor TSO response times and degraded batch throughput. CANDLE CORP., Marina del Rey, Calif.

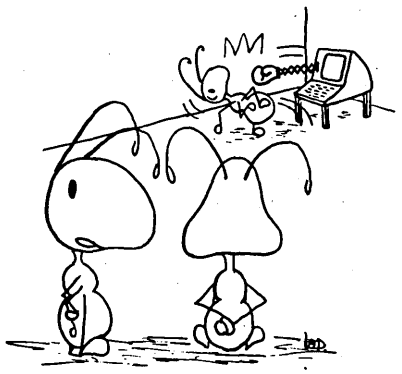
FOR DATA CIRCLE 337 ON READER CARD

MICR CROSS-ASSEMBLER

Users running CP/M on their 8-bit microcomputers can assemble code for Intel's 16-bit 8086 and its 8088 with the A.C.T. II cross-assembler from Sorcim. The cross-assembler supports Intel mnemonics, and offers macro capabilities, pseudo-ops, absolute assemblies, system text file support, local procedure definition, and standard Intel hex code file formatting. The cross-assembler is supplied on an 8-inch diskette for $175, which includes an owner's manual and sample programs; the manual is offered separately for $20. SORCIM, Santa Clara, Calif.

FOR DATA CIRCLE 339 ON READER CARD

ANTWORTH



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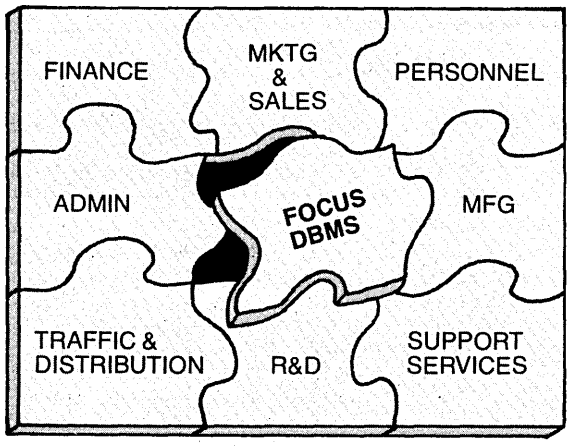

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CIRCLE 138 ON READER CARD

"We switched to NCR."

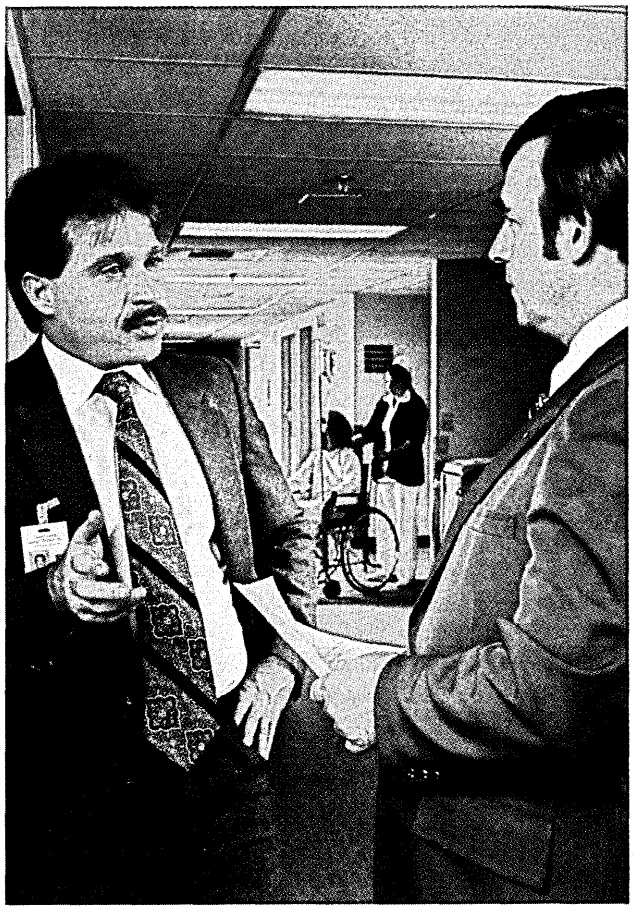
Frank J. Sanzone, Jr., Carroll County General Hospital

SANZONE:
We switched to an NCR computer for several reasons. First, we had to have an interactive system. And only NCR seemed to offer true interactivity with the power we needed.

NCR's MONOGUE:
And with the capacity to grow.

SANZONE:
Second, we had reached a gap in our vendor's range of systems, so we were facing a difficult conversion any way we turned. With NCR, we knew we would not run into that kind of gap again.

NCR's MONOGUE:
That is NCR's Migration Path Engineering. We believe a user should be able to upgrade his hardware without obsoleting his software.



Frank J. Sanzone, Jr., is Assistant Director of Finance, Carroll County General Hospital, Westminster, Maryland. Robert Monogue is an NCR Representative.

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Then there's multiprogramming, a feature rarely available on systems the size of our NCR I-8410. Without multiprogramming, we would have had to add a second shift. And there's ease of operation. Training an operator takes just hours. In fact, this system runs just the way you said it would. We did the right thing in switching to NCR.

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Cullinane has made the Integrated Data Dictionary the foundation of its completely integrated database management system and this is the most important difference between IDMS and others. We've had it for four years, while others still talk about it as a concept.

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CIRCLE 140 ON READER CARD

SOURCE DATA

BOOKS

COMPUTER SECURITY AND PROTECTION STRUCTURES by Bruce Walker and Ian Blake

COMPUTER SECURITY by David Hsiao, Douglass Kerr, and Stuart Madnick

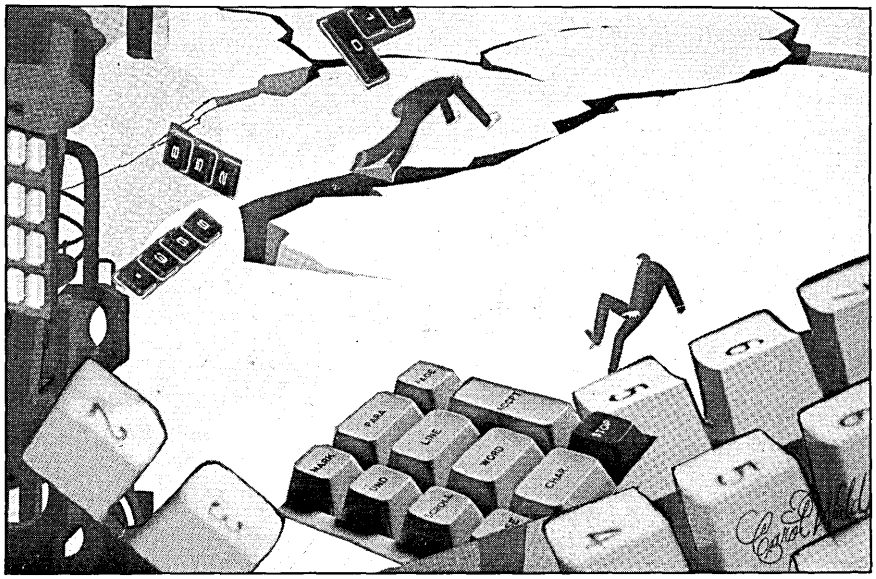

ILLUSTRATION BY CAROL WALD

A Viennese professor of history once divided human endeavor into 1) the adventurer's era, which begins all things, and 2) the historian's era, which always follows. This analysis is nicely applicable to dp: development is in its adventurous heyday, while literature about much of what is happening is not yet even a glimmer on the horizon.

Perhaps this is why data processing produces so many slim volumes covering such vast areas as, for example, computer security. In a period of hard and fast development, writers are not catered to, and must get their material catch as catch can. They have my sympathy, if not always a wide and appreciative readership. In the time it takes to approve galleys, startling developments can appear, altering the relevancy and accuracy of what one just sent to the publisher. Which is to say, the Big Books on just about every aspect of dp are probably yet to be written, or are presently being revised.

From Canada comes *Computer Security and Protection Structures*. The authors, a professor of electrical engineering and his assistant, seem genuinely excited about their field. They begin by making a rather elaborate claim in the preface: "All levels of security relating to computers are investigated." This is saying lot for a book divided as follows: 20 pages on Threats, 75 pages on Countermeasures, and 26 pages on a Survey of Implemented Systems.

Despite the preface, the authors cannot seem to decide what, exactly, the book should focus on. The military is mentioned in passing, business is discussed here and there, and academia is cited in a general way. But each group of subsections within a main chapter tends to simply list examples. In its entirety, this is what is offered under Threats, Miscellaneous: "Other natural calamities that may occur to computer centers include explosions, earthquakes, tornados, aircraft crashes, war, lightning, industrial chemicals or gas, sandblasting near air conditioning intakes, etc. (Weiss 74)."

Weiss is one of the almost 200 authors listed in the bibliography and given as sources after nearly every paragraph. These writers are responsible for a large body of work, the bulk of which appeared between 1970 and 1975. But without a description of the particular work cited, or some sort of classification system, it is difficult to say if the author listed comes from the scientific or business community, or is responsible for a scholarly paper, a government report, or a portion of a lecture series. These distinctions are important for a reader dealing with a mass of information that crosses technical, commercial, and legal lines.

The book passes from the confusing to the mundane with anecdotes that have a kind of "helpful hints for your data center" tone: "Stories such as the one about the touring garden-club matron who took a handful of punched cards from a tray as a souvenir of her visit to the data center emphasize the need for computer security." Heloise could do better.

In certain areas—cryptography, for example—the authors of *Computer Security and Protection Structures* show a deep understanding of their material. Elsewhere, however, the obvious is belabored: "Although natural disasters, which not only include fire, water, and wind but also rioting and bombing, can be classified as either accidental or deliberate, they will be discussed separately because they have different characteristics. They tend to occur infrequently, can be very damaging, and are easily detectable." Walker and Blake have tried to summarize, in a few pages, a large and diverse body of work; this kind of clutter dooms their effort. Dowden, Hutchinson & Ross, Stroudsburg, Pa. (1977, 160 pp., $22).

In contrast, *Computer Security* by Hsiao and Kerr of Ohio State University and Madnick of MIT, is a thoroughly professional book. "Written for technical managers, program monitors, and other managerial people" and "intended as a review of computer security research," *Computer Security* is a work to be taken seriously.

SOURCE DATA

In textbook style it begins with a definition of computer security, as opposed to computer privacy, and explains why these two concepts are often confused. Each chapter contains a postscript and reference list, the latter giving a short summary of each work cited and describing its major contributions from the author's point of view. The organization of the postscripts and reference lists alone make this book invaluable as a source guide for material relating to computer security.

The easy flow and confident organization of *Computer Security* make the book a model for its field. For example, the thorny matter of the right to privacy, so open to misrepresentation, is handled as follows: a concise, readable history of the right to privacy in America is given, followed by a review of existing legislation. The cost of privacy for businesses is outlined and then the technical implications for security are discussed. At this point, the reader-manager can actively step into the picture, having been provided with a solid briefing.

Chapters include Operational Security, Physical Security, Hardware Security, Cryptographic Transformations, Operating Systems Security, and Database Security. Under the topic Operational Security, for example, one reads: "In general, much of the literature and research on security-related matters has focused on either privacy and its associated social and legislative implications or technical mechanisms to enforce a security objective. In comparison, the managerial and organizational issues and the precision of the technical solutions have received more limited attention." There follow discussions of internal policies, misconceptions, operational considerations, the problems of education and attitude when extensive computer security is introduced, and so forth. The authors cover just the problems I would expect managers to encounter. Hsiao, Kerr and Madnick accomplish what they set out to do, and know exactly who their potential readers are.

If you are interested in computer security, by all means begin with this book. Its style and scope do not limit it to the business world, but make *Computer Security* an ideal introductory or reference work for a wide range of dp applications. Academic Press, New York (1979, 299 pp., $18).

—Sally Williams-Haik

SEMINARS

FAT MARKET LOOMS

A two-day conference on the implications of fiber optics, computers, satellites, two-way interactive CATV, and networking for the home and business markets. Technologies will be discussed on Feb. 2, markets Computer Netformatics, a consulting company, and Information Gatekeepers, 167 Corey Road, Suite 111, Brookline, MA 02146.

PERIODICALS

FAILURE ANALYSIS JOURNAL

Systems, Objectives, Solutions, a new journal edited by Henry J. Lucas, Jr. of New York University and published by North-Holland, will appear in early 1981. The journal aims to examine failure and success patterns in information processing systems; it will stimulate research on individual systems and groups of related systems, and seek to encourage the development of criteria for success in information processing. SOS welcomes writers who can report on their experiences in developing information systems. For a free copy of the first issue write J.C. van Eybergen, Journal Manager SOS, North-Holland Publishing, P.O. Box 103, 335 Jan Van Galenstraat, 1000 AC Amsterdam, The Netherlands.

LARGE SYSTEM CENSUS

Mainstream, a monthly newsletter, presents data on medium-to-large installations, including population, configuration, and migration. Written for the computer professional and dp manager, *Mainstream* uses information supplied and continually

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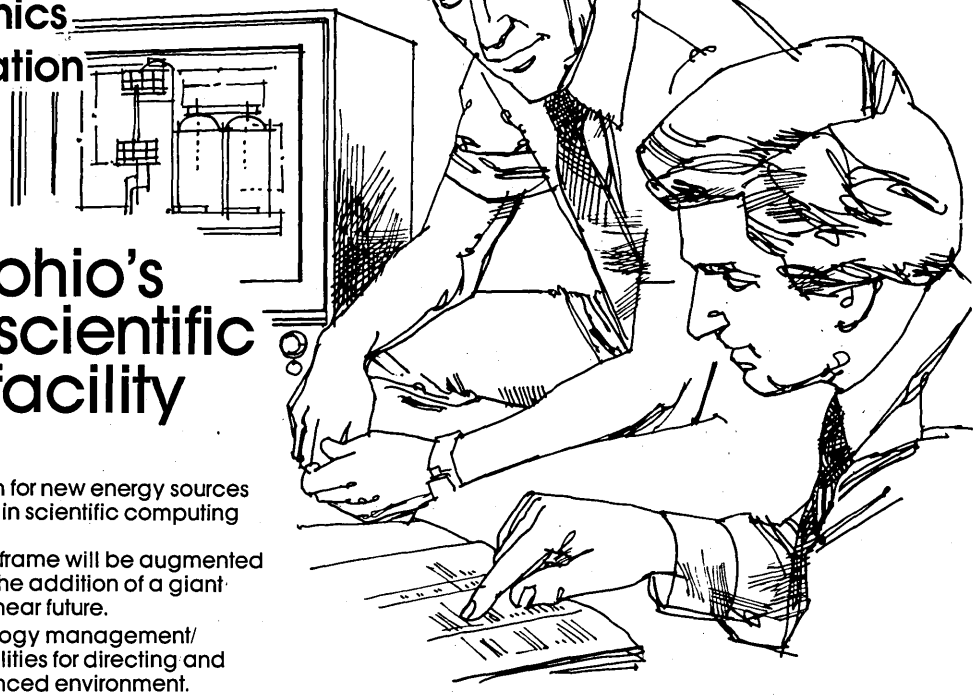

Grow with Sohio's expanding scientific computing facility

Our rapid expansion in the search for new energy sources has resulted in an explosive growth in scientific computing requirements.

The present CDC Cyber 175 main frame will be augmented with a Cyber 760 by late 1980 and the addition of a giant vector processor is planned for the near future.

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You have demonstrated work experience in a measurement and analysis program for a large main frame. Experience with a Cyber 175 and/or 760 would be a definite plus.

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- Planning for Cyber disruption recovery, contingency off-loading and computer security.

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Your strong professional background, including 4-5 years proven experience with a variety of computer graphics terminals and software (petroleum engineering or exploration related a plus) should have prepared you for this key graphics product manager opportunity.

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To meet the challenges of this position, you should have 2+ years hardware evaluation experience in a main frame environment – and have demonstrated the ability to work independently and follow through with successful hardware acquisitions and installations. We prefer that you have your M.S. in Computer Science, Electronics or related technical area. Your involvement with SOHIO:

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updated by Computer Intelligence and other research firms. Equipment covered includes offerings from IBM (of course), Honeywell, Burroughs, Univac, Control Data, Digital Equipment, Hewlett-Packard, NCR, and the pcms. Charter subscriptions go for $150 (or $175 for air delivery outside North America). TECHNOLOGY NEWS OF AMERICA, 26 Broadway, New York, NY 10004.

ACOUSTICAL IMAGING

Acoustical Imaging and Holography is a new publication subtitled *An International Interdisciplinary Journal*. Subscription price is $26, $34 outside North America, including air delivery. Crane, Russak & Co., Inc., 3 E. 44th St., New York, NY 10017.

DEC SOFTWARE EXCHANGE

Digital Digest is a new publication with an interesting twist—a monthly text version will be available, but emphasis is on the electronic version, a 24-hour "digital magazine" free to DEC users. The service is accessible with a 300 baud modem and a terminal set up for data bits, even parity, and one stop bit. The initial data line phone number is (404) 447-5254. The aim is to provide a vehicle for software exchange, as well as to share advice and suggestions, reading lists, product reviews and listings, etc. Exchange of software is free to contributing members; noncontributing members may have access for $75. The print version of *Digital Digest* is $15 per year. Digital Publications Inc., 1101 Nobel Forest Dr., Norcross, GA 30092. (404) 449-8617.

APL NEWSLETTER

Two APL newsletters have merged. The former *Personal APL News* will now appear as a regular column in *APL Market Newsletter*. Subscription rate is $8, $12 outside the U.S., Canada, and Mexico. There will be a $2 charge for billing. *APL Market Newsletter*, Southwater Corp., 2348 Whitney Ave., Mt. Carmel, CT 06518, (203) 288-0283.

VENDOR LITERATURE

MAKE UP YOUR MIND

Decision Makers' Guide, a pamphlet from Lortec, asks 173 questions to help you make some judgments about uninterruptible power sources.

FOR DATA CIRCLE 350 ON READER CARD

MY BOSS IS IN THIS CASE HERE

Computer Devices will send you a brochure promoting "the first truly portable, self-contained computing system." The device is preprogrammable, so nontechnical users can take it where their business is for audits or quick sales reports. It travels in a briefcase and would probably impress a sales prospect accustomed to seeing his order written up by hand.

FOR DATA CIRCLE 352 ON READER CARD

LEST WE FORGET

Hitachi offers a new, 180-page catalog of its line of IC memories. Block diagrams, tables, and graphs provide information on access times, voltage requirements, read and write cycles, etc. The company thoughtfully includes a parts number cross-reference section to permit substitution of its memories for those offered by other suppliers.

FOR DATA CIRCLE 353 ON READER CARD

DESIGNER PLATES

Tangent Template offers a catalog of templates for use in drafting schemata and circuit design. They'll also quote you a price on a custom template.

FOR DATA CIRCLE 351 ON READER CARD

NO FANS

The lens is in the base and the lamp in the hood above, explains Situs in a brochure about its microfiche readers. The readers remain focused when jarred, and don't make much noise—they're fanless. SITUS CORP., Mayville, Wis.

FOR DATA CIRCLE 354 ON READER CARD

computer professionals

L.D. Schreiber Cheese Company Inc., a fast growing national, private label food manufacturing company with sales in excess of $500 million per year, is rapidly expanding the corporate data processing staff to meet the needs of the 80's.

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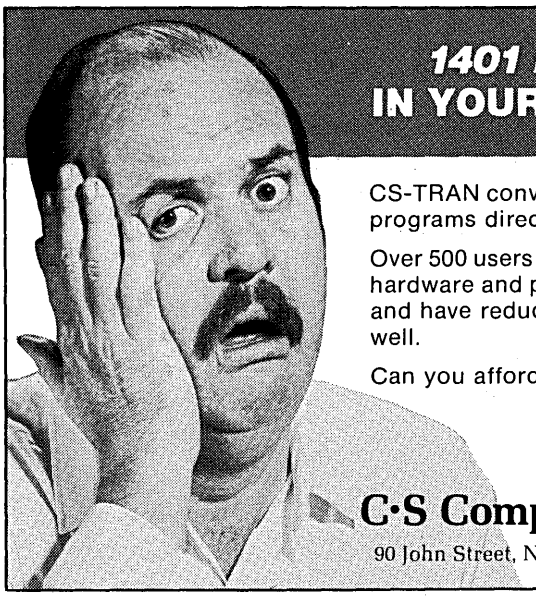

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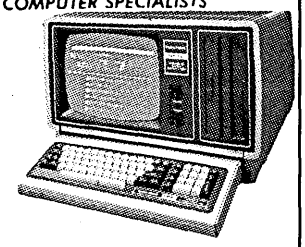

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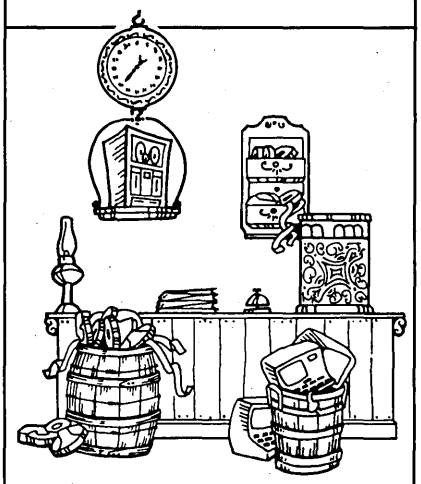

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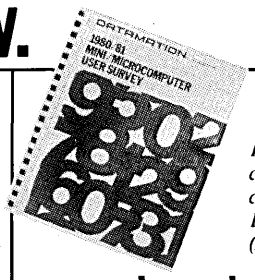

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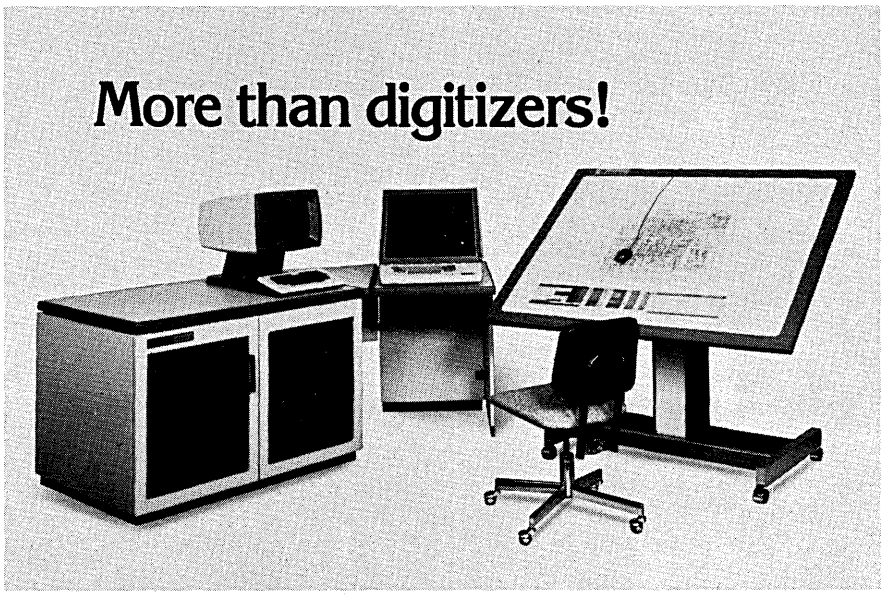

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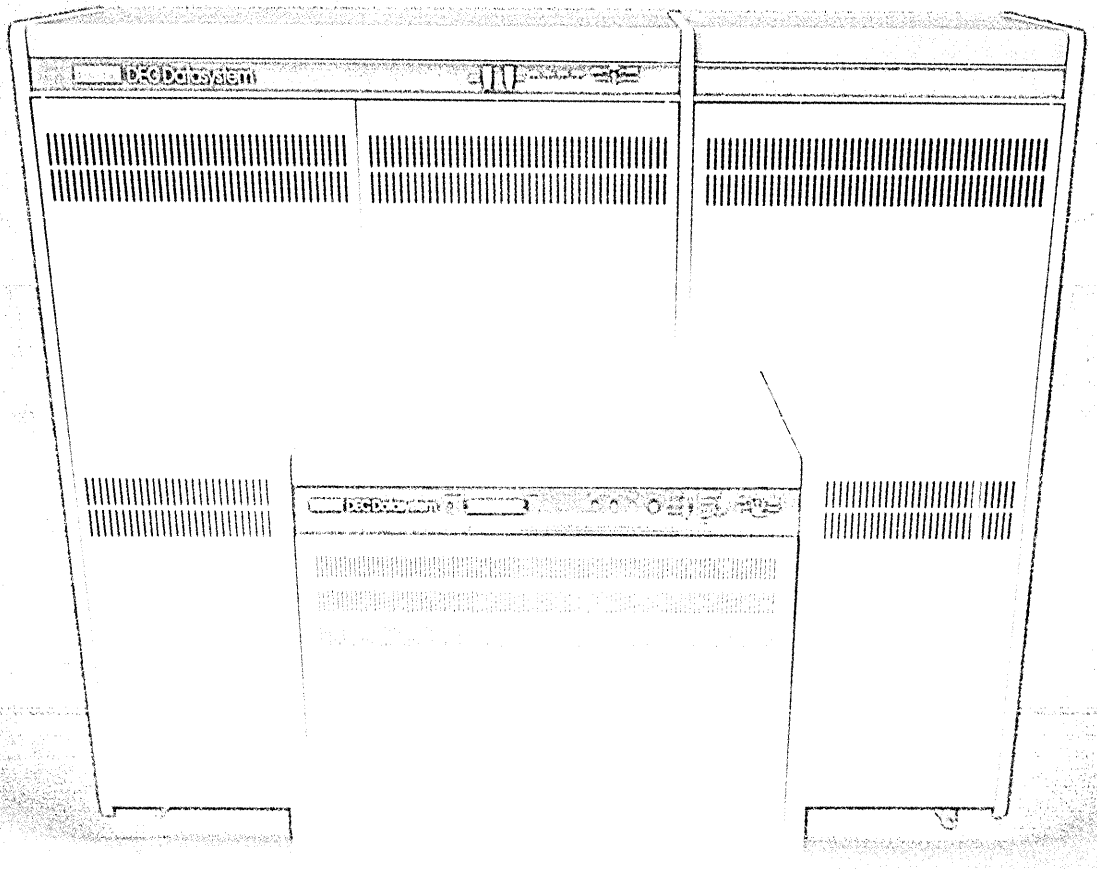

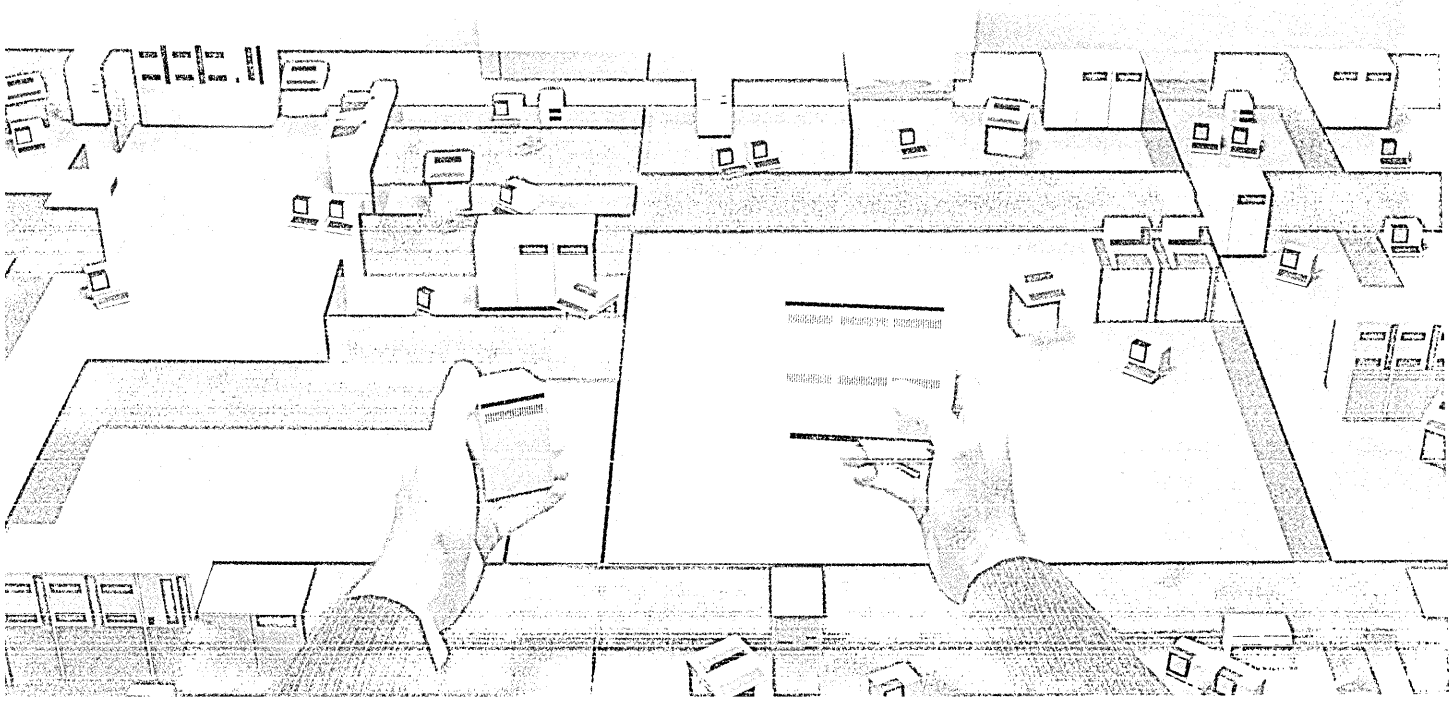

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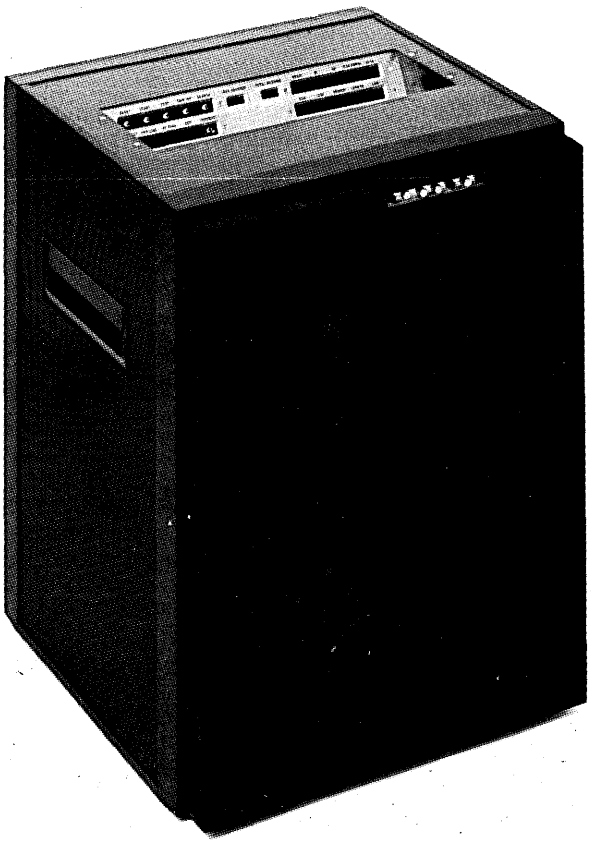

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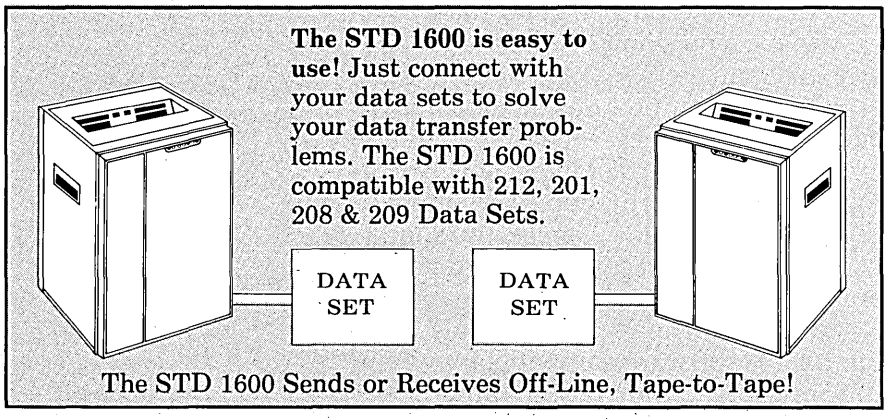

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An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

MANAGING INFORMATION IN THE OFFICE

There has always been a demand for labor-saving devices in the office. The electronic calculator, the electric pencil sharpener, and the electronic typewriter all proved to be not only desirable but cost-justifiable. In each case, the equipment made its user more productive by consuming less time. In fact, these devices not only saved labor, but also gave the user more accurate calculations, sharper pencils, and a higher quality of correspondence.

Would these products have succeeded if the user had also had to change his or her methodology? Would these products have succeeded if they were anything more than effective tools enabling people to function more productively? The answer is no.

The point is that the planners, designers, and implementers of office systems should concentrate their efforts on fully understanding the users' needs first, and then on either implementing new procedures and methodologies *or* designing new equipment-based systems. The choice is dependent upon the circumstances, but it is not practical to pursue both directions simultaneously.

Given, for example, an equipment-based approach, the user should keep in mind that the system will improve the current operation, not revolutionize it. I recommend that expressions such "office revolution," "office automation," and "the office of the future" be stricken from the corporate vocabulary. They are misleading and conjure up visions of conveyor belts or automatons taking over the office.

The first step is to begin using terms such as "office tools," or "office systems." We must not alienate the intended user with jargon that intimidates. In fact, the user must be included during the analysis, decision-making, and ongoing usage phases. The user must fully understand his or her needs and accept the solution if a change is to prove successful.

Why doesn't management, via workstations, access and use available information? Partly because ease of use, familiarity, and quality are often lacking. Managers will use systems that are pleasant to work with, require minimal (but meaningful) inputs, do not require a change in methodology, and utilize reliable, high quality equipment. The missing ingredients in today's systems are human engineered software and high quality equipment.

The user should be provided with a meaningful input environment: a file structure that resembles the paper world (in organization only); electronic mail that is fast and reliable; simple links to MIS computer systems; and management resources such as calendars, message logs, and follow-up lists. All should be made easy to use and consistent in operation.

If you do all this well, your management will be better suited to manage its information, make better decisions, and increase corporate profitability.

—Mark Lieberman
New York, New York

CONFESSIONS OF A ONE-LINER

My story must be told. I can no longer live with the guilt. I was a one-liner—a programmer who put cleverness above all, brevity before efficiency, and job security ahead of clarity. Yes, friends, it's shameful. But I've seen the folly of my ways, and now I want to tell you about my decline so that you might recognize the signs in yourself or your loved ones before the disease is advanced too far to cure.

In the beginning, the temptations were few. Like everyone else, I used IF tests and a separate computation for each situation. Programs were long, but easy to read and modify. I could write working programs using tried and true methods, but I began to feel that the creativity was gone. Where was the challenge? Wasn't programming supposed to be fun?

Then, my friends, I was led astray. I happened to be writing a FORTRAN program that required switching a buffer number from 1 to 2 or from 2 to 1. In that moment I realized that instead of a test, two assignments, and a GO TO, just *one line*, K = 3 − K, would do the trick! Like the first sip leading to alcoholism, that one experience started me down the path of trickery. Now, don't get me wrong: I never tried to hide the purpose of the code. My earlier training compelled me to use comments and written explanations of the method. And I never bragged about the tricks. Well, not too often. This was a solitary vice. I could spend an entire day devising a polynomial with certain properties to do the same thing as three decisions and some assignments.

For instance, customers had status codes of 1 or 2 which indicated whether their discount rate was 5½% or 6%. Sounds like a simple decision. Not for me. I could CALCULATE the discount as equal to 5% plus the status code times ½%. I suppose in retrospect that an occasional data entry error slipped in and gave some bonus discounts, but after all, we're only human.

As my fascination grew, my tricks got more involved. A term in an expression could be turned off or on by multiplying it by zero or one, which in turn was the result of an integer division by some threshold value. To simply change the sign of a value, I could multiply it by −1 raised to an odd or even power.

In another case, I needed to test a variable for being equal to 1, 5, or 9. Why use a Boolean combination when you can compute the remainder of dividing by 4 and then test that result against the value 1?

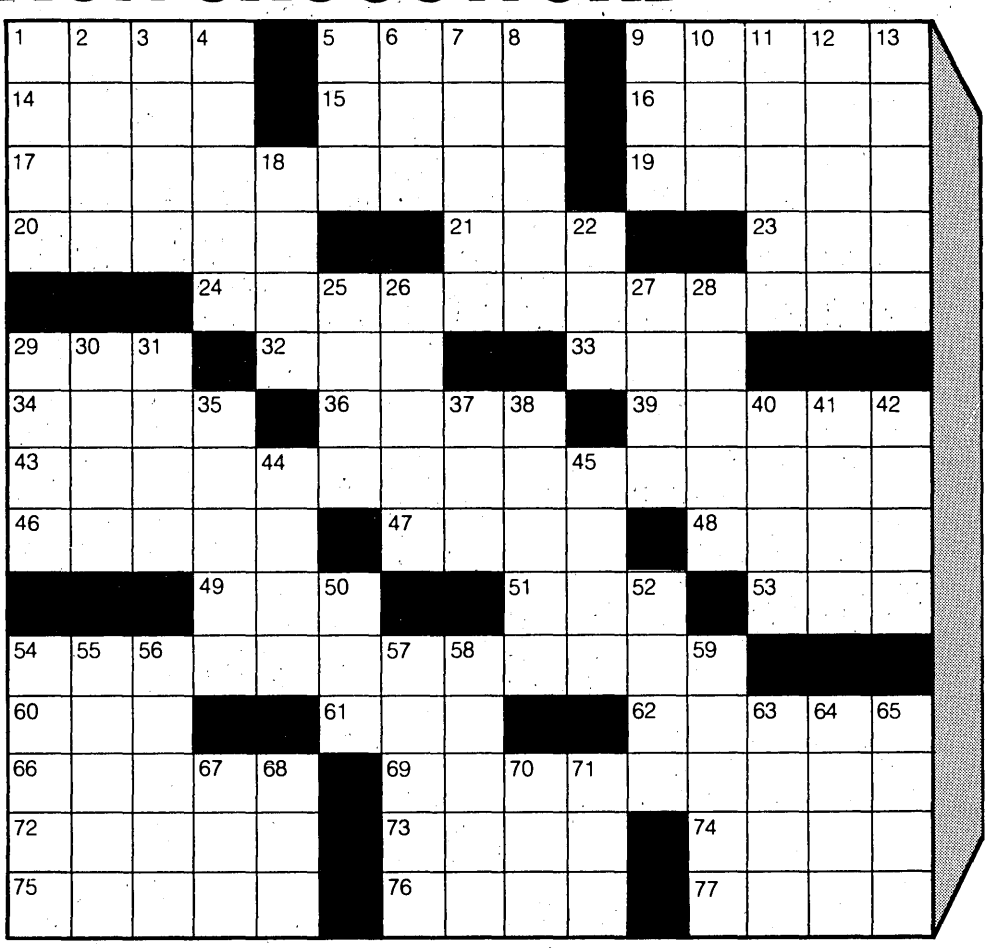
Little did I realize the price I was paying for these intellectual puzzles. First, there was the need to beat my previous record. If I had devised a separate computation for each of two cases, I struggled to combine them into a single, longer computation.

Second, my programs ran slower than other people's, and my checkout runs were left for the second or third shift. Then I began to notice I was doing more maintenance on older production programs that I had written. Most of my coworkers' programs were updated by trainee-level staff. And I seemed to be called in at night and on weekends when something went wrong more often than the other programmers.

Well, friends, you probably think I continued to decline until my boss looked at some code and insisted that I change my ways. That certainly would have done it. But no, it wasn't my boss threatening termination. It wasn't my wife threatening to leave me.

DATAMATION CROSSWORD

CODE ROAD
by Brian Burke



ACROSS
1. Instead of mad
5. Moor's goad
9. Two Kaplans
14. Kind of devil
15. Shank
16. What the underworld meets on 42nd Street
17. COBOL or FORTRAN to assembler, with 69 across
19. Median seam on a symmetrical organ
20. Sound induced by a homily
21. Display technology
23. B.O.M.C. inducement item
24. System/34
29. Drunkard's yacht
32. La predecessor
33. Peking sandwich spread
34. Pamela's job
35. Doleful
36. Dagger
39. What soldiers lay
43. Case study in Brooks' *Mythical Man-Month*
46. Bacchanalian activity
47. Ooze
48. Off-white
49. Kennedy's windmill
51. Wertmuller's anarchist, Bunuel's buddy
53. Prow initials
54. CODASYL DBMS design philosophy
60. ____tributary (Austrian river)
61. Lou Groza's nickname
62. Word with lend or hold
66. Pertaining to kidney
69. See 17 across
72. Belch
73. Database structure
74. Sloth, et al.
75. Lodged, as a pig
76. Stanch
77. Parimutuel machine

DOWN
1. Icelandic diphthongs
2. Otiose; bootless
3. And so
4. Alleged lover of Lady Mountbatten
5. Heiden's highway
6. American revised version
7. Ghibelline foe
8. Canadian phys. 1849-1919
9. Teut.
10. Bear's lair: abbr.
11. Two-legged support
12. Mrs. Mertz
13. Down at the heels
18. ____we forget
22. Start of a BASIC array declaration
25. Early; archaic
26. Indian royal ladies
27. Like Sunday morning
28. Static
29. Roma reversa
30. Fate of the lock
31. Chicken ____
35. Doleful
37. Comp. dir.
38. To be needed, Cicero
40. Write, with acid
41. "Smaller than a pachyderm"
42. Flightless birds
44. Mrs. Mahler
45. Mil ____
50. Knuth's "The ____ of Computer Programming"
52. Flows into Korea Bay
54. A&W Dad's Frosty
55. Neon, e.g.
56. Boredom in Bordeaux
57. .45
58. Has its reasons
59. But not last
63. Arbitrage fee
64. Deployed
65. To be
67. A one, in Liar's
68. Battles Impalas in suburbia
70. Born female
71. Beaut

Solution on page 200

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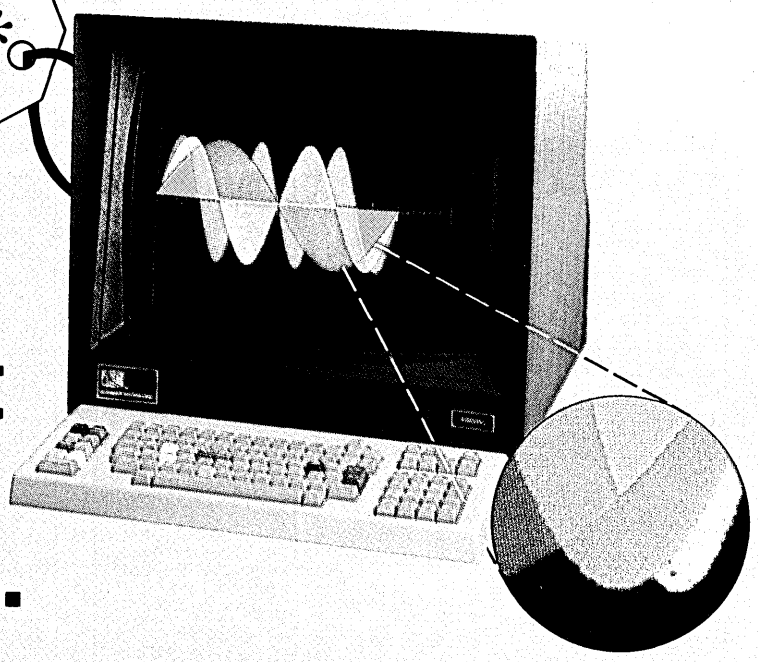

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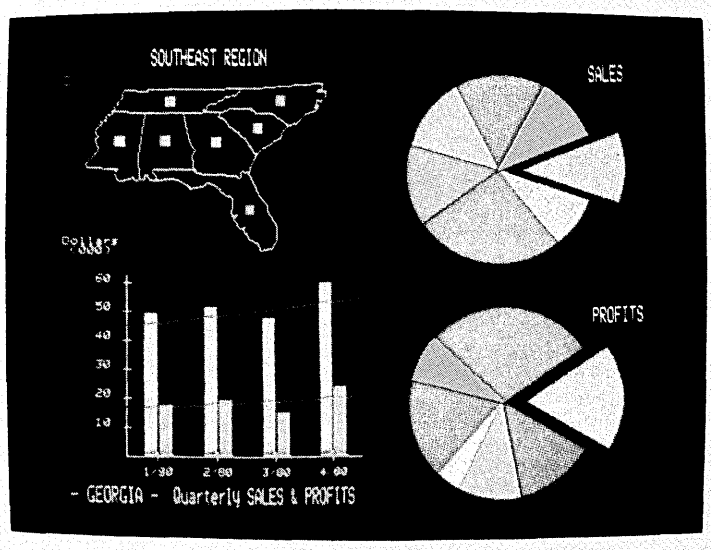

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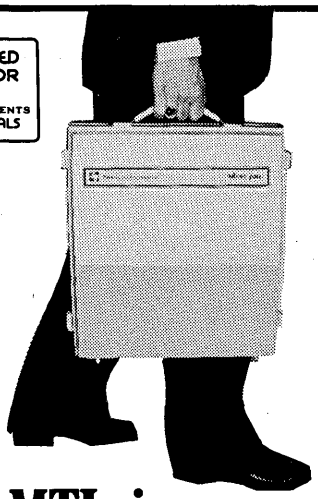

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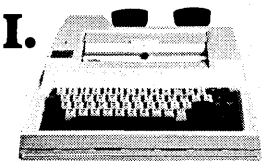
1. 

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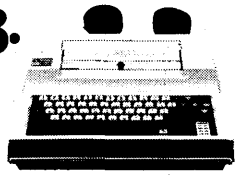
3. 

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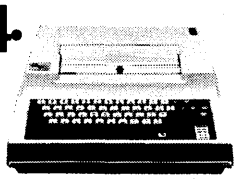
4. 

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CIRCLE 181 ON READER CARD

READERS' FORUM

And it wasn't some traveling revival preacher threatening eternal suffering.

BACK ON TRACK

What got me back on the path of righteousness was a talk given by the manager of a good-sized computer operation. He kept stressing the burden of program maintenance. No matter how much foresight you try to use when designing a system or coding individual programs, you're going to be wrong. If you build for eight options, the users will suddenly want 16. If your payroll system handles withholding tax, your state governor will declare a two-month moratorium, right after the guy who wrote the original code leaves for another job.

His list went on. The best defense, he said, was to build everything in rather small pieces and in a straightforward manner. Such programs are very quickly coded, debugged, and modified.

Yes, that was the revelation to me. I saw that if each condition had a separate decision, it was very easy to slip in an additional one later, or change the value of one without upsetting the rest. It also made it easy to trap invalid data that failed all the tests.

I wish I could tell you that I immediately tore apart all my old programs and rewrote them, or that I ran to the office and told of my evil ways. But I didn't.

What I did do was start concentrating on the virtues of clarity and ease of modification. I found that I produced more lines of good code per day than I used to, my evenings and weekends were seldom interrupted by calls from the operations staff, programs ran faster, and error complaints were fewer. Then one day I overheard a senior analyst giving advice about good programming techniques and citing my style as an example.

So now you know why my story can be told and, indeed *must* be told. Life is too short to waste time devising slow, cumbersome techniques that in turn demand more time to fix or change.

Recall my earlier remark about getting into the bad habit because of a need to be creative? The creativity is still there, and I find it even more exciting. I try to predict modifications and "put the hooks in," so that when the time comes, the framework is already there. Believe me, it's just as challenging, and it's respectable! It *is* possible to be efficient and clear and clever at the same time. And it is possible to beat the one-line devil. I know, because I've done it.

—James Gross
Sheboygan, Wisconsin

Answer to puzzle on page 198

E	V	E	N	■	I	A	G	O	■	G	A	B	E	S
D	A	R	E	■	C	R	U	S	■	E	L	I	T	E
H	I	G	H	L	E	V	E	L	■	R	A	P	H	E
S	N	O	R	E	■	■	L	E	D	■	■	O	E	D
■	■	■	U	S	E	R	F	R	I	E	N	D	L	Y
A	R	K	■	T	R	A	■	■	M	A	O	■	■	■
M	A	I	D	■	S	N	E	E	■	S	I	E	G	E
O	P	E	R	A	T	I	N	G	S	Y	S	T	E	M
R	E	V	E	L	■	S	E	E	P	■	E	C	R	U
■	■	■	A	M	A	■	■	R	E	Y	■	H	M	S
H	I	E	R	A	R	C	H	I	C	A	L	■	■	■
I	N	N	■	■	T	O	E	■	■	L	E	A	S	E
R	E	N	A	L	■	L	A	N	G	U	A	G	E	S
E	R	U	C	T	■	T	R	E	E	■	S	I	N	S
S	T	I	E	D	■	S	T	E	M	■	T	O	T	E

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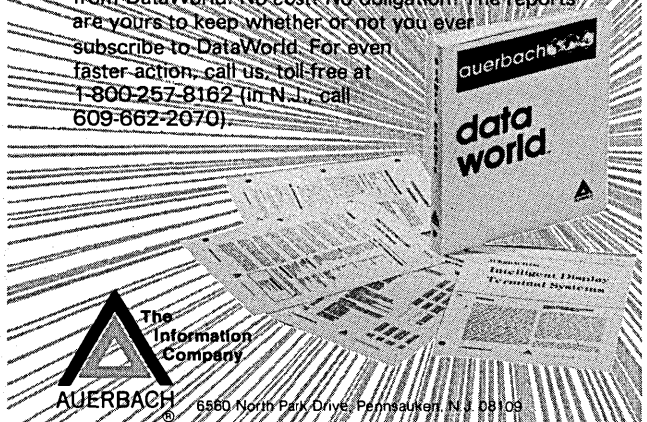

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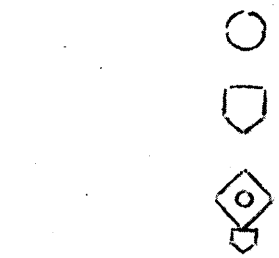
CIRCLE 180 ON READER CARD

CHART A FLOW ANSI WHAT HAPPENS

Flowcharting is now unmistakably a part of our culture. Even non-dp specialists are exposed to the practice in textbooks, car care manuals, and government brochures. It is the universal language, today's equivalent of Latin. As such, we must seek to provide for its orderly growth.

Back in 1970, ANSI standard X3.5 was adopted for flowchart symbols. This standard has served our industry well, but it has gradually become apparent that certain important concepts are not adequately represented under the current system.

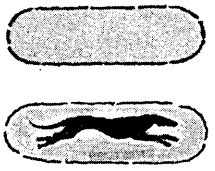
What follows is a proposed augmented ANSI flowchart standard (X3.5 ± .005). The author has found it to be both concise and complete.



Connector

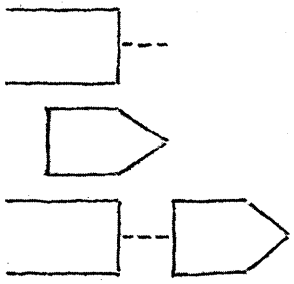
Offpage connector

Connector over home plate



Terminal

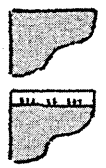
Greyhound terminal



Annotation

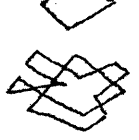
Program modification

Annotation modification or a side view of an elephant sucking peanuts from a bag



Document

Aerial view of a grand piano



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Indecision

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1979 DATAPRO HONORABLE MENTION

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SAMPLE OF FATS REPORT

FAST ANALYSIS OF TAPE SURFACES DETAIL REPORT -- FATS VER 4.0 Z

MESSAGE	ID	UCB	LABEL	LOCATION	LENGTH	RETRIES	ACTION
FATS204	TAPE2	281	987654	1607 FT	4 IN	10	PERM DATA CHECK
FATS204	TAPE2	281	987654	1607 FT	8 IN	10	PERM DATA CHECK
FATS204	TAPE2	281	987654	1608 FT	13 IN	10	PERM DATA CHECK
FATS204	TAPE2	281	987654	1608 FT	17 IN	10	PERM DATA CHECK
FATS204	TAPE2	281	987654	1608 FT	21 IN	10	PERM DATA CHECK
FATS204	TAPE2	281	987654	1609 FT	26 IN	10	PERM DATA CHECK
FATS204	TAPE2	281	987654	1609 FT	30 IN	10	PERM DATA CHECK
FATS204	TAPE2	281	987654	1609 FT	34 IN	10	PERM DATA CHECK
FATS204	TAPE2	281	987654	1610 FT	39 IN	10	PERM DATA CHECK
FATS204	TAPE2	281	987654	1610 FT	43 IN	10	PERM DATA CHECK

The length of these bad spots would cause unrecoverable data checks and I/O errors during processing.

INNOVATION DATA PROCESSING

970 Clifton Ave., Clifton, NJ 07013 • 201-777-1940

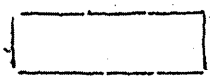
CIRCLE 182 ON READER CARD

READERS' FORUM

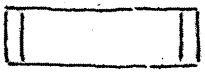
Sort

Collate

Lose a bowtie in the line printer



Process



Predefined process

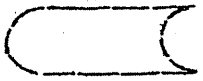
Video game

Punched tape

Transmittal tape

Magnetic tape

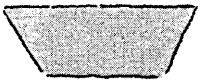
Scotch tape



On-line storage

Off-line storage

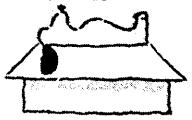
Clothesline storage



Manual operation

Keying operation

Auxiliary operation



Snoopy operation

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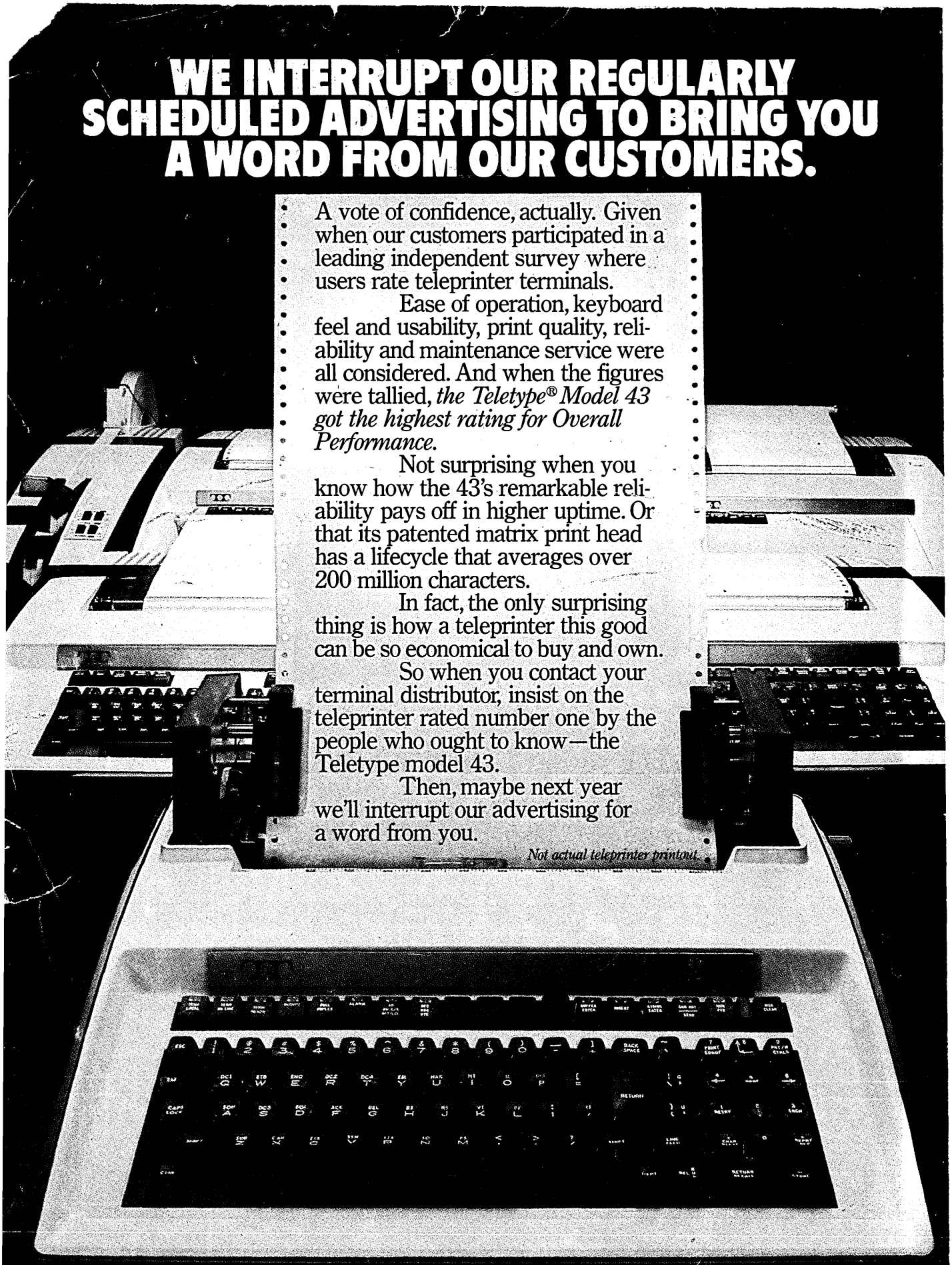
Then, maybe next year we'll interrupt our advertising for a word from you.

Not actual teleprinter printout.



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