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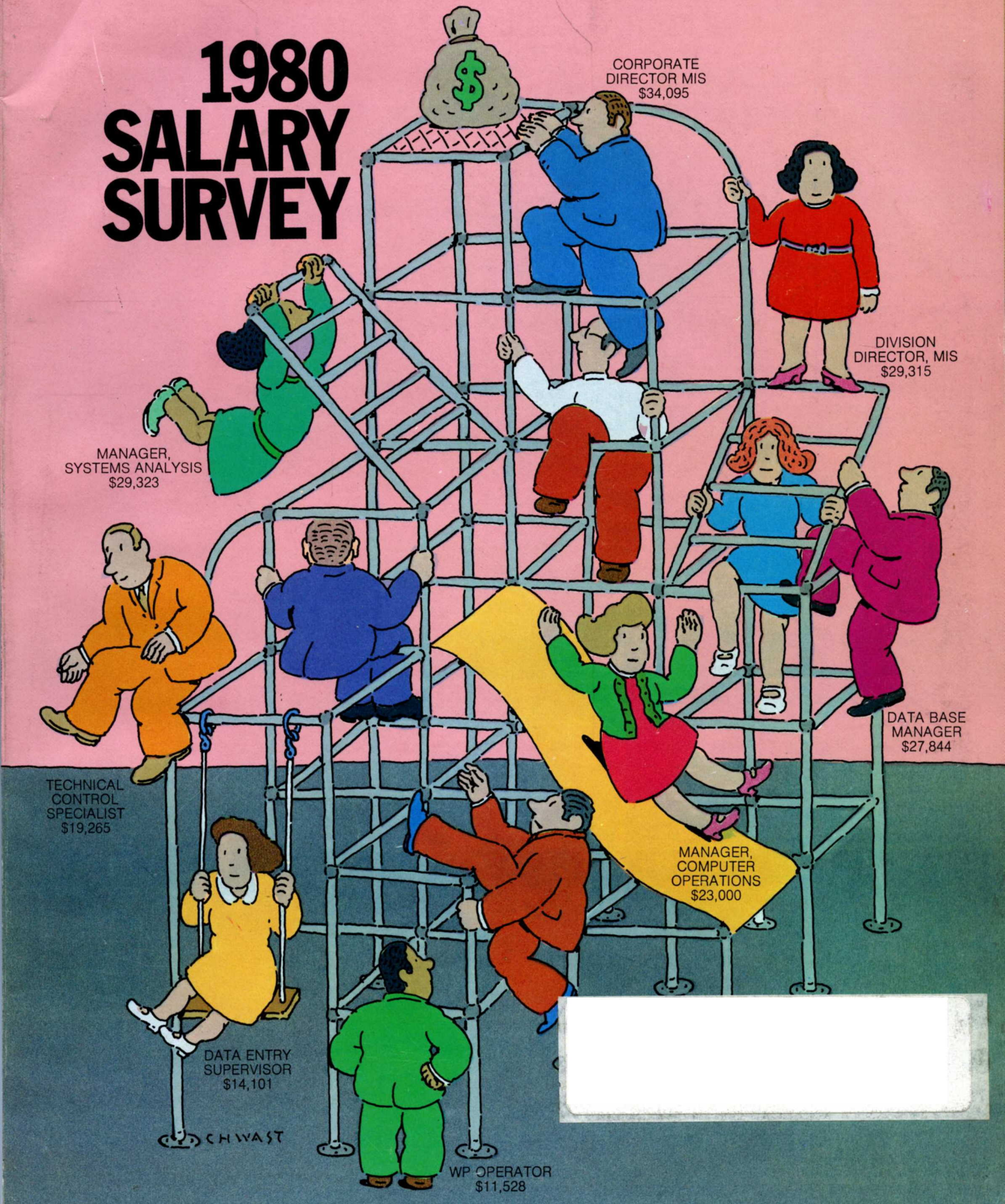
1980 SALARY SURVEY



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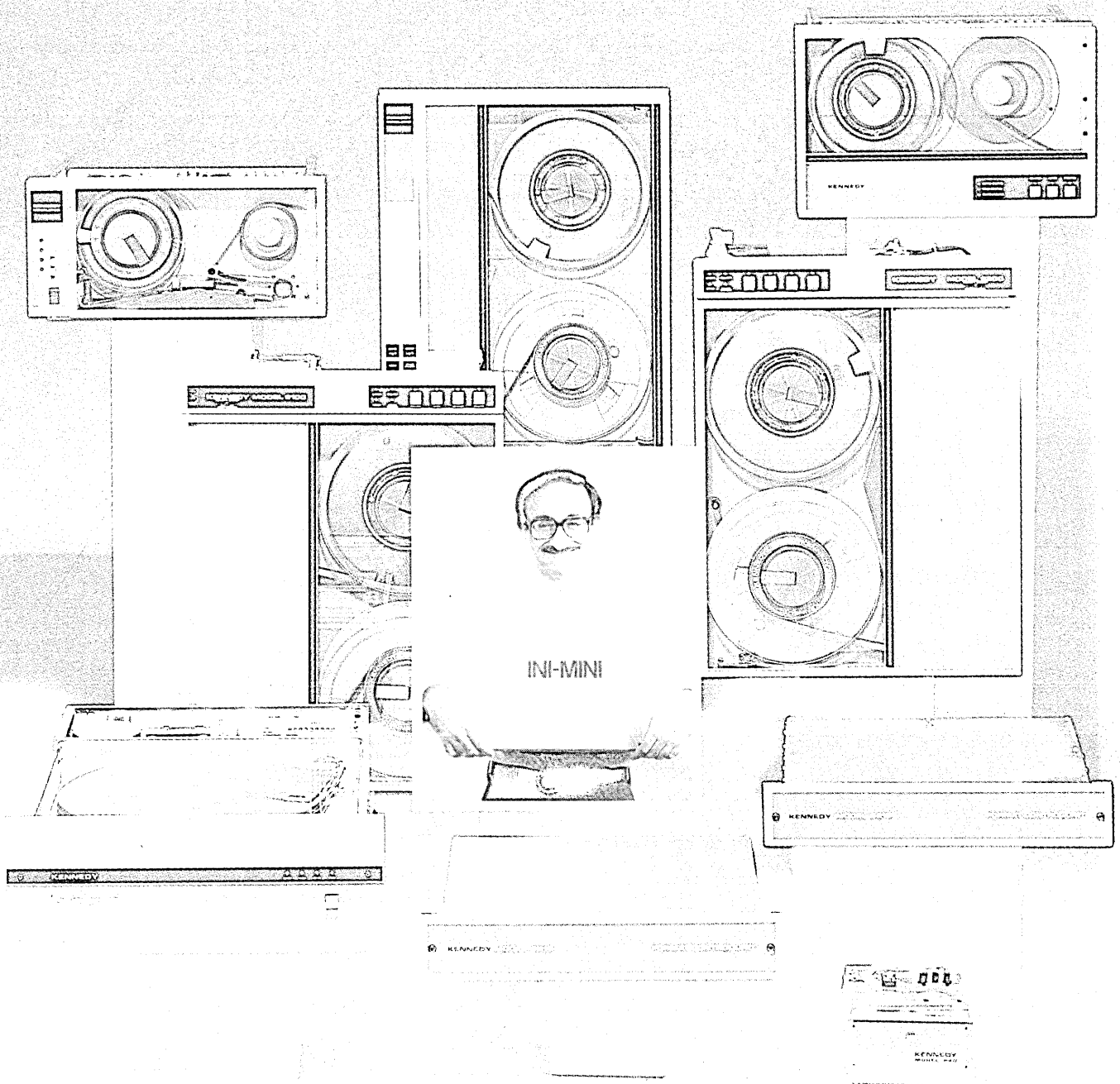

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with more coming all the time.

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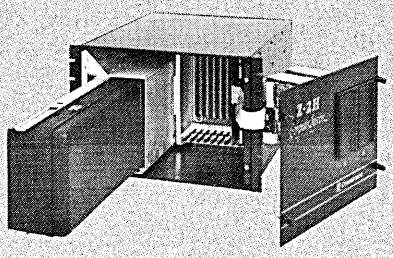
With all its features the new Z-2H, including its hard disk drive, is still housed in just one compact cabinet.



Hard disk drive at lower left can be interchanged just by sliding out and disconnecting plug. Seven free card slots are available. Z-2H includes printer interface card.

Included in that cabinet, too, is Cromemco ruggedness and reliability. Cromemco is time-proved. Our equipment is a survey winner for reliability. Of course, there's Cromemco's all-metal cabinet. Rugged, solid. And, there's the heavy-duty power supply (30A @ 8V, 15A @ +18 V, and 15A @ −18V) for circuitry you'll sooner or later want to plug into those free card slots.

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Last summer we told you this new Z-2H would be a smash. And it is. So see it at your dealer's now. Have him put you in touch with a user—there are lots of them because Cromemco has been delivering for months. See for yourself how pleased our users are.

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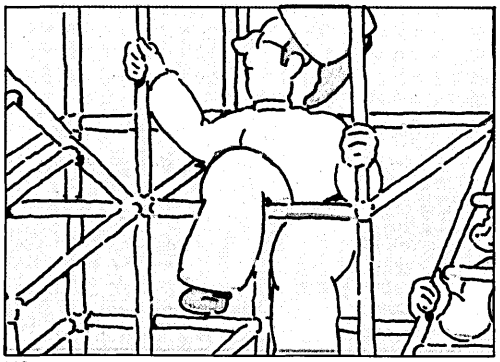
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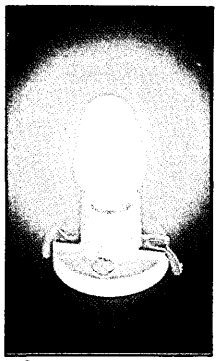
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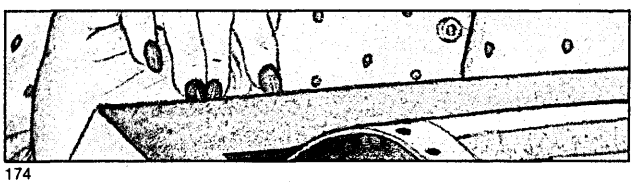
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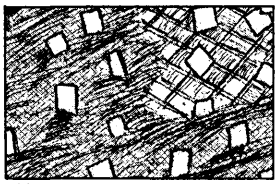
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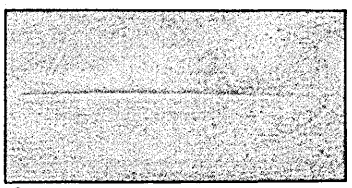
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EDITORIAL OFFICES

Headquarters: 666 Fifth Ave., New York, NY 10019. Phone (212) 489-2588. **New England:** 161 High St., Boston, MA 02110, (617) 482-4606 **Eastern:** 1531 Inlet Ct., Reston, VA 22090, (703) 435-3206. **Southwestern:** 11500 Stemmons North, Suite 152, Dallas, TX 75299, (214) 247-5221. **Western:** 1801 S. La Cienega Blvd., Los Angeles, CA 90035, (213) 559-5111; 2680 Bayshore Frontage Rd., Suite 401, Mountain View, CA 94043, (415) 965-8222. **International:** 6605 Burlington Pl., Springfield, VA 22152, (703) 569-3383. **Foreign:** 20 Leamington Road, Southend-on-Sea, Essex, SS1 2SN, England; phone: Southend (0702) 611648. **New York, N.Y. TELEX 640-229.**

Art Director Kenneth Surabian
Production Manager Robert Gaydos
Art/Production Coordinator Susan M. Rasco

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Director of Marketing Deborah Dwelley
Publisher James M. Morris

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Al Netten, Vice President, Peripheral Systems Group

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CIRCLE 7 ON READER CARD

From the graphics leader.

"Management is greatly improved use of graphics."

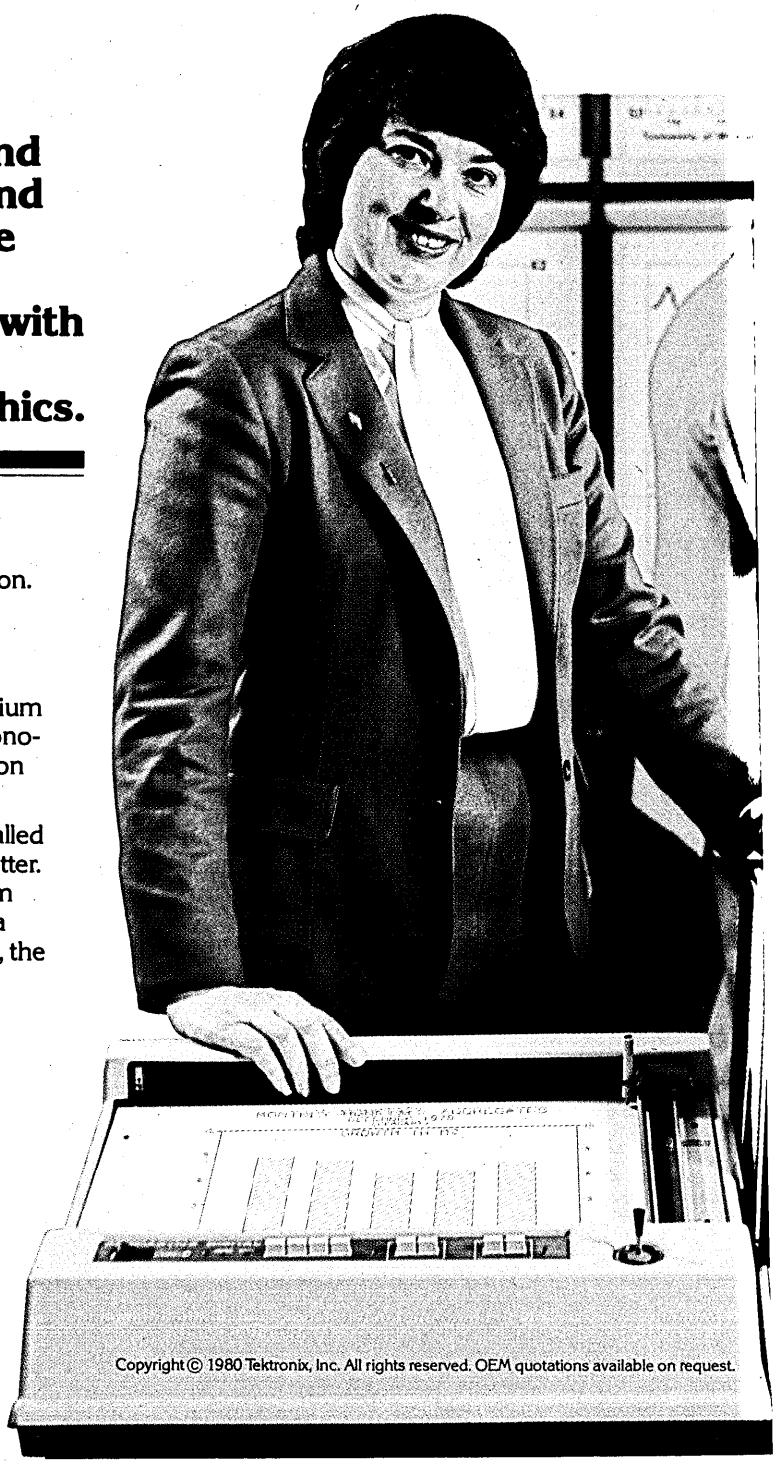
Mellon Bank has long been respected for its analyses and presentation of financial and economic conditions. Reports, once composed with ordinary columnar printouts, are now being improved with multi-color, instantly meaningful graphs ... thanks to Tektronix Graphics.

Deborah Rejniak
Assistant Economist
Mellon Bank
Pittsburgh, Pennsylvania

Business indicators such as money supply, interest rates and GNP are perfect subjects for graphic presentation. Mellon Bank is now able to visually interpret this data as well as expand its coverage of important issues.

"We discovered a whole new medium of communication," says assistant economist Deborah Rejniak, "with the addition of automated graphics."

A year and a half ago, Mellon installed a Tektronix 4662 Interactive Digital Plotter. Tied to an interactive graphics program and to economic data bases through a major computer services organization, the 4662 draws precise plots of from one to eight colors, on paper or mylar, to highlight reports and information for management meetings.



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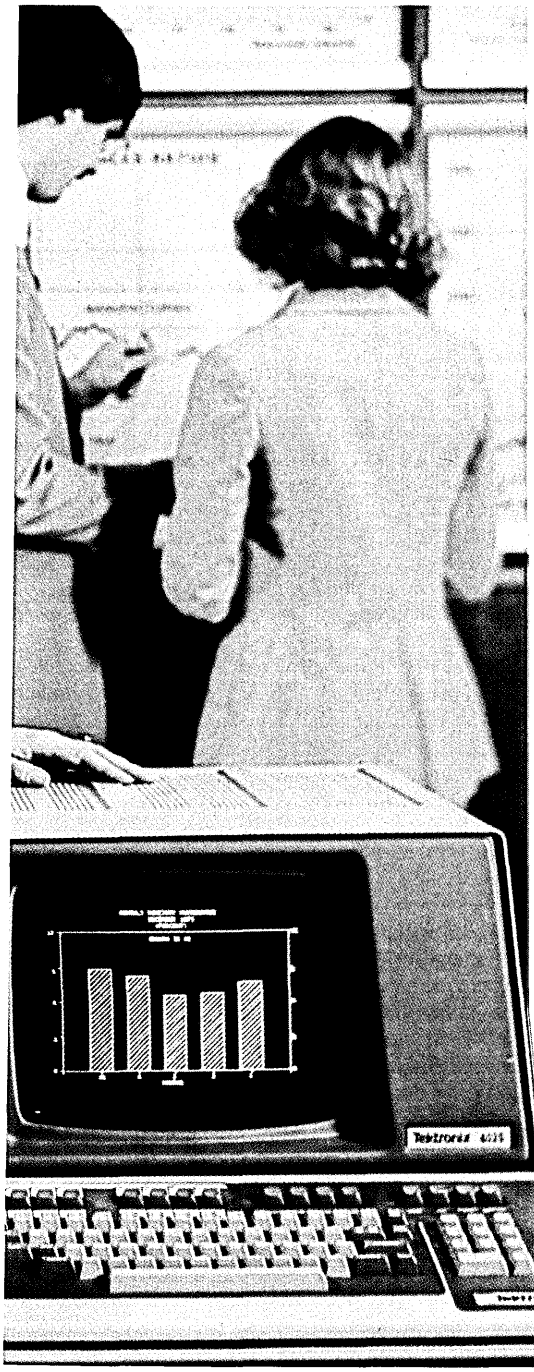
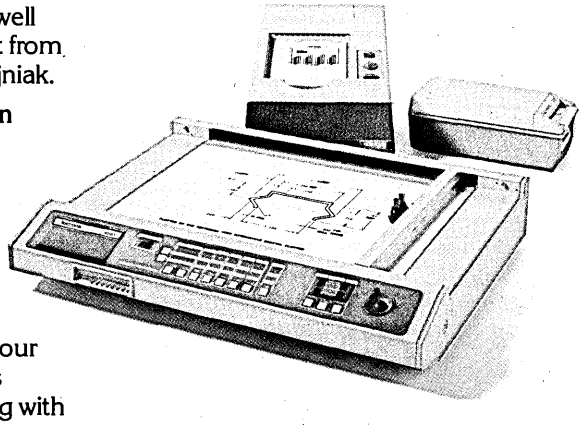
information with our expanded



"The plots are extremely well received and generate interest from all areas of the bank," says Rejniak.

As an input device, Mellon recently added the Tektronix 4025, an easy-to-use graphics and alphanumerics terminal with exceptional editing, forms ruling and buffering capabilities. "There's no question that it has increased our turnaround," says Rejniak. "It's very efficient for experimenting with variables and seeing the effects before committing a graph to the plotter."

As the world's computer graphics leader, Tektronix can assemble a complete graphics package, including easy but versatile software that's suitable for your financial analysis. No one else comes close to our broad line of graphics capabilities, including fast field service and a worldwide reputation for product reliability. For more detailed information, call your local Tektronix sales office or our automatic answering service at 1-800-547-1512 (in Oregon, 644-9051 collect).



In addition to its small plotters, Tektronix also offers quiet, compact, reliable hard copy units that produce sharp, binder-size copies of on-screen graphic displays at the push of a button.

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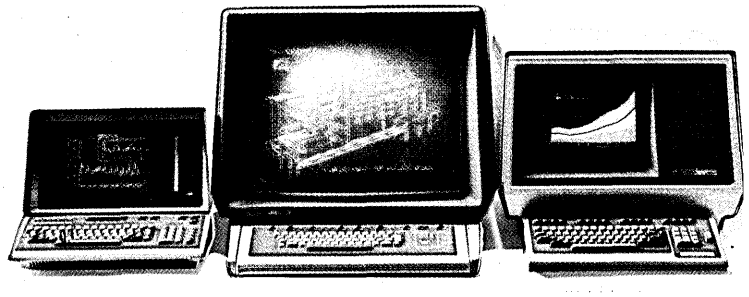

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CIRCLE 9 ON READER CARD

LOOKING BACK

MARCH/APRIL 1960

Some data and followups on items from the March/April 1960 issue:

- Membership in the Los Angeles chapter of the ACM hit a record high in March with a head count of 900, said Don Madden, president of the Los Angeles chapter.
- Sandy Lanzarotta, corporate affairs manager, Xerox, revealed the facts behind a rumor concerning IBM and the Winter Olympics. According to the rumor, IBM sponsored the Winter Olympics, and of course this was not true. It was the first time a computer company had offered its services to the Olympic events. IBM digitized the results of the competition, sent them to a central bank, and then to newscasters who repeated "Results just in from IBM . . . ." Wherever the cameras focused on the Squaw Valley, Calif., Olympic game grounds, one read the name IBM.
- Minneapolis-Honeywell disclosed it had a backlog (worth approximately $35 million on its Honeywell 800 unit.
- The fastest computer memory was announced by Telemeter Magnetics Inc. (TMI). Its engineers developed a one-microsecond memory, available to users and manufacturers in April 1961. An experimental, 64-word capacity model existed, and work on larger models was in progress.
- Digital Equipment Corp. was honored by having its president, Kenneth H. Olsen, chosen as a "Young Electrical Engineer of 1959." The award was bestowed upon Olsen by Eta Kappa Nu, a national electrical engineering honor society, at a testimonial dinner in February 1960.
- National Cash Register Co. announced that sometime during 1960 it would be opening dp centers in New York, Dayton, and Los Angeles for use by firms as small as neighborhood retail stores. This idea has since blossomed into a total of 69 centers (25 in the U.S. and 44 internationally), and it looks as though the upward trend will continue through the '80s. These numbers were provided by B.L. Trippett, editorial services manager, from NCR's annual report.

APRIL 1970

The Editor's Readout in April 1970 warned the computer industry to start tightening its purse strings. It stated, "While economic theorists debate whether we're facing a recession, a slowdown or a minirecession, it's fairly clear that in certain segments of the industry, at least, the computer bandwagon is slowing perceptibly."

National defense, aerospace firms, and most user industries were reducing their edp spending—in short, expansion had become a dirty word.

Edp managers, accustomed ordering all the latest developments to cope with constantly increasing workloads, were affected by the cutbacks. These people were simply not used to calculating their expenses down to the last penny. But it had to be done in all areas. Mentioned in Readout were "luxury terminals" in use only an hour or two a day, cutting back on the number of tapes, deciding how many were really necessary, plug-plug-compatible peripherals, tall-pack disks rather than several six-packs, etc.

The editorial also broached the subject of measuring and evaluating the performance of employees, not only that of hardware and software. With reduced manpower, budgets, and workload, it was recognized as difficult to "hold on to those bright people interested in innovative work, a precious resource likely to drift off at the first sign of cutbacks in advanced projects."

The column ended with a warning, and some clues as to the direction most beneficial for managers to take: "The edp manager who can survive the current slowdown, keep vigor in an organization that isn't expanding any more, will win important brownie points with management . . . and pave the way for future advancement and success. Growing up isn't all bad."

Unfortunately, most companies did not heed the warning, and the following year brought the expected recession to the computer industry.

—Deborah Sojka

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Each of our 10 models is surrounded with features and options that make customizing easy.

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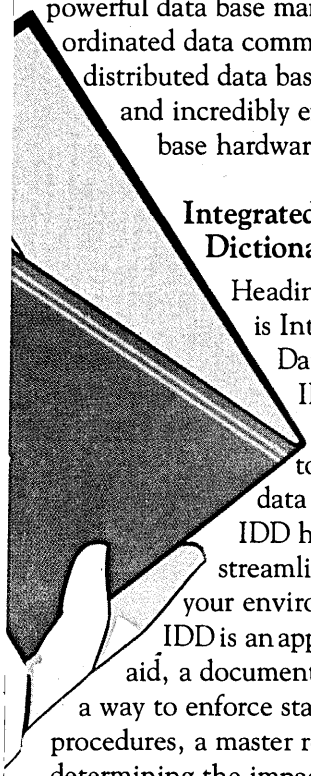


Integrated Data Dictionary: IDD.

Heading up the family is Intel's Integrated Data Dictionary, IDD. An indispensable tool for effective data administration, IDD helps you streamline and control your environment. IDD is an applications design aid, a documentation vehicle, a way to enforce standards and procedures, a master reference for determining the impact of changes to your data.

Data Base Management: SYSTEM 2000®/80.

Blending the finest enhancements from previous releases with a multitude of advanced facilities, SYSTEM 2000®/80 DBMS is a family member which you, your designers, programmers, data administrators, and end users will all appreciate. Each feature is designed to increase productivity and make your environment as flexible as possible.

Multiple languages. For designers and programmers, there's PLEX, Intel's Programming Language Extension to COBOL, PL/1, FORTRAN and Assembler. And for end users Intel provides QUEST, an easy-to-use (but powerful) English-like language.

Multiple data structures. SYSTEM 2000/80 DBMS indexing and direct access keys provide fast access to relational, hierarchical, and network data structures.

Multiple operating systems and mainframes. SYSTEM 2000/80 DBMS runs on IBM, CDC, Univac, and IBM-compatible mainframes. And Intel was first with a DBMS for IBM's new 4300 series.

Data Communications: DC.

Supporting your need for high volume, on-line production processing are Intel's communications extensions to the leading TP monitors, including CICS.

Distributed Data Base: DDB.

Intel's newest addition is Multiple Systems Coupling, MSC. Providing communications between two or more IBM processors, including the new 4300 series, our MSC software lets you execute applications and transactions in one CPU while accessing data managed by SYSTEM 2000/80 DBMS in another.

Data Base Hardware: DBH.

Bringing synergism between hardware and software technologies into our Information Resource Management product family is the FAST-3805 Data Base Assist Processor. With the FAST-3805 Data Base Assist Processor, SYSTEM 2000/80 DBMS transaction throughput capacity can be improved by as much as 100 percent and with a 50 percent or better reduction in response time.

The Family and You.

Our relationship with you brings unsurpassed customer support and service. Live classroom training. Video-assisted, multimedia education. Easy-to-understand documentation. And hot-line support, to name a few.

Clip this coupon or call 512/258-5171 for an introduction to our family.

intel delivers solutions.

Europe: Intel Semiconductor (Nederland) B.V., Commercial Systems Division, Oranjestraat 1, 3441 Ax Woerden, The Netherlands, 31/3480-11264, Telex 47970 CSD NL.

Please introduce me to Intel's new family of Information Resource Management products.

Name_____

Company_____

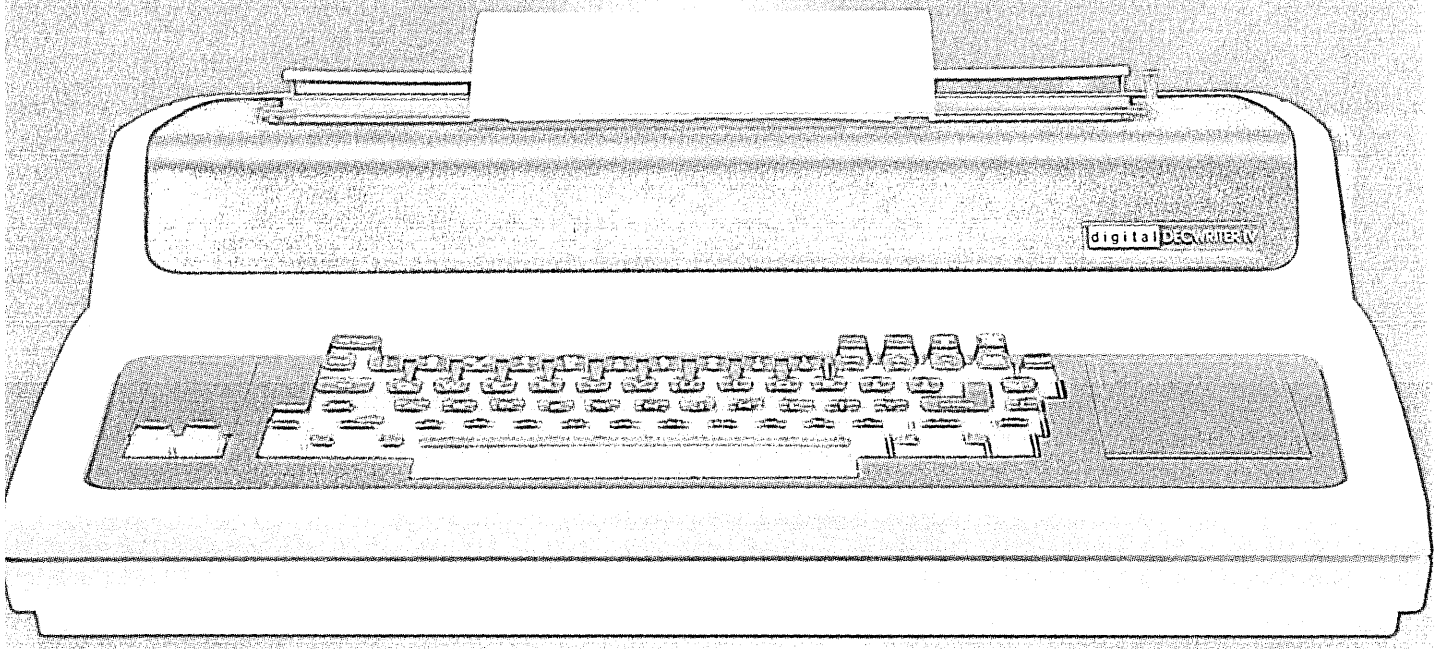
Mailing address_____

_____ State____ Zip____

Return to Intel Commercial Systems Division, P.O. Box 9968, Austin, Texas 78766

CIRCLE 11 ON READER CARD

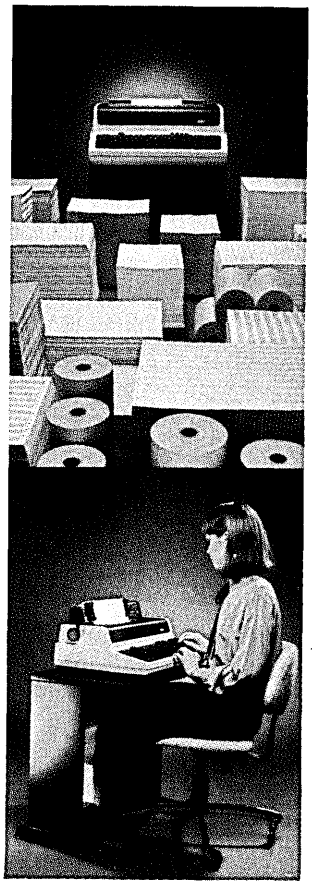
DECwriter IV.
The leader in terminal printers does it again.



If you know anything about terminal printers, you probably know something about our LA36 DECwriter II—the largest selling 300 baud terminal printer ever made.

The DECwriter II set whole new industry standards for reliability and performance.

And now there's the DECwriter IV.



With the DECwriter IV, we used the same sound thinking and proven features that made the DECwriter II so successful. True 30 CPS throughput. Microprocessor control. Switch-selectable 110 and 300 baud rates, and solid state components for unmatched reliability.

But then we added a capability to the DECwriter IV that sets it apart from the competition even more.

Unequalled flexibility in paper handling.

The DECwriter IV gives you all this flexibility because a terminal that *can't* handle all types of paper isn't just inconvenient. It's also expensive.

For instance, some terminals restrict you to using 8½" x 11" paper—sideways. Which may be fine for some jobs, but awkward for others.

Others force you to put up with the high cost and short shelf life of thermal paper. And they can't handle multi-part forms at all.

But the DECwriter IV matrix impact terminal lets you use the right paper for every job. Which means no waste. Easy filing, too.

In the standard LA 34 friction feed configuration, you can use rolls or sheet paper in any width up to 14⅞".

Take a minute to snap in the tractor-feed option, and the DECwriter IV converts to handle standard or custom forms up to four parts.

Forms as narrow as 3". Or as wide as 14⅞".

All in a portable printer no bigger than an office typewriter.

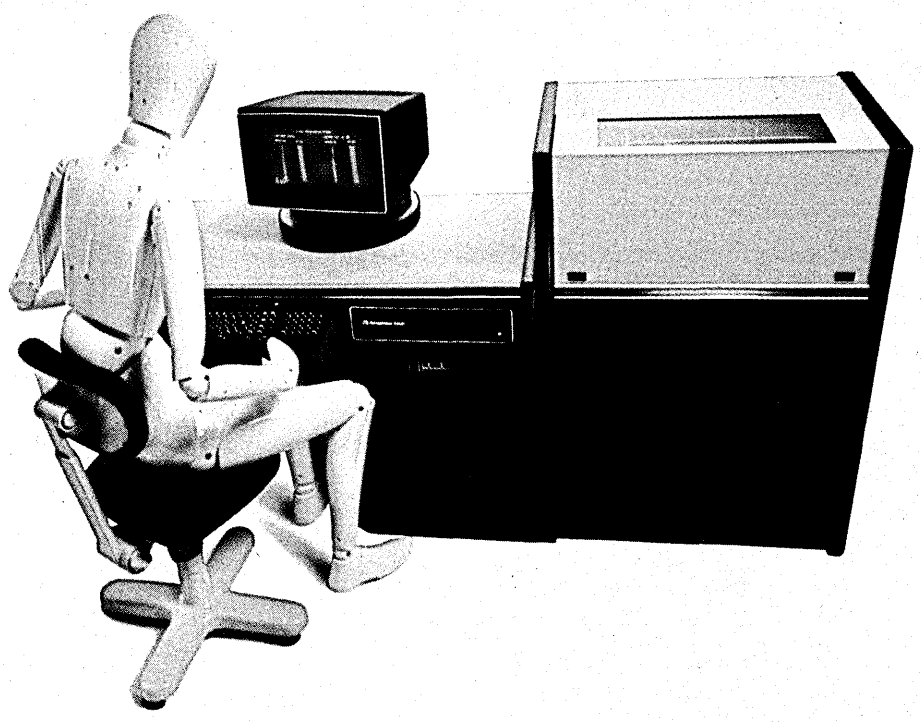
So why put up with all the restrictions you get with other terminals. Restrictions that cost you time and money.

With the DECwriter IV, one size fits all.

For 30 day delivery, contact your terminals supplier or write to:
Digital Equipment Corporation,
Terminals Product Group, MR2-2/M67,
One Iron Way, Marlborough, MA 01752.

digital

CIRCLE 12 ON READER CARD



A solution to a human problem in information management.

The Bell System knows that information management works best when it's people-oriented. After all, that's been the basis of our business for years.

So our Dataspeed® 4540 data communications terminal is human engineered.

It has a display unit with a tilting screen to eliminate glare and eye fatigue. Plus simplified controls on the console. And you get a choice of keyboards with numeric cluster arrangement.

Of course, the terminal is every inch an information management problem-solver that transmits at speeds from 2400 to 9600 bps efficiently and has built-in diagnostics and greater hardware flexibility.

Its microprocessor-based controller interconnects with up to 32 devices. Eight of them can be printers which can be located up to 2000 feet away from the controller. Keyboard displays can be up to a mile away.

The Dataspeed 4540 data communications terminal. You can expect it to add efficiency and economy to business applications involving inquiry response, data entry and retrieval.

With our knowledge, our advanced communications technology, our thousands of experienced information management specialists—and with service that is superb—we can help your business. A call to your Bell Account Executive will put our knowledge to work for you.

The knowledge business

A CHALLENGE FOR THE 1980s:

'Control your information or it will control you.'

—Amnon Ben-Yehuda
General Manager
NCR Micrographic Systems Division

Are you looking for better ways to access system information? And, at the same time, enhance the value of the system to your organization?

NCR has a proven answer. It's Micrographics, the data processing technology that puts data in people's hands in its most useful format.

Micrographics is fast, accessible and very easy to use. It maximizes the value of the substantial investment in your system by making data conveniently available to every facility in your organization, regardless how small or remote.

NCR Does It All

NCR is uniquely a total systems company, the only company to provide it all: A wide range of computer systems; data terminals and communications networks; Micrographics hardware, software and consumables; and one of the best and largest service organizations in the world. With this total systems approach to information management, it's no wonder that NCR is a leader in Micrographics data processing.

We're ready to build on that leadership. We're poised for new growth, to be an even greater force in Micrographics through new and enhanced user benefits.

NCR has been helping people manage data for nearly a century. We can help you now. Contact us to find out how. You'll be glad to discover how easy it is to turn your system's problems into opportunities.

Micrographic Systems Division
NCR Corporation, Box 606
Dayton, OH 45401

NCR
Complete Computer Systems

CIRCLE 14 ON READER CARD

The Leader for full color graphic displays

C³, CCIS, Mission Planning, and Situation Analysis User Interface Consoles utilize AYDIN CONTROLS 5216 Color Graphics Display Computer

AYDIN CONTROLS 5216 multi microprocessor-based color display console provides a complete intelligent color graphics system that includes multi-tasking, multi-user list processing utilizing the most advanced state-of-the-art hardware.

Designed for modularity and human engineering, the AYDIN color graphics system permits many configurations, enhancements and options.

The console is designed to meet the rigid requirements of NACSEM 5100 (TEMPEST).

Demanding programs like the BETA, BMEWS-TOR upgrade, Cruise Missile Mission Planning, and AN/TPQ 27 Program currently depend on AYDIN CONTROLS' 5216 color graphics computer systems.

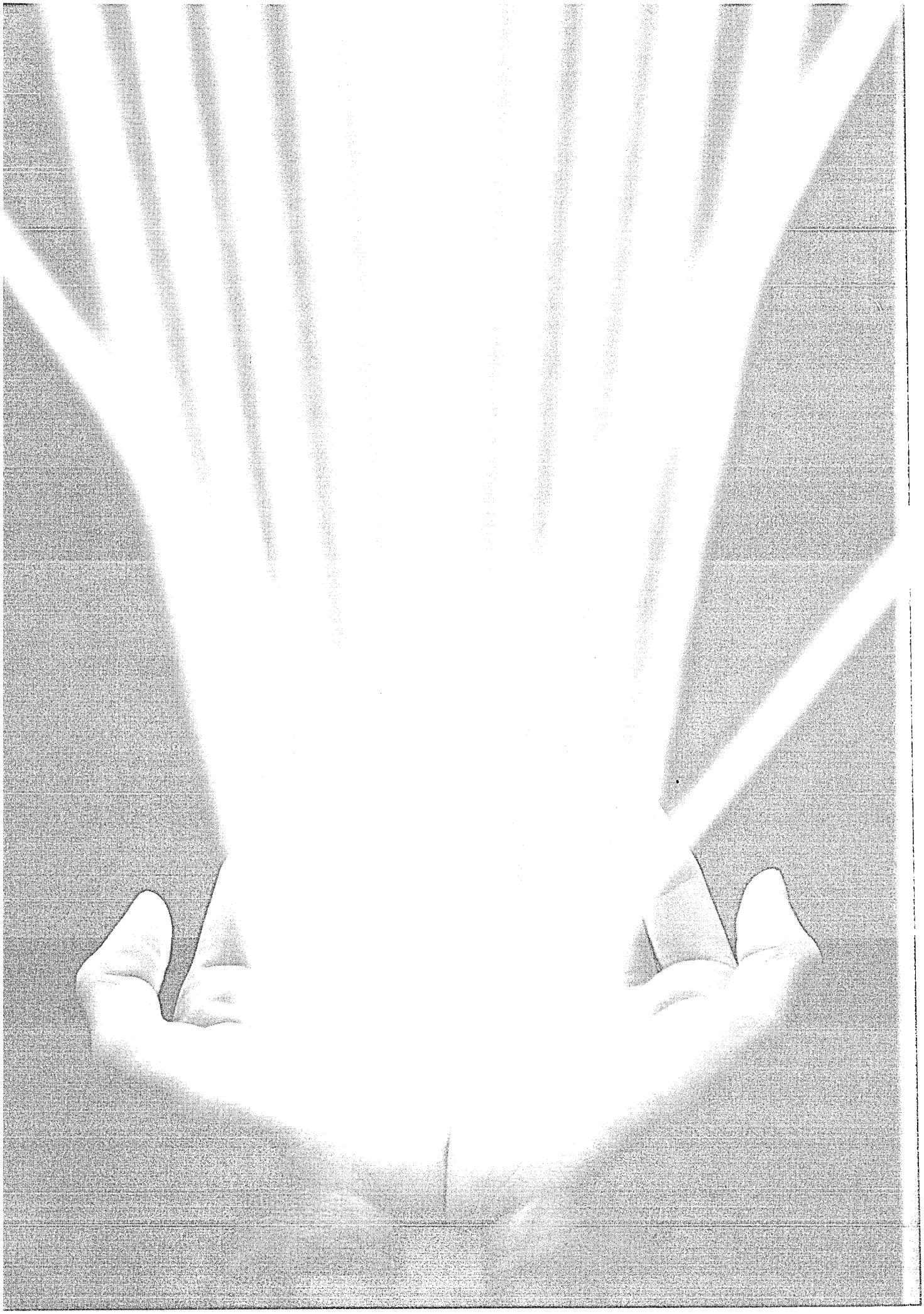
When your application requires high resolution, intelligent color graphics, data and communication processing, AYDIN CONTROLS' complete line of modular software and high reliability hardware can be customized and programmed for your application. Look to AYDIN CONTROLS — the pioneer and leader in military color graphics.

AYDIN CONTROLS

The pioneer and leader in computer graphics

414 Commerce Drive • Fort Washington, Pa. 19034 • (215) 542-7800 • TWX 510-661-0518

CIRCLE 15 ON READER CARD



WHERE DATA BECOMES INFORMATION

Like the Universe, the business world had its own Big Bang. At some point in the not-too-distant past, data started exploding out of every corner of every office.

Not bad, all that raw data. Once you got it organized, you could spot trends. Anticipate problems. Look at your business in a dozen different ways.

But the data didn't stop. Before long you had enough to look at your business in a *hundred* different ways. And now —now you can hardly see the information for the data.

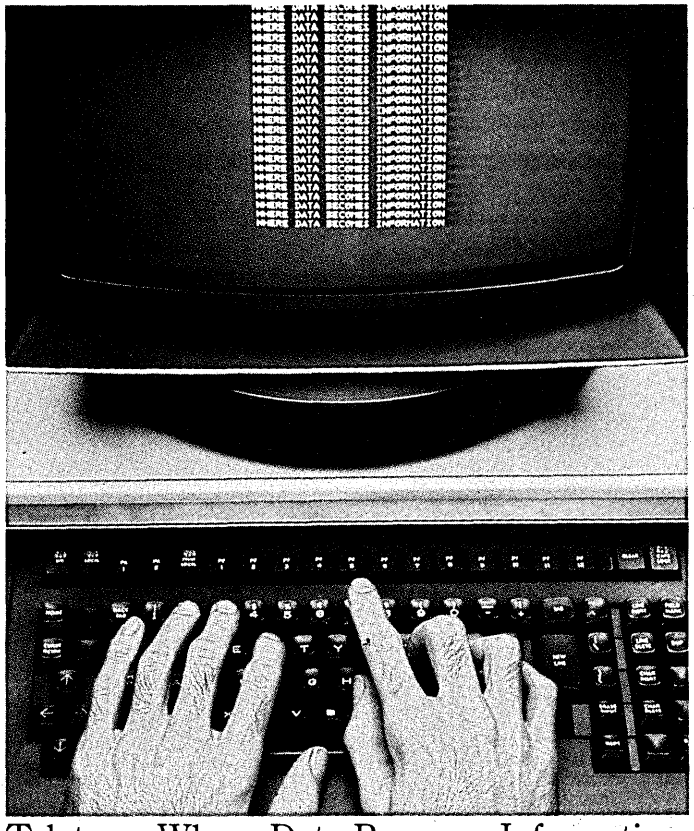
The point where you get control is a Teletype* terminal, designed to give you the useful information hidden in all that data.

Teletype terminals are flexible. To work the way your business works. And to be adapted and enhanced with greater capability as your business grows.

And Teletype terminals have a remarkable record of reliability. Because today's information must be as accurate as it is timely.

As a member of the Bell System, we're coupling AT&T's communications knowledge with our own research and development. The result is an extremely advanced family of terminals.

And a company you can count on to help bring order out of chaos. And information from data.



Teletype. Where Data Becomes Information.

Teletype Corporation. 5555 Touhy Avenue, Dept. 3141-A, Skokie, IL 60077. Tel. (312) 982-2000.
**Teletype is a registered trademark and service mark of Teletype Corporation.*

CIRCLE 16 ON READER CARD

The BTI 5000/ES. Single system prices start at just $29,950 for 10 megabytes hard disk, 4 ports. BTI Systems are delivering the best price/performance at over 2,000 installations. And the BTI 5000/ES will deliver the best for you, too. Just send us the coupon, we'll show you how.

BTI COMPUTER SYSTEMS

Tell me about the BTI 5000/ES:

Name _____

Title _____

Company _____

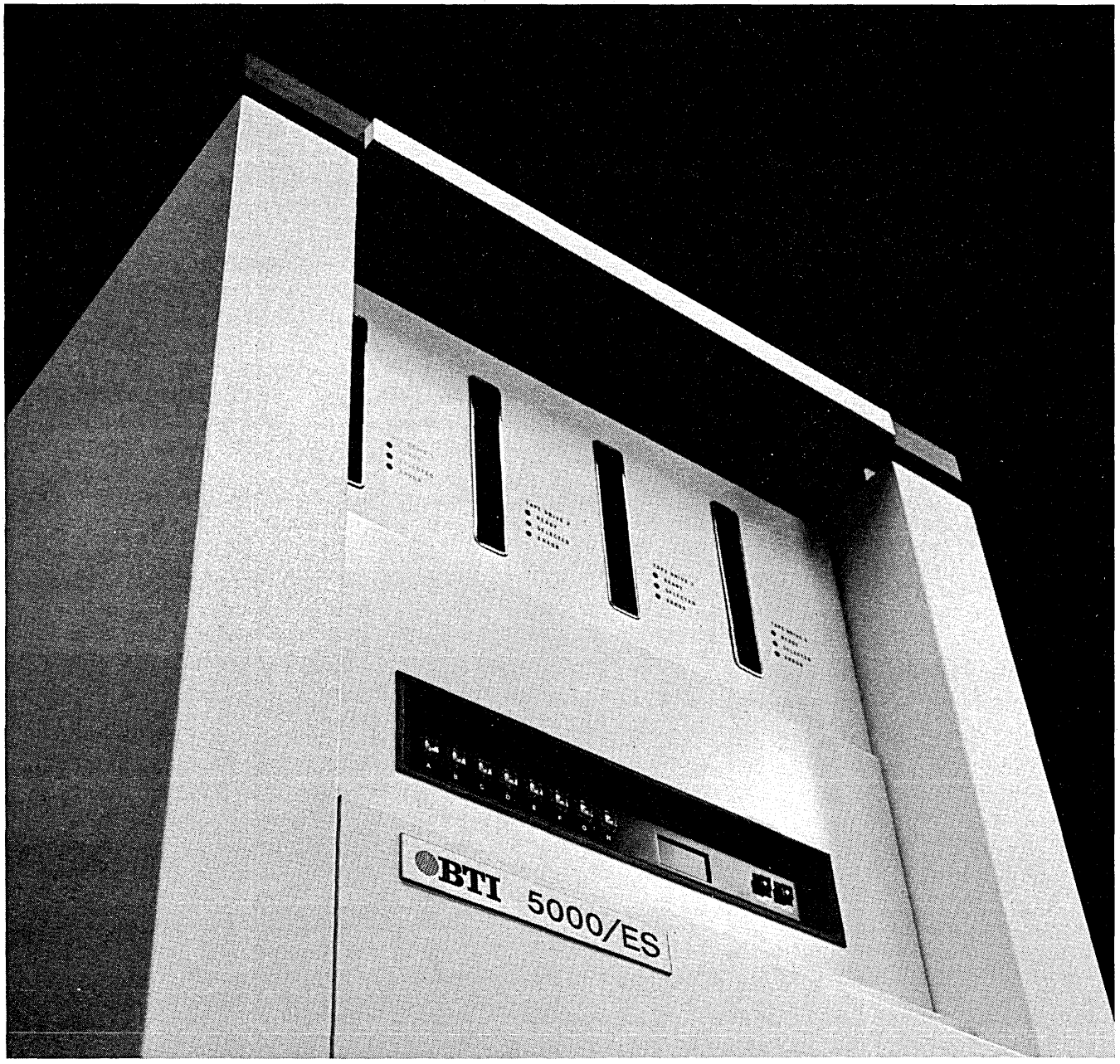
Address _____

City _____ State _____ Zip _____

Phone _____ D

BTI Computer Systems, 870 W. Maude Ave.
Sunnyvale, CA 94086. (408) 733-1122

If you want to support 4 to 32 interactive users simultaneously with the best possible performance at the lowest possible cost, this is the computer that makes it possible:



CIRCLE 17 ON READER CARD

LOOK AHEAD

PCMS READY THEIR OWN OS

Amdahl's long-rumored proprietary operating system will be unveiled some time this year, claim Wall Street sources. Amdahl reportedly expects that at least 35% of its client base would "seriously consider" going to the PCM's first independent OS if the price is attractive, the features competitive, and some measure of IBM compatibility is maintained. User surveys have convinced Amdahl execs that an OS offering -- coupled with, say, data base management software -- would cover. development costs and quickly return a profit

And Amdahl may not be alone in the PCM rush to OS offerings. Magnuson, a young company in a very big hurry, is also reportedly developing independent system software.

NEW GEAR FROM HARRIS

Harris Corp.'s Data Communications Div. expects to begin Beta tests in May on an interactive terminal that supports IBM's SNA and SDLC protocols, as well as bisync. Two models will be displayed at the NCC in May -- the 9200-10 and 9200-20. We hear the 20 can communicate concurrently with two or more host computers, regardless of their location. Prices will range from $9,000 for single terminal configurations up to $100,000 for 32-terminal systems. IBM's models 3274 and 3278 are limited to communications with a single host.

PRIME'S LOSS IS PODUSKA'S GAIN

Former Prime Computer vp for R&D, Bill Poduska, has drawn off perhaps a half-dozen of Prime's engineers and designers for a new Massachusetts-based company. The new firm reportedly will offer sophisticated micro systems as superintelligent terminals. Few were shocked that several of Poduska's followers were on his MIT development team, but many were surprised when Dave Nelson, Prime's R&D director and former VAX architect at DEC, defected too. Sources say Prime has depth to cover the loss, but the company was already complaining about the scarcity of R&D talent. And Poduska is seen by some to be skimming the cream of Prime's engineering staff.

COMPUTERS COME TO THE HOME

One of the most comprehensive tests of a two-way data base service to the home will begin this month in Coral Gables, Fla. Called Viewtron, the service will use an interactive, two-way tv terminal designed by Bell Labs and built by Western Electric. The terminal will operate at 1200 bps in full duplex mode over conventional phone lines at 160 test homes.

LOOK AHEAD

Sponsored by Viewdata Corp. of America, a subsidiary of Knight Ridder Newspapers Inc., the information data base will be stored on a DEC VAX 11/780. The alpha mosaic screen display will include a full range of consumer-oriented services from local information providers. Sears will offer a Teleshop service allowing viewers to select items and then pick them up at a local store, while Grand Union will accept grocery orders which will then be delivered to the home. An eleventh hour shopping service may include such features as last minute discounts for flights out of Miami not yet booked full.

Thirty of the Bell System terminals will be rotated among the test homes for a period of six months. Color images will be displayed in a 20-line by 40-character format and will include AP news, weather, stocks, educational and other information.

AT LONG LAST FOR AMDAHL

Sources tell us that Amdahl Corp., which gained a communications capability in its acquisition last month of Tran Telecommunications, will soon bring out a telecommunications product of its own. It's a 370X front-end processor that Amdahl has been developing since it missed out in the attempt to acquire Comten. The front-end system, however, will be introduced under the Tran name.

PREPARING FOR THE H BOMB

Both Cray and CDC are reportedly preparing challenges for IBM's top-of-the-line H Series processors. Cray, in particular, is described as "breathless with anticipation" as IBM pushes the commercial market up into the mammoth systems range Cray has long dominated for scientific users.

IBM BUYING UP CITY PROPERTIES

IBM is reportedly purchasing additional in-town properties in major metropolitan cities. Some sources suggest these downtown sites will house IBM technical schools, offering courses to the public on word processing and office automation. Sources say it's a strategic bid to do in small systems what IBM's support for collegiate dp did in its mainframe market.

XTEN RANKS DWINDLE

Xerox's surprise decision to move its Xten operation from the West Coast to Long Island caused a lot of soul-searching among the operation's 100-plus employees, many of whom had been recruited from East Coast companies. The division, which is researching the reallocation of microwave bands for transmission of radio distribution, had moved six months ago from a facility in Tarzana, Calif. to a larger one in nearby Woodland Hills. Last

(continued on page 61)

Think what your programmers could do if your users did their own reports.

Answer/DB, the latest Implementation System from Informatics, is the new on-line software tool for report generation. It lets non-DP people develop their own report requests at a terminal — in an English like language — with as few as four simple statements.

That means much faster report turnaround, wider smiles from non-DP people in your organization, and greatly increased programmer productivity.

Answer/DB has made old-fashioned batch reporting systems obsolete because it's designed to handle the problems you'll be facing in the data base and data communications world. Answer/DB operates with your standard OS/DOS files and IMS data bases. And it offers completely interactive, on-line query entry with syntax checking and editing capabilities for creating error-free report requests.

For more information on Answer/DB and other information retrieval systems, just complete the coupon. Or, call us at (213) 887-9121.

Informatics Inc., 21050 Vanowen Street, Canoga Park, CA 91304
Tim Corey, Product Manager
(213) 887-9121 Telex: 69-8473

AD-D-480

informatics inc

☐ Send me complete details on Answer/DB.
Send me complete details on:
☐ Other Informatics report writers
☐ Inquiry systems
☐ Have a salesman call me.

Name_____ Title_____

Company_____

Address_____

City_____ State_____ Zip_____

Telephone ( )_____

Computer_____ Operating System: ☐ DOS/VS ☐ OS/VS
TP Monitor: ☐ IMS/DC ☐ CICS/VS ☐ TSO

CW2-25-80

Introducing Answer/DB™ by Informatics.®

CIRCLE 18 ON READER CARD

The Information Management Company.

Xerox just gave us the opportunity of the century. And we couldn't be happier.

We're part of Xerox. Diablo Systems, Inc. is, too. And they've got plans for both of us.

Diablo will concentrate on printers. Century will concentrate on disk drives. Makes sense. And it means we now have full responsibility for sales and marketing of the Diablo disk drive product line.

The big winner in this exchange is you, the customer.

If you're a Series 30 customer, count on us for eager-to-please support and a dependable source of supply for years to come.

If you've evaluated the Series 44B and think it is as good a 5440-type drive as we think it is, you're about to see us rewrite the book on enthusiastic marketing and conscientious support.

And if you need spares for Series 10, 20 and 44A Diablo drives, we're pledged to keep you smiling, too.

Here are the specific actions we're taking.

FAST ANSWERS. The man's name is Howard Wing. He's our Diablo Team Captain. His phone number is 714/632-7500. Answers he doesn't have, he'll get. Fast. Think of Howard as your single point of responsibility for Diablo drives from Century.

FAST DELIVERY. We call it our Distribution Center. It's designed to provide off-the-shelf delivery of new orders, spares and critical components, such as spindles. We're building inventories to meet your needs. And even though we're months away from eliminating backlogs, we wouldn't put it in black and white if we weren't committed to it.

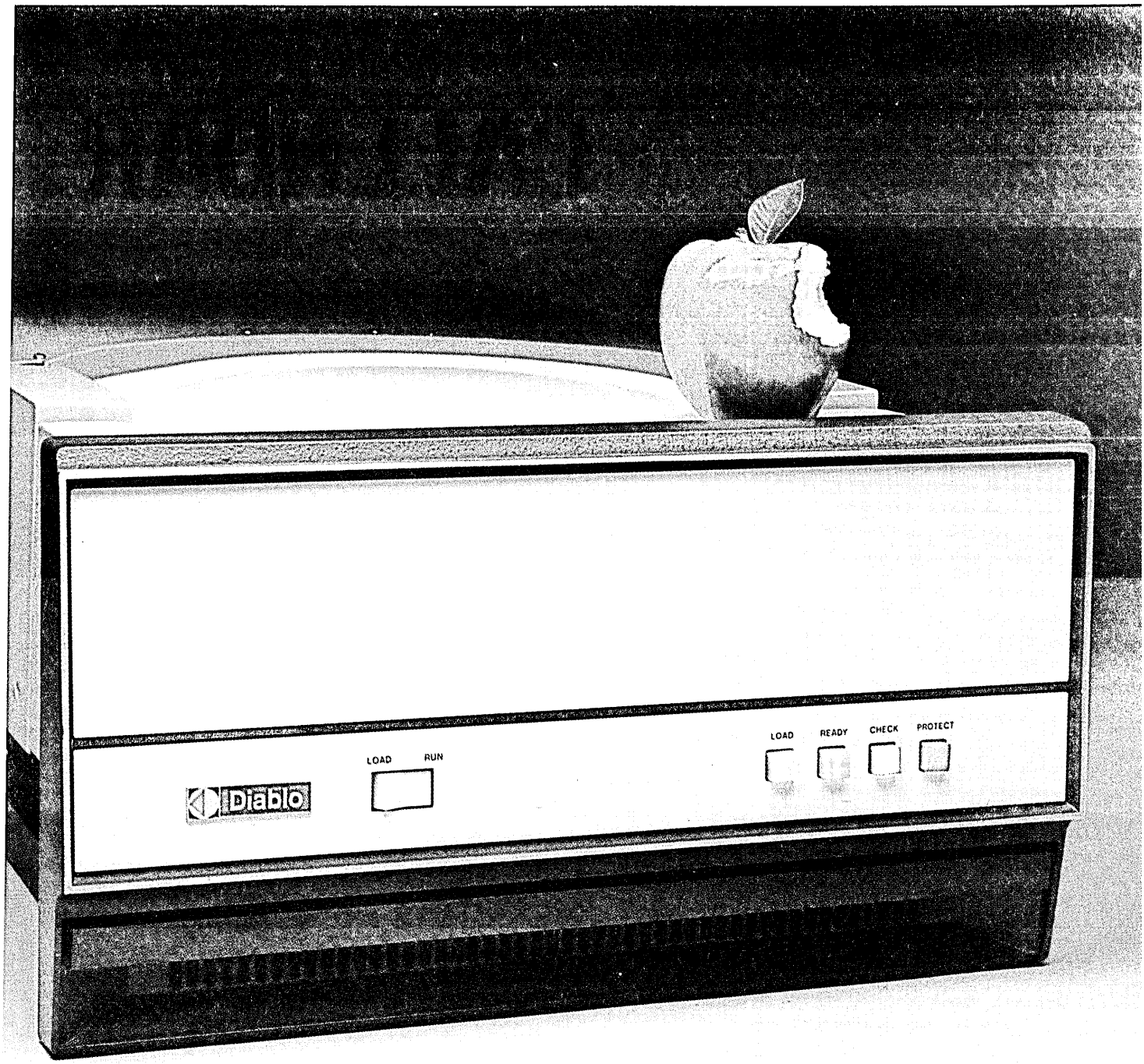
SUPPORT, SUPPORT, SUPPORT. Complete Century Data documentation on our Diablo product line is available now. We're conducting Diablo-drive training seminars for our sales force. We've worked out details with Diablo (the company) to ensure continuing quality service for Diablo drives.

In short, we're doing all we can to make Diablo drives from Century the drives you can't resist. We've sunk our teeth into this opportunity. And won't let go.

Century Data Systems, A Xerox Company,
1270 North Kraemer Blvd., Anaheim, CA 92806
(714) 632-7500

Century Data Systems
A Xerox Company

CIRCLE 19 ON READER CARD



NOW, CENTURY DATA MAKES DIABLO DRIVES MORE TEMPTING THAN EVER.

CALENDAR

APRIL

Federal DP Expo, April 28-30, Washington, D.C.

Update on trends, applications, and state of the art of all facets of ADP. Contact Sheldon Adelson, Conference Director, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

Computerized Office Equipment Expo—Midwest '80, April 30-May 2, Chicago.

Will feature latest developments in computers, word processors, copiers/duplicators, telephone systems, other business equipment. Contact Industrial and Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

MAY

Fifth Micro Expo '80, May 6-8, Paris.

The largest microcomputer and personal computing conference in Europe, featuring themes relating to personal computing, new products, industrial applications. Contact Robert Maraziti, Sybex, Inc., 2344 Sixth St., Berkeley, CA 94710, (415) 848-8233.

NCC, May 19-22, Anaheim, Calif.

Will cover the broad areas of management, applications, science and technology, and social implications. Contact AFIPS, 1815 North Lynn St., Arlington, VA 22209, (703) 243-4100.

CECON, May 20-22, Cleveland.

The exhibits will display new products related to instruments, components, and systems. Contact Cleveland Electronics Conference, Inc., 2728 Euclid Ave., 5th Floor, Cleveland, OH 44115, (216) 241-5515.

JUNE

Automated Business Systems Exhibition, June 3-6, Mexico City.

The exhibition will be sponsored by the U.S. Department of Commerce. Contact Annette V. Napper, Industry Participation Division, Room 6015, Office of Export Promotion, U.S. Department of Commerce, Washington, DC 20230, (202) 377-2952.

National Computer Graphics Association Conference, June 16-19, Washington, D.C.

Will include tutorials in particular computer graphic fields, conferences focusing on new developments in computer graphics, and vendor exhibitions. Contact National Computer Graphics Association, Inc., 1129-20th St., NW, Suite 512, Washington, DC 20036, (202) 466-5895.

DATA COMM, June 17-19, Geneva, Switzerland.

DATA COMM is an international forum where developments in microprocessors, mini/microcomputers and associated services can be seen, together with new equipment for data communications and distributed processing. Contact Industrial and Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

World Computing Services Industry Congress II, June 23-25, San Francisco.

Geared toward the serious discussion of responsibilities as custodians of the international information resources. Contact ADAPSO, 1925 Lynn St., Arlington, VA 22209, (703) 522-5055.

Syntopicon VIII, June 23-26, Minneapolis.

The International Word Processing Association conference will feature one day of conference and three days of exhibits from all major vendors of text processing systems. Contact IWP, Maryland Rd., Willow Grove, PA 19090, (215) 657-3220.

SEPTEMBER

Integrated Systems Expo '80, September 9-11, Washington, D.C.

The National Micrographics Association will feature the development and promotion of the effective uses of micrographics, including interfaces with other information-processing technologies. Contact John Bidwell, NMA, 8719 Colesville Rd., Silver Spring, MD 20910, (301) 587-8202.

Internepcon/Semiconductor International Expo, September 11-13, Singapore.

Keyed to the specific needs of engineering, manufacturing, and support personnel of Southeast Asia. Contact Industrial and Scientific Conference Management, Inc., 222 W. Adams St., Chicago, IL 60606, (312) 263-4866.

Wescon '80, September 16-18, Anaheim, Calif.

This convention is the largest high technology assembly held in the United States. Contact Robert Myers, Communications Counsel, Wescon, 999 N. Sepulveda Blvd., El Segundo, CA 90245, (213) 772-2965.

IPAD National Symposium, September 17-19, Denver.

NASA and an Industry Technical Advisory Board (ITAB) to report on progress of the joint industry/government computer-aided design project called IPAD (Integrated Programs for Aerospace-Vehicle Design). Contact IPAD Project Office, Mail Stop 246, NASA Langley Research Center, Hampton, VA 23665, (804) 821-2888.

Federal Computer Conference, September 22-24, Washington.

Cosponsored by DATAMATION. Will address the management of change in the 1980s for federal dp users. Contact Ms. Lynn Green, P.O. Box 368, Wayland, MA 01778, (617) 358-5181.

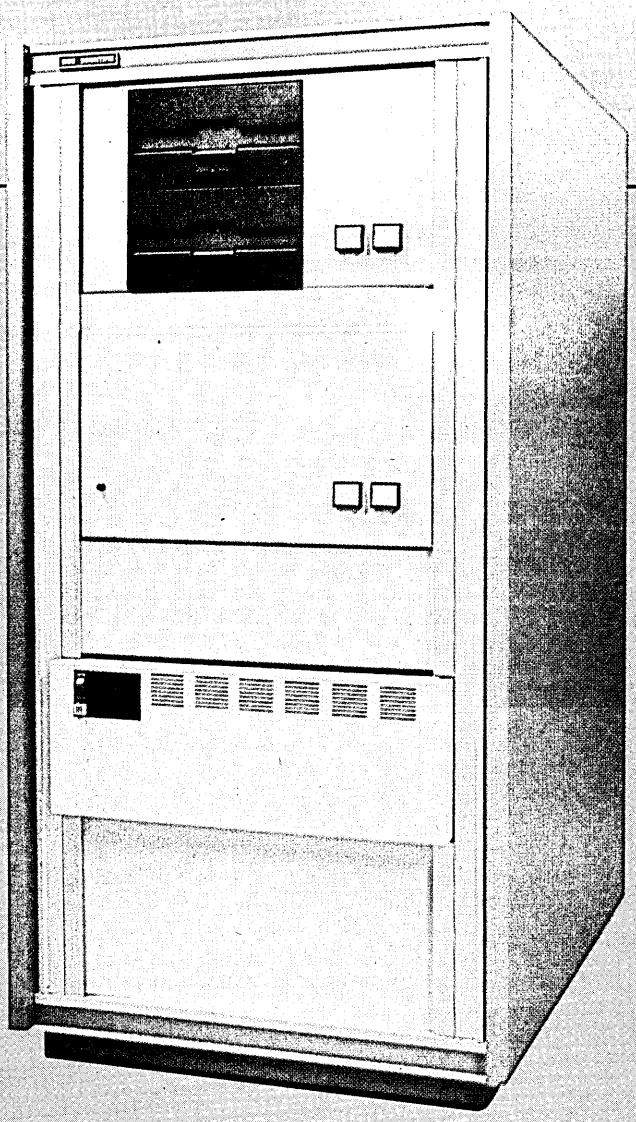
12th Annual Conference of the Society for Management Information Systems, September 22-25, Philadelphia.

The conference theme will be "MIS Management in the Emerging Information Age" and will examine the challenges facing the MIS Executive. Emphasis will be on the impact of converging technologies on the role of the MIS executive in the 1980s. Contact M. Rippey, the Society for Management Systems Information, 111 East Wacker Dr., Chicago, IL 60601, (312) 644-6610.

Compcon Fall '80, September 22-26, Washington, D.C.

Theme will be Distributed Processing and Networking. Contact Executive Secretary, P.O. Box 639, Silver Spring, MD 20901, (301) 439-7007. ✲

Ohio Scientific: The leader in Winchester based micro-computers.



Ohio Scientific produced the first Winchester based microcomputer in 1977. Since then, we have shipped more of these systems than the rest of the industry combined. Among them are our C3-B and our C3-C microcomputers.

The C3-C.
23 Megabytes. Under $10,000.

The C3-C computer has been designed and engineered to fill the void that existed between floppy disk systems and larger hard disk systems.

In its normal configuration, the C3-C includes the Challenger III processors, 52K RAM, the 23 Megabyte Winchester drive and dual floppy drives for file system back up. And the cost is less than $10,000.

The CPU employs three micro-processors, the 6502, the Z-80 and the 6800. And the processor bus has been designed so new, more powerful micros (like 16 bit CPU's) can be added to the system later on.

There are also 10 open slots in the basic C3-C. The system supports up to 768K bytes of memory, in a multi user configuration.

The C3-B.
74 Megabytes. Under $13,000.

For those who require even more hard disk storage, Ohio Scientific offers another microcomputer in the C3 Series, the C3-B. Its specifications are the same as those of the C3-C. However, the C3-B offers a 74 Megabyte Winchester drive.

For those who do not need hard disk capacity now, but in all probability will need it in the future, Ohio Scientific offers the C3-A. It is like the C3-B and the C3-C in all respects but two. 48K RAM is standard in the C3-A, and it offers 12 open slots. When more storage is needed, the C3-A is easily expandable to either a 23 Megabyte or 74 Megabyte hard disk system. The C3-A is priced at less than $6,000.

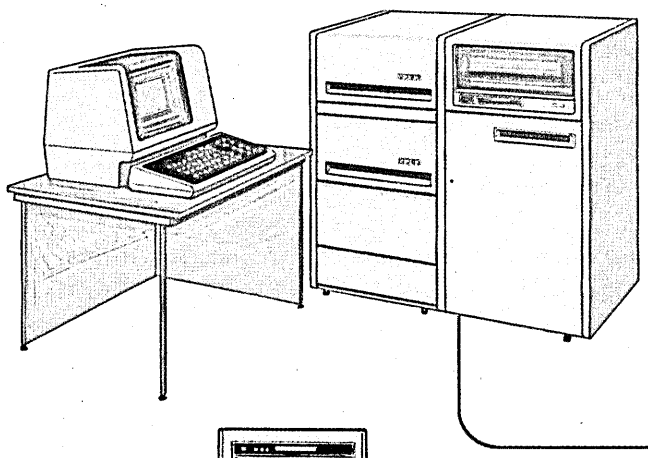
For literature and the name of your local dealer, CALL 1-800-321-6850 TOLL FREE.

OHIO SCIENTIFIC
1333 SOUTH CHILLICOTHE ROAD
AURORA, OH 44202 • (216) 831-5600

CIRCLE 20 ON READER CARD

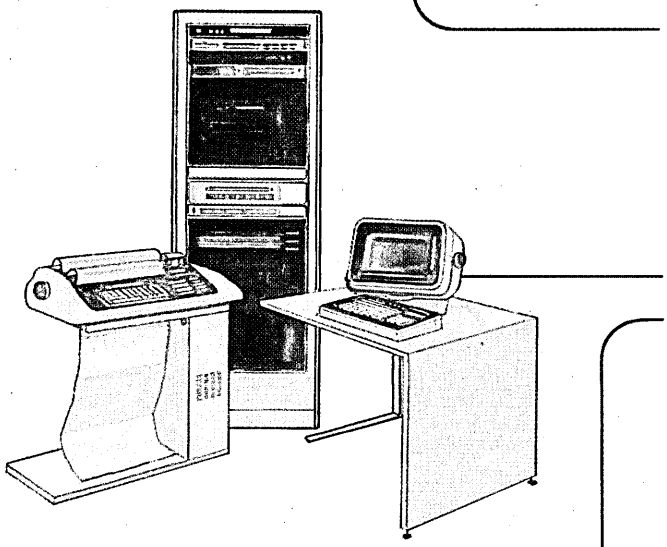
If you have a PDP-11 Nova/Eclipse® or HP-1000

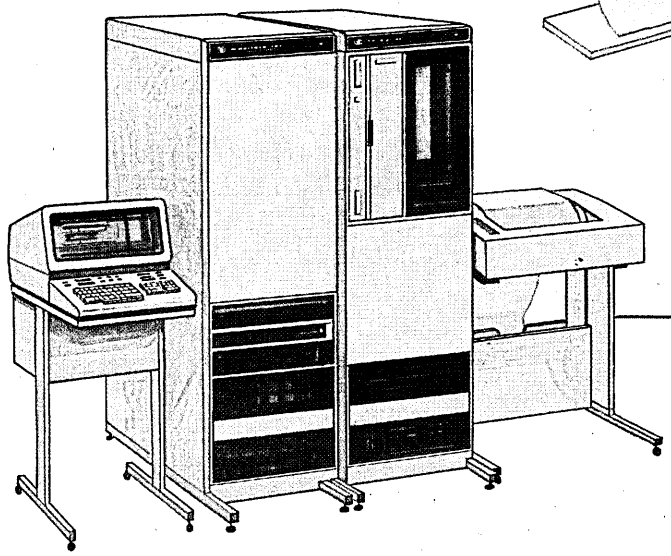
Why not have digital plotting capability?



The CØMPLØT® CPS Plotting Systems give you everything you need for quality digital plotting—your choice of plotter size and speed, a microprocessor based plotter controller and the software support to meet your particular plotting needs.

Whatever your application, the CPS Plotting System makes computer graphics from your minicomputer easy and economical. You simply select the plotter speed, the plotter size and the operating software you need and you have a digital plotting system tailored to your requirements.





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Houston's CPS Digital Plotting System gives you the plotter, controller and software support for your minicomputer

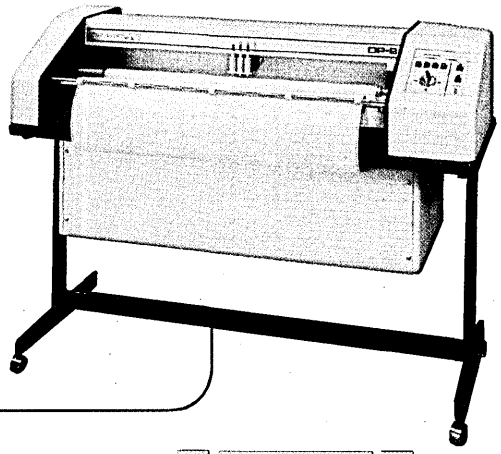
PLOTTER

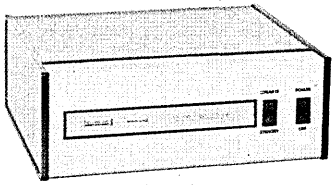
The CPS System digital plotting package combines a plotter, controller, and software...ready to operate from your minicomputer.

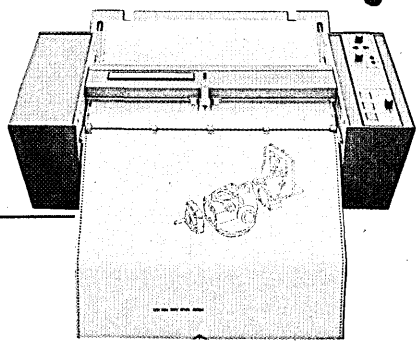
With the CPS System you can be assured of the right speed, resolution and plot size by selecting the plotter that's suited for your application.

Each plotter features rugged construction, easy paper loading and storage, English or metric step sizes and a unique chart drive and high speed pen drive stepper motor for eight vector movement.

Plotter speeds range from 300 to 400 steps per second with step sizes from 0.001″ to 0.01″ (.0025 cm to .025 cm). Paper widths from 11″ to 42″ (27.9 cm to 106.6 cm) are available. Prices start as low as $4445.*



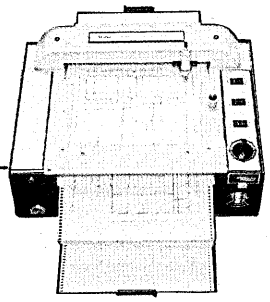




CONTROLLER

The plotter controller utilizes a microprocessor to provide automatic detection and correction of transmission errors, local generation of alphanumeric characters, circular buffer memory, and line-segment generation. The host computer software is designed for maximum I/O code compression, using the controllers compact command structure.

The controller attaches easily to any EIA RS-232 interface and operates with a wide variety of modems not requiring line control protocol, as well as all terminals that accept and transmit ASCII code using asynchronous data format. It features 1024 byte memory, operation capabilities to 4800 baud (CPS-11 and CPS-8 systems), programmable resolution, firmware character generation, and 14 special centered marker symbols (in addition to a standard character set).



SOFTWARE

A complete library of software packages is available, compatible with the following operating systems with Fortran capability;

PDP-11	Nova/Eclipse	HP-1000
RT-11	RDOS	RTE-3
RSX-11M	AOS	RTE-4
RSTS/E		

For descriptive literature on our CPS Plotting Systems call toll free (outside Texas) 1-800-531-5205.

For information on software support request bulletin # SW 903.

Software is also available for most other minicomputers. For a complete listing of available software support or information on HI plotters contact:

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***CIRCLE NUMBER 21* FOR LITERATURE.**
***CIRCLE NUMBER 22* TO HAVE A REPRESENTATIVE CALL.**

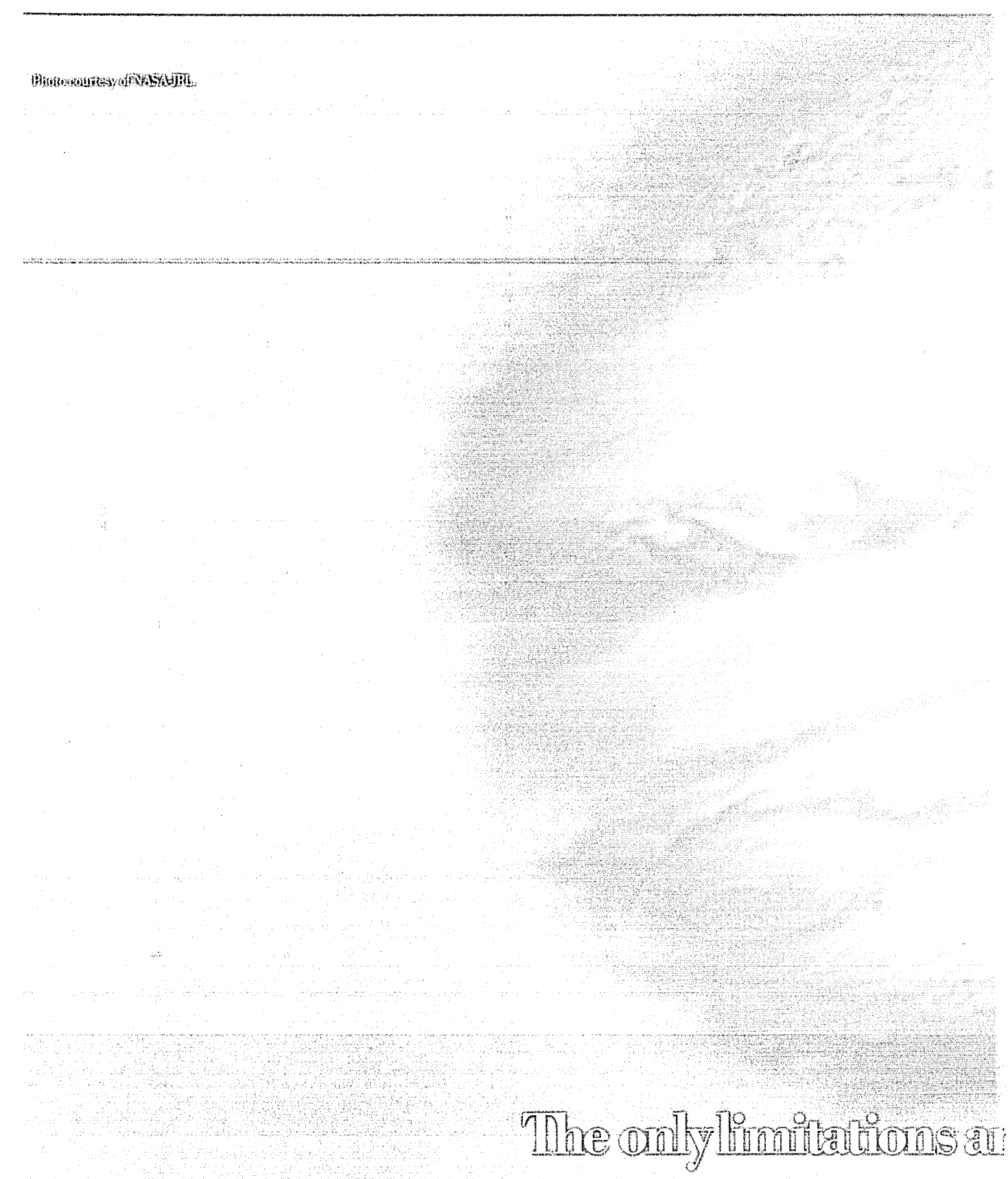

Photo courtesy of NASA/JPL.

The only limitations ar

Computer Sciences Corporation believes that any problem humans can conceive of, they can eventually solve. The only limitation is the sophistication of their science. That belief has involved us in many of the world's most difficult problems and in some of its most astonishing accomplishments.

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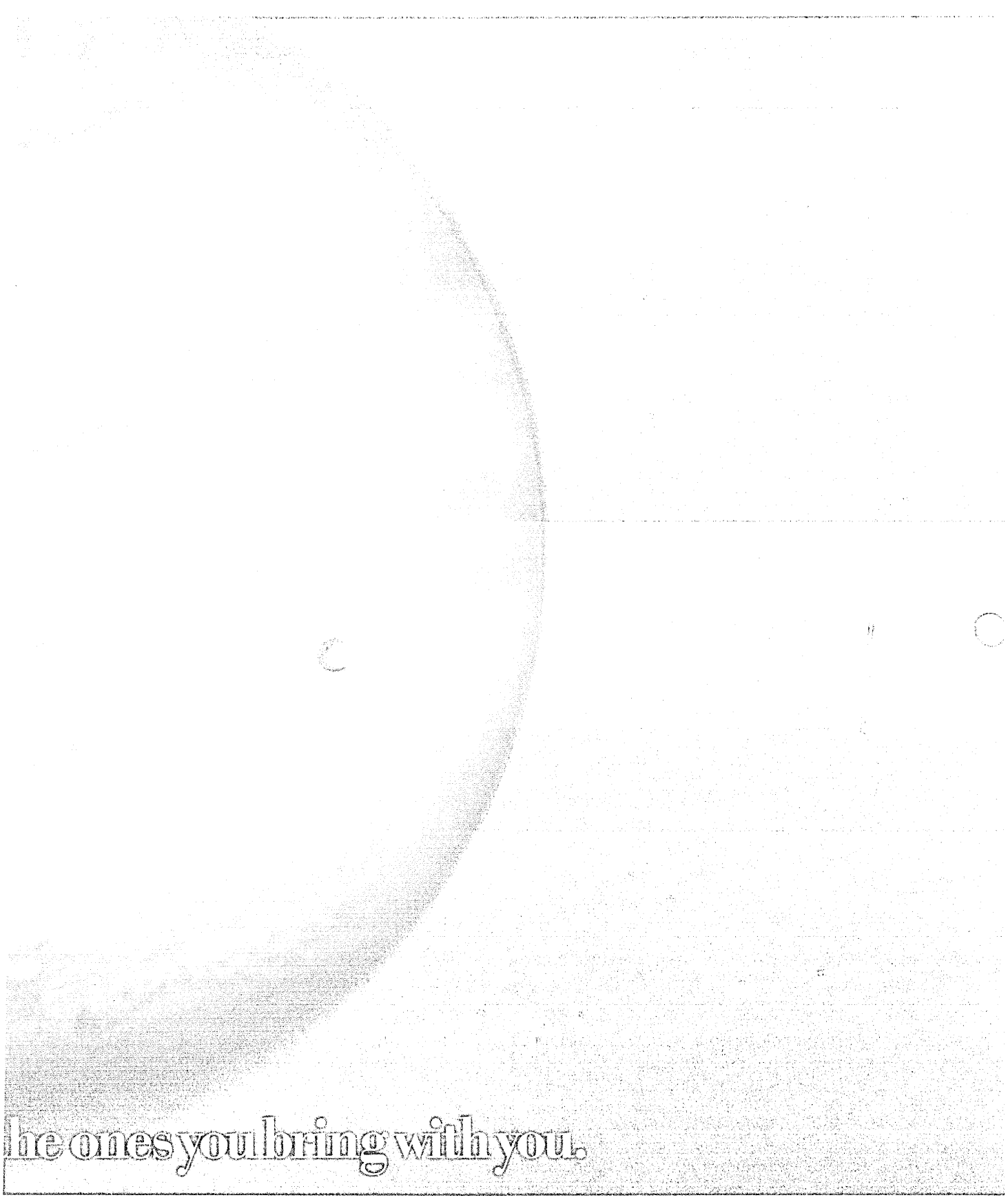
As NASA's computing partner, CSC has developed programs and systems and handled data processing for the missions that have orbited the earth and explored the solar system.



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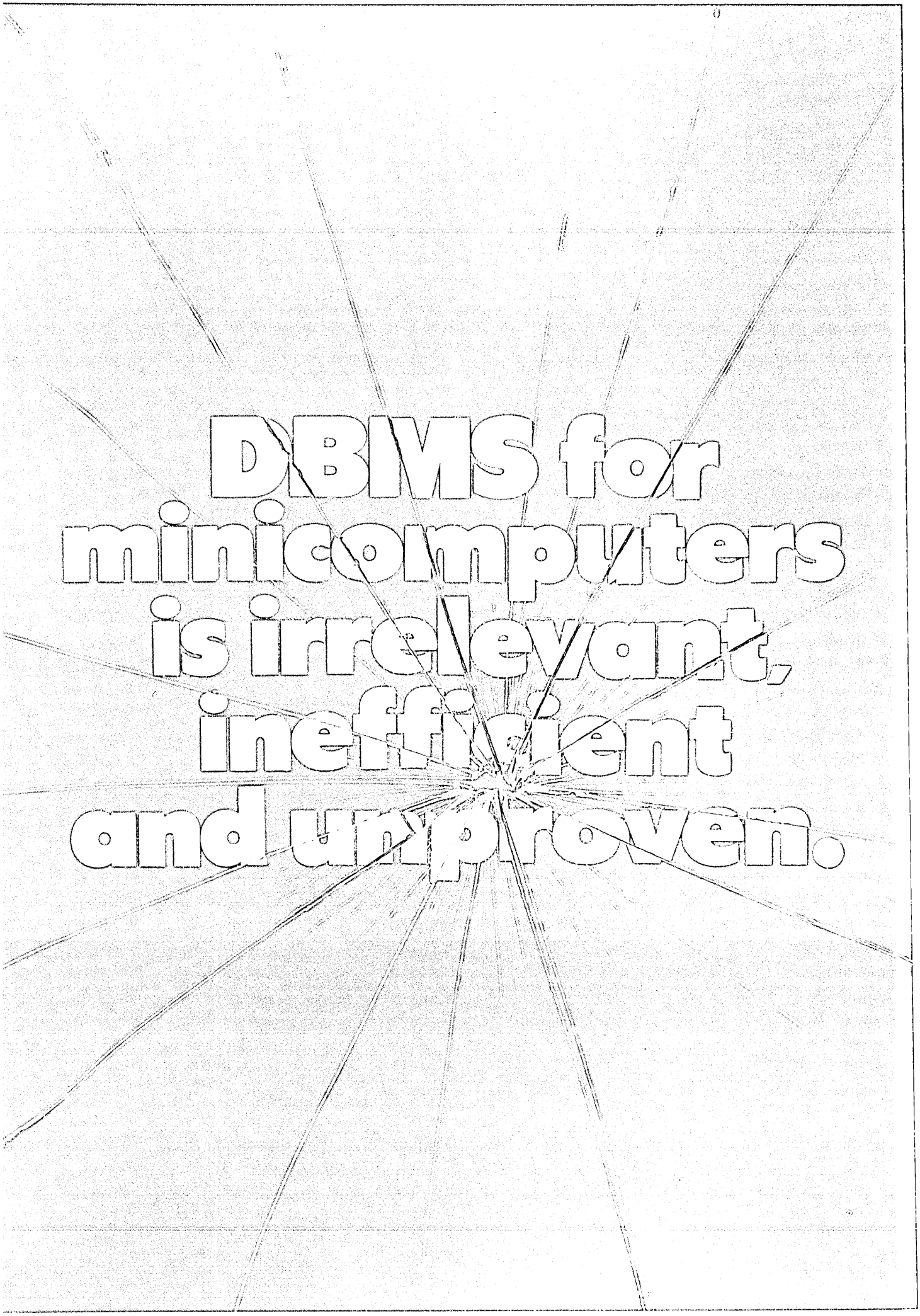
DBMS for
minicomputers
is irrelevant,
inefficient
and unproven.

INTRODUCING
Minicomputer TOTAL®.
The DBMS that shatters the myths.

For companies building minicomputer based systems, there's a fresh opportunity to design and implement integrated information systems right from the start.

But while the benefits of DBMS are well known, myths about its relevance on minicomputers may be leading you toward another kind of solution that's more cumbersome—and more costly. A choice that could eventually paint you into a corner.

So the first step in building your minicomputer based system is to tear down the myths about DBMS. Myths that have been shattered by Cincom's Minicomputer TOTAL.

Myth #1. DBMS is for mainframes, not minicomputers.

While DBMS did grow up with mainframes, it is rapidly becoming the data management standard for today's commercial minicomputer applications. That's because the complexity of the data management problem bears little relationship to the size of the processor. And for your sophisticated applications, only Minicomputer TOTAL provides the power and flexibility you need for today—and as you grow.

Myth #2. Data base management systems for minicomputers require too much overhead.

This may be true of other DBMS's, but not TOTAL. Minicomputer TOTAL has the lowest overhead requirements of any DBMS in the industry, making it the most efficient system available. Its powerful design minimizes I/O, memory requirements, and disk space, which gives you the benefits of a DBMS—while reducing your hardware costs.

Myth #3. There is no proven Minicomputer DBMS.

Operating successfully at more than 1200 minicomputer installations worldwide, Minicomputer TOTAL has been proven in use. Introduced in 1977, it has been refined and perfected to become the most widely used minicomputer data base management system available.

The TOTAL approach.

Minicomputer TOTAL's blend of power, performance, and efficiency is what makes TOTAL so unique.

With TOTAL's powerful data structuring capabilities, you can choose hierarchical, network, or multi-keyed access. This flexibility enables you to build the simplest to the most sophisticated information system. And that's important to your evolving needs.

TOTAL's flexibility and power also means it is easier to learn and use than any other Minicomputer DBMS. Data base design and application programming can be mastered after only two days of technical training. The result: faster implementation and higher productivity.

In addition, TOTAL is the most portable minicomputer DBMS. Only TOTAL offers horizontal data base portability across 18 different minicomputers while providing vertical compatibility to Series 80 TOTAL in the mainframe environment. This unique benefit allows you to (1) develop applications centrally and distribute them to users with different target minicomputers, and (2) lay a solid foundation for distributed data base.

Minicomputer TOTAL's unique combination of power, efficiency, ease-of-use, and portability enables you to build the flexible information system you need. So if you're building a minicomputer based information system, you can't afford to overlook TOTAL.

If you're presently working with or considering... DIGITAL PDP-11 or VAX, HONEYWELL Level 6, IBM System/3 or 34, PRIME 150 through 750, PERKIN-ELMER (Interdata) 7/32, 8/32 or 3200 Series ... you can use TOTAL now.

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Reserve a seat at one of 11 seminars to be held in major cities during April, May and June, or for immediate action–
Ask for Max Biller.
OEM's ask for Harold Daniels.

Cincom Systems, Inc.
Minicomputer Products Division
2300 Montana Avenue, Cincinnati, Ohio 45211

CIRCLE 24 ON READER CARD

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It wouldn't take much of a fire near your computer room to raise room temperature to 150° or relative humidity to 85%. Both are critical figures, however, because at either point, magnetic media can be damaged or destroyed. Without "input", you can't have "output".

But a Diebold Data-Safe can help protect input . . . and your tomorrows. It's been tested and has been listed with Underwriters' Laboratories for its ability to shield essential media from destructive temperature and humidity . . . Unlisted containers are untested.

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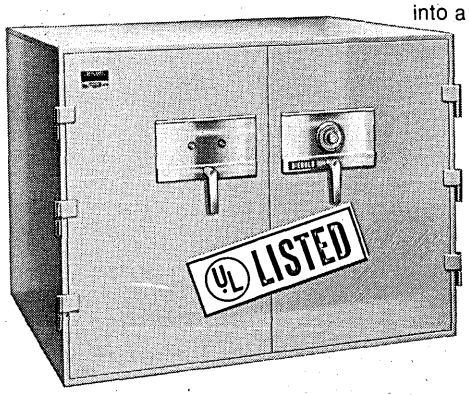

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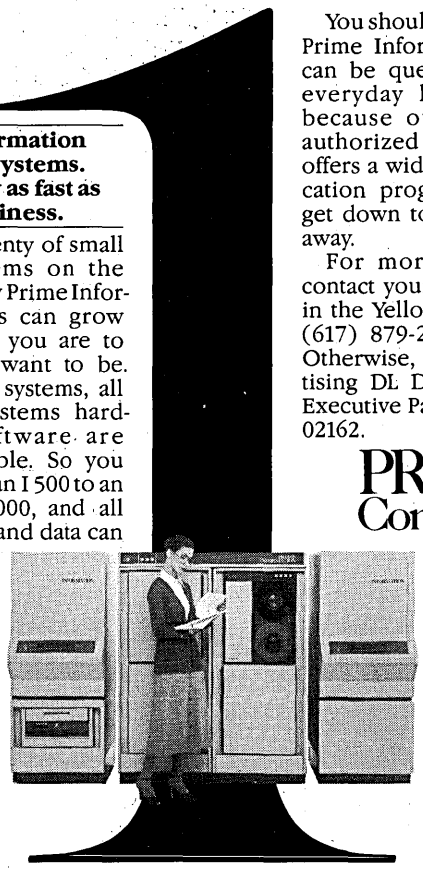

CIRCLE 25 ON READER CARD

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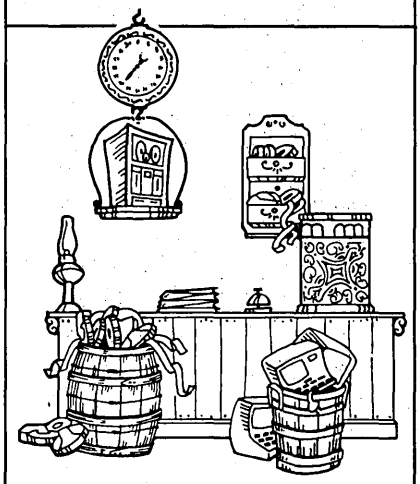

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LETTERS

STILL SQUEEZING

Re: "Squeezing More From Dp" (Jan., p. 121), Mr. Bearley describes a nonprocedural implementation focused primarily, if not exclusively, on the advantages of such an implementation. As an economic pragmatist interested in nonprocedural languages, I would like to mention an important disadvantage of nonprocedural systems. The resultant object code generated by a nonprocedural language processor will likely require some real memory or cause higher swapping ratios than the object code generated by a procedural language processor.

However, this disadvantage is not one which would preclude utilization of a nonprocedural language. This comment is to point out that a nonprocedural implementation does have certain negative aspects which must be considered in a trade-off decision.

Certainly, the personnel costs attributed to software development can be reduced (or not significantly increased) via a nonprocedural implementation. However, a projected decrease in hardware costs may not occur, since increased computing resources would be a very possible and logical consequence.

DOHN P. ADDLEMAN
Infodata Systems, Inc.
Falls Church, Virginia

APT APL

Re: "Advanced Commercial Applications in the '80s" (Nov. 25, 1979, p. 104), the articles painted a very strange picture of computer programming in the '80s. All the articles saw the '80s as an extension of the '70s. Rather than taking a fresh perspective on computing, they all accepted the status quo, i.e., they accepted complexity as a way of life.

Yet is there really any need for such complexity? For the sake of argument, I list below the steps toward solution.

- Massive training and retraining of personnel
- Increased operational system software in advanced applications
- Recognition that programing is more a science than an art
- Use of higher level languages
- Use and investigation of programming tools

All these steps involve trying to reduce complexity, rather than examining whether this complexity is needed at all. A computer language surely has the opportunity to be far more logical and simple than the complexity that has arisen in the different tongues around the world. A language is constituted by the fact that it has a distinctive vocabulary—a set of "primitive ideas" or "basic concepts"—and a "syntax," a set of rules for "translating" the sentences of the language into other sentences, either within or outside the language.

So why should a universal computer language not exist, based on these principles, and on a simple notation easily understandable by the computer? After all, a universal music language already exists. In fact, such a question is rhetorical. A universal computer language does exist. It is APL, and the use of APL in the '80s may well be the single most important factor contributing to the use of the computer as a tool. Yet there was not a single mention of APL in the various articles.

The age of the computer "chauffeur" is over. End users and dp professionals alike could be using APL to program the computer in the '80s. Not in all cases, but in at least the majority of cases where the matter in hand is for management support purposes, rather than operational purposes. It will certainly not be a case of providing *information systems* for management.

What will be provided are raw data and APL functions, and management will then exercise their inalienable right to do their own processing. The technical sand pit provided for technicians to play in will actually start coming up with the goods. If any evidence is needed to support such a view of APL, then the growing numbers of APL-based microprocessors surely provide enough.

It will not be surprising if it is APL rather than the microchip that changes business in the '80s and provides a completely new perspective on business processes.

A. CAPLIN
Croydon, Surrey,
England

The article ignored the two movements that I believe will be the most important facts to happen in the data processing community in the coming years. These are the shift away from traditional procedural languages in professional computer programming and the emergence of direct computer usage by non-dp technical people in financial, accounting, personnel, sales, corporate, and other similar business offices.

In the '70s, we witnessed dramatic improvements in data processing hardware performance, while the ability to implement computerized applications remained practically unchanged. As long as batch processing was the main mode of dp operations, the pressure to replace conventional languages was relatively soft. With the advent of on-line processing, increasing programming productivity becomes a pressing necessity. With on-line, new expertise is needed and programmers and managers face the problems of working tools that are no longer adequate. Although the elimination of conventional code is many years away, more and more dp implementation departments are adopting application development systems that greatly facilitate programming and eliminate the need for procedural code in both on-line and batch computer applications.

The cost of putting a terminal in front of a person has constantly decreased in the most recent years and will continue to drop in the immediate future. This fact, combined with the increasing awareness in end-user departments of computer power, is fostering an all-new arena of one-time analysis, reporting, and file/data base interrogation applications which are implemented by non-dp professional users.

By 1986-88, I expect programs originally written in a traditional procedural language to be the smallest piece of most applications and occasional users to be the biggest users of data bases.

DR. MICHAEL A. AMADIO
Senior Market Analyst
Informatics Inc.
Canoga Park, California

GAP CLOSED

Re: "The Productivity Gap" (Dec., p. 131), as a project leader in a shop with too few people for many jobs (where a large number are maintenance), I am interested in ways to better manage resources. I have found that careful, well-documented analysis is the best antidote for excessive maintenance. Sometimes, it is difficult to convince management that this attention is warranted as they will not see "programs"

as fast as for the projects without detailed analysis.

Please continue to include more articles similar to this one. I am one of many dp professionals who uses the hardware chosen by someone else. I concentrate on ensuring that I have a thorough understanding of the application area and ensuring that the software to be developed and maintained is correct. It would also be very helpful if you include references on the articles so that people may learn more about the techniques used.

BARBARA ROBERTSON
St. Regis Paper Co.
New York, New York

MUSIC REVIEW

Re: Source Data, (Feb., p. 178), to our surprise and delight, we found a review of *Creative Computing*'s recording of the First Philadelphia Computer Music Festival. To our surprise and dismay, we noted Mr. Froehlich neglected to mention our address, phone number, and price. While the review was not overly favorable, we would like to think that among your readers are a few "gadget worshipers" who might like to have this information. By the way, the price of the album is $6 and our address and phone are: P.O. 789-M, Morristown, NJ 07960, (201) 540-0445.

NANCY WOOD
Creative Computing
Morristown, New Jersey

MURMURS ON BUZZ

Re: "Buzzwords Revisited" (Jan., p. 159), Werner Frank announced the demise of the term "application generator." Specifically, he notes, "It is not clear, however, how this Application Generator can be moved toward production of complex transaction systems and achieve individualized results. The concept will probably slide into disuse." American Management Systems first developed an application generator over five years ago. Generation 5 is currently being used in over 200 applications for some 80 of our clients (25 of whom have installed Generation 5 on their own computers). AMS has seen a 50%-70% decrease in development and maintenance costs over COBOL using Generation 5.

While we have only recently begun marketing this product for general use (up until now, it was used by our service bureau and consulting staff in developing systems for our clients), and thus do not claim that the term "application generator" is fully accepted, we believe that it is a highly significant concept taking an evolutionary step from procedural languages and even parameterized languages. We also note that IBM has begun to use a similar term in describing some of their latest products. While the term application generator is "low profile," it is highly likely that it will "still make it" as one of the major software development advances of the 1980s.

JERROLD GROCHOW
American Management Systems, Inc.
Arlington, Virginia

Frank's comment that "Problem oriented languages have been unsuccessful" is a puzzle. Each compared individually with procedure-oriented languages, perhaps. But as a group? No doubt you recall COGO, STRESS, and STRUDL. Are they gone? How about "Query by Example"? Our own problem-oriented language, Table Producing Language (TPL), has been acquired by over 200 installations around the world and is now in its fifth version.

The difficulty with assessing the extent of problem-oriented languages is that, by definition, each is focused on a single problem, usually narrowly defined, which most computer users do not have. As a result, compared with the widespread application of general-purpose, procedure-oriented languages, the ratio of users to language is no doubt much smaller in the case of problem-oriented languages. Taken as a group, we might be surprised at their extent.

RUDOLPH C. MENDELSSOHN
Assistant Commissioner
Systems and Standards
U.S. Dept. of Labor
Washington, D.C.

POINTS OF LIGHT

Re: "Grassroots, Micros, and Papal Visits" (Dec., p. 175), what a delight to see a personal touch in DATAMATION. Just imagine: an army of volunteers and loaned minicomputers to welcome John Paul to mid-America. John Paul does bring out the best in us. Let's keep this spark alive.

LAWRENCE V. HAMMEL
Administrative Coordinator
Forecasts/Monitoring
Tri-State Regional
Planning Commission
New York, New York

HUMOR INTACT

Many years ago (circa unknown) DATAMATION printed an article discussing an input/output device and all of its characteristics. The device turned out to be a mailbox. Readers no doubt enjoyed reading that article as I enjoyed reading the "Storage Medium" in the Forum section of the February 1980 issue. It appears that along with taxes our humor hasn't changed either.

LINDA C. NELSON, Director
Cooperative Education Program
Skagit Valley College
Mount Vernon, Washington

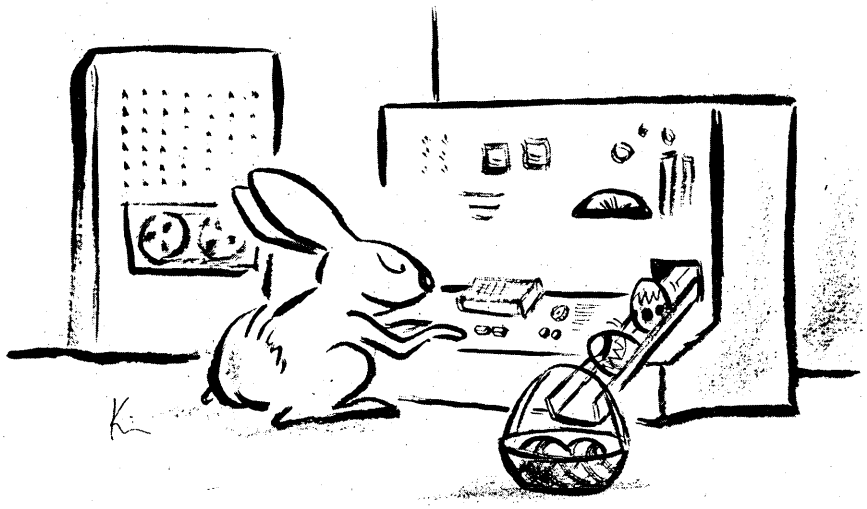
CORRECTIONS

Re: "The Disk Revolution" (Feb., p. 147), the transparent videodisk shown in the photograph is actually made of vinyl, not, as the caption stated, thin glass coated with special resin. The resin/glass description fits the master from which the final product is stamped.

Re: "Planning for Growth" (Dec., p.184), on p. 184, the correct computer should be 3031 instead of 3301; on p. 186, the correct number should be 4341, not 4351.

Re: "Ears For The Oem Market" (Dec., p.70) Pauses between words in commercial voice recognition systems are typically one-tenth of one second, not ten seconds, as quoted in the article.

Re: "One Year Later" (Aug., p. 61): Modutest manufactures Mod 9 computers as a hardware and software compatible replacement for the original Sigma 9 computer. It does not have a marketing agreement with Telefile Corporation. ✲



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It's color. It's a self-contained computer. It's only $3300.* And it's as close as a phone call.

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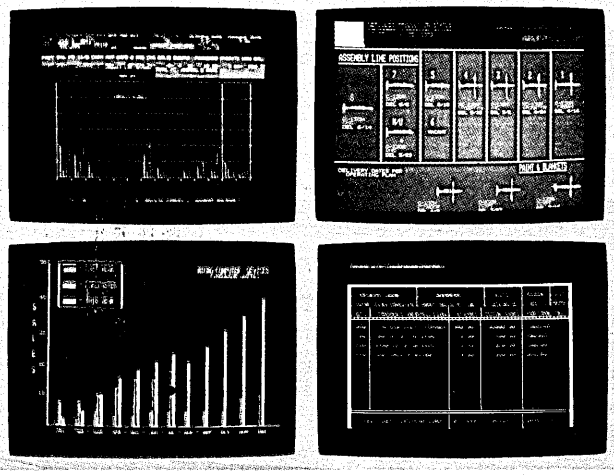
The 3621 is ideally suited for distributed processing. Standing alone or used on-line with another system, it can provide up-to-the-minute data on everything from inventory to personnel. In 8 dynamic colors that speed comprehension and increase user efficiency.

The system includes 32K RAM for user workspace, and a built-in micro-disk drive that uses specially formatted Sof-Disks™ with 51.2K bytes of storage per side. Optional separate disk drives can add up to 26M bytes of memory. Also available is an X-bus interface for any number of peripherals.

A BASIC interpreter and FORTRAN compiler, both standard, give a choice of two powerful languages. As an option, users may specify special graphic characters of their design.

Intecolor's 3621 is made for maximum flexibility – from its unique file handling capabilities to the deluxe built-in keyboard with color and numeric clusters.

See for yourself how it can address complex applications and improve your operation. Contact your ISC sales rep today, and put color to work for you. **Color Communicates Better**



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CIRCLE 26 ON READER CARD

"Let me send you my newest recommendations on how to PUT AN END TO POWER-RELATED COMPUTER PROBLEMS"

Says Emil Rechsteiner, President of Frequency Technology, Inc., Makers of ISOREG™ Computer Power Modules.

UNSTABLE AND ELECTRICALLY "NOISY" POWER LINES CAN MAKE A SHAMBLE OF YOUR COMPUTER OPERATIONS!

Voltage Spikes (very high over-voltages lasting milliseconds or less) can scramble your computations, wipe out stored data, alter programs and even destroy computer circuits. *Brown-Outs* can wipe out stored data, turn your computer runs into disasters and can paralyze your equipment—perhaps even your business, maybe at the worst possible moment! *"High" Line Voltages* can overheat and quickly burn out your computer circuits, causing bothersome interruptions and costly repairs.

Sounds like a nightmare? Indeed, unstable and electrically noisy power lines *are* nightmares to all who depend on computers!

What to do?

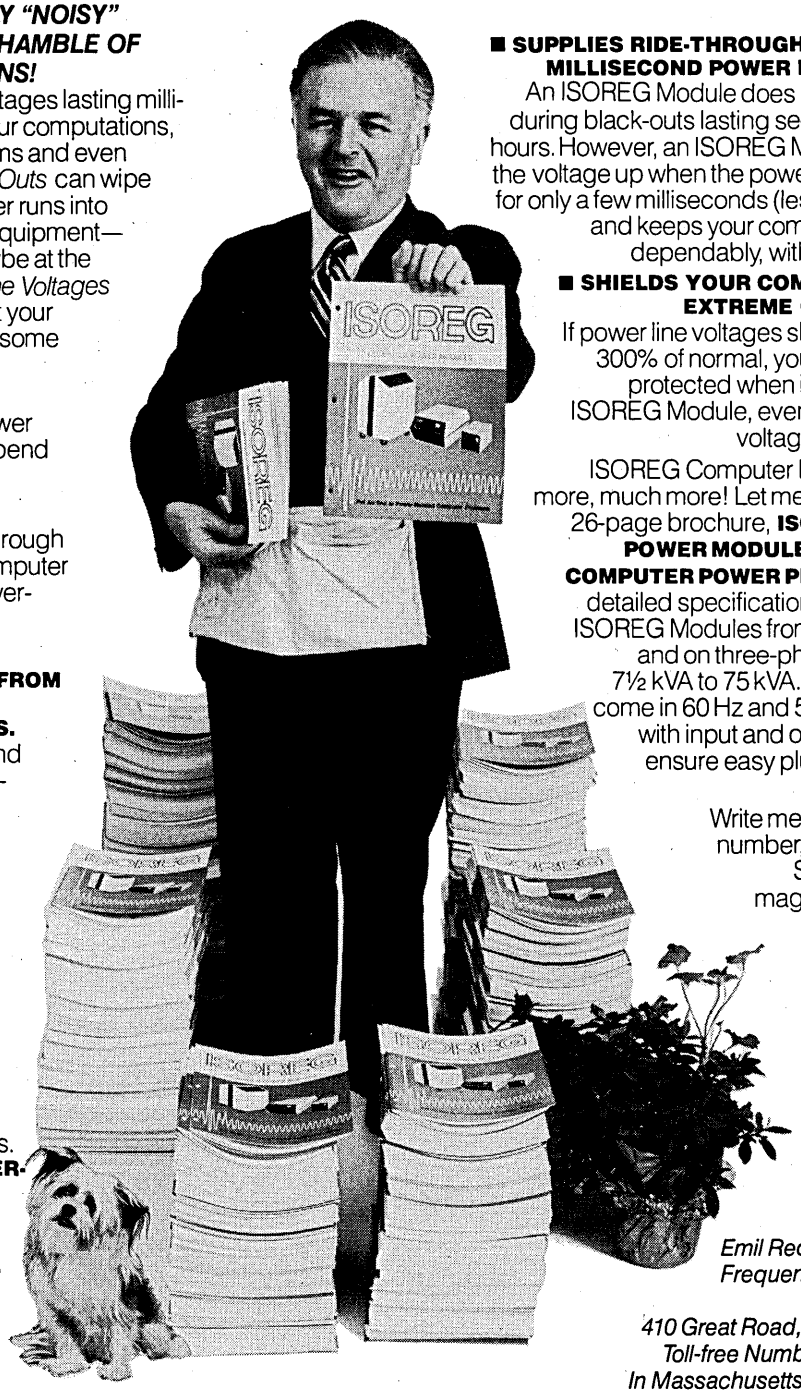
Supply power to your computer through an ISOREG Module. ISOREG Computer Power Modules put an end to power-related computer problems!

An ISOREG Computer Power Module:

■ **ISOLATES YOUR COMPUTER FROM UTILITY POWER AND SCREENS OUT VOLTAGE SPIKES AND DIPS.** Even spikes of a thousand volts and more are cut down to levels imperceptible to the computer.

■ **REGULATES COMPUTER VOLTAGES WITHIN TIGHT ±½% LIMITS EVEN WHEN LINE VOLTAGES DROOP TO 75% OR SURGE TO 115% OF NORMAL.** If utility voltages fluctuate between "too low" and "too high," an ISOREG Module *automatically* supplies the correct voltage to your computer. You make no adjustments whatever; the ISOREG Module operates unattended, dependably, for years.

■ **KEEPS YOUR COMPUTER OPERATING DURING BROWN-OUTS** If your utility voltage stays 25% below normal for minutes, hours or even days, an ISOREG Module *automatically* raises the voltage to the correct level and keeps your computer operating dependably, even when you cannot depend on your utility power.



■ **SUPPLIES RIDE-THROUGH POWER DURING MILLISECOND POWER INTERRUPTIONS.** An ISOREG Module does *not* supply power during black-outs lasting seconds, minutes or hours. However, an ISOREG Module *does* keep the voltage up when the power line goes "dead" for only a few milliseconds (less than a full cycle) and keeps your computer operating—dependably, without missed digits.

■ **SHIELDS YOUR COMPUTER AGAINST EXTREME OVER-VOLTAGES.** If power line voltages shoot up to 200% or 300% of normal, your computer is fully protected when it is powered by an ISOREG Module, even if such excessive voltages last for minutes.

ISOREG Computer Power Modules do more, much more! Let me send you our new 26-page brochure, **ISOREG COMPUTER POWER MODULES PUT AN END TO COMPUTER POWER PROBLEMS.** It offers detailed specifications on single phase ISOREG Modules from 250 VA to 25 kVA and on three-phase Modules from 7½ kVA to 75 kVA. ISOREG Modules come in 60 Hz and 50 Hz versions and with input and output voltages that ensure easy plug-in convenience around the world!

Write me, or call our toll-free number, or use the Reader Service Card of this magazine to obtain our new brochure, free.

Emil Rechsteiner, President
Frequency Technology, Inc.
TDC Division
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Toll-free Number: 1-800-225-5078
In Massachusetts Call: 617-486-3539
TWX 710-347-6974

CIRCLE 172 ON READER CARD

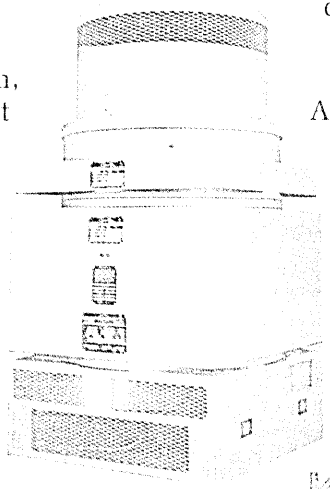
How do you explain a brownout to a computer?

The same way you explain the other unpredictable line anomalies found in today's commercial power. You don't.

There is an answer, however, to this rapidly growing problem.

A Kato motor-generator set. It delivers a constant supply of clean, accurate power so you can ride out sudden voltage fluctuations that often shut down systems needlessly. In fact, you can continue operations indefinitely, despite voltage reductions of 20% or more.

And because an M-G set is the only method that provides total load isolation, you're fully protected against harmful spikes that result in costly, often untraceable computing errors.



Kato Engineered M-G sets do the job with energy saving efficiency and low maintenance requirements.

They're rugged, too. Our conservatively designed units withstand severe overloads that would destroy a solid-state device in seconds.

Ask us about the cost-advantages of using a Kato motor-generator set in your operation. We'll draw on our 50 years of experience in meeting your power conversion needs. Call Kato Engineering Company, Mankato, Minnesota 56001. (507) 625-4011.

CIRCLE 27 ON READER CARD

KATO Engineering

TANDEM Nonstop™ PATHWAY

NOW ON-LINE'S AS EASY TO PROGRAM

On-Line Programming—25 to 50% cheaper. User developed on-line applications packages just got a whole lot easier. And better. Not to mention 25 to 50% cheaper. We've eliminated all the time-consuming grief of dealing with terminal handling characteristics for one. And not incidentally, there's even greater protection in data base integrity, too.

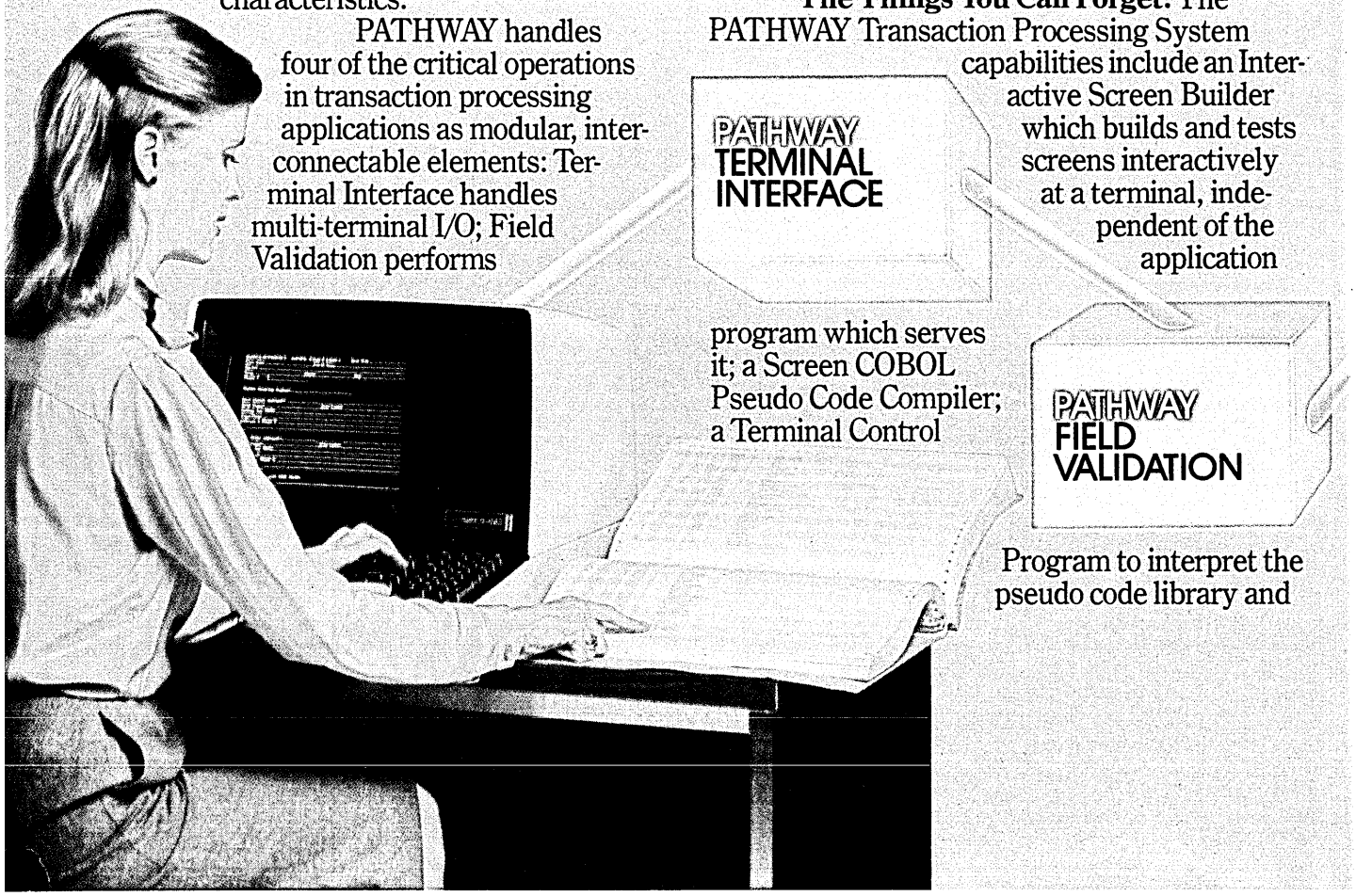
PATHWAY has all the programs, procedures and structures you need to get your applications up and running, in NonStop™ operation, in record time. Inexpensively.

Terminal Independent Applications. By taking the on-line programming task on in component parts rather than attacking it as an all-encompassing, monolithic whole, PATHWAY software makes the transaction processing system job relatively simple, and frees the application programmer from concern over terminal characteristics.

PATHWAY handles four of the critical operations in transaction processing applications as modular, interconnectable elements: Terminal Interface handles multi-terminal I/O; Field Validation performs data consistency checks; Data Mapping controls data conversion and formatting; and Transaction Control covers application and transaction flow. Each resource is partitioned, with well-defined interfaces between them. This is the secret to a modular systems' success. It allows optimized utilization of all the resources and permits additional resources to be dovetailed into the system as needed—without rewrite, without redesign and without degrading system performance.

We Speak Your Language. When it's time for the fifth operation—interaction with the data base—a Data Base Application Program can communicate in any of the languages available on the Tandem NonStop™ System: industry standard COBOL, FORTRAN, MUMPS, or our own transaction-oriented language, TAL, all facilitated by Tandem ENSCRIBE to interact with the Data Base management capabilities.

The Things You Can Forget. The PATHWAY Transaction Processing System capabilities include an Interactive Screen Builder which builds and tests screens interactively at a terminal, independent of the application program which serves it; a Screen COBOL Pseudo Code Compiler; a Terminal Control Program to interpret the pseudo code library and



AS BATCH.

check the flow and content internally; the Applications Monitor which has power to create, track and alter the application run time environment; and finally the Application Monitor Control Language which lets an operator communicate with an active Application Monitor. It's a powerful system, easy to use and inexpensive. With everything you need to get your on-line transaction applications up and running, with all the benefits of a NonStop™ System, in record time.

Dynamic Load Balancing. It comes from taking logical advantage of the multiprocessor environment. There is no need for the programmer to consider load balancing with the PATHWAY Transaction Processing System. It's handled automatically; with additional copies of PATHWAY applications started in designated CPUs as needed. And deleted when no longer required. Dynamic load balancing—built into the system's resource management capabilities.

PATHWAY DATA MAPPING

And PATHWAY software also takes full advantage of the unique multi-page storage capabilities built into our new 6520 terminal.

Because terminal mapping translates physical into logical characteristics, programmers can forget about code signal conversions and call on terminals by name. And there's one more major advantage of the PATHWAY Transaction Processing System: one system can be used for convenient development, testing and production of application packages.

PATHWAY TRANSACTION CONTROL

The Tandem NonStop™ System. Even when it wasn't this easy, it was miles ahead in the on-line world. With immediately available alternatives in all hardware and software elements, the NonStop™ System can go right around any failed element and never skip a beat. Even when a failure occurs in a processor, an I/O Channel, a disc, or a disc controller. Remarkable.

This is the one system in the world which lets you start with only the computing power you need right now and add as your needs grow, in low cost modular elements. From an entry level two processor system, you can go to sixteen processors with thousands of terminals and not lose one cent on your original investment.

Protection From Loss. Because of its unique parallel operation at all critical points, no transaction in process is ever lost or duplicated. The data base and programs in operation can be readily duplicated, hence completely protected from damage or destruction.

RECORD IN RECORD OUT DATA BASE SERVICE

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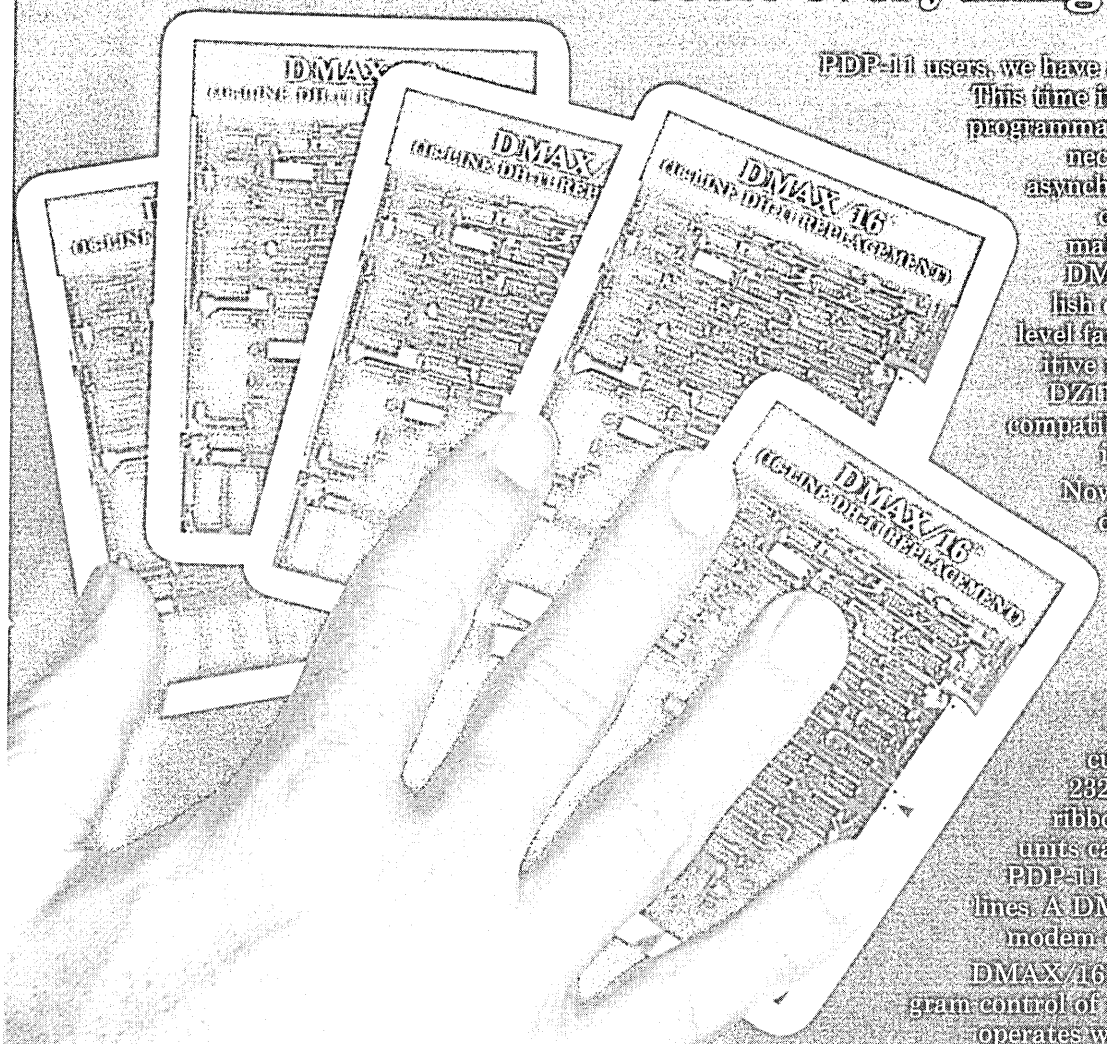
One call does it all.

CIRCLE 29 ON READER CARD

Our Wildest Card Yet

A programmable 16-line multiplexer that beats everything in its class*

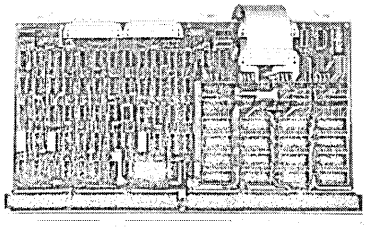


PDP-11 users, we have another winner for you. This time it's DMAX/16™, our new programmable multiplexer for connecting your PDP-11 to 16 asynchronous serial communications lines. DMAX/16 makes the most of the 11's DMA capabilities to establish computer overhead at a level far below that of competitive units like the DJ11 and DZ11. It also offers software compatibility with the DH11 ... in one-fourth the space!

Now, for the first time, you don't need an expansion box or special backplanes. DMAX/16 consists of two hex boards which install easily into standard SPC slots and connect to the current loop or EIA/RS-232 panel by separate flat-ribbon cable. As many as 16 units can be placed on a single PDP-11 for a total of up to 256 lines. A DMUX/16™ option allows modem control for 16 channels.

DMAX/16 provides complete program control of the lines, each of which operates with several individually programmable parameters, such as character length and number of stop bits. Parity generation and detection are odd, even or none. The operating mode is half duplex or full duplex. Fifteen software programmable baud rates: 0 to 9600 baud — plus 19,200 baud — and an external baud rate. Breaks may be generated or detected on each line and the unit can echo received characters without software intervention.

Play the wild card now. You'll get top performance and a competitive price advantage of at least $1000 along with immediate response to your order. Write for details and find out why we consider ourselves the leader among manufacturers of DEC enhancements. Able Computer, 1751 Langley Avenue, Irvine, California 92714. (714) 979-7030. TWX 910-595-1729.



Able, the computer experts

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CIRCLE 300 ON READER CARD

*You will save half your bandwidth or run at twice the speed! Able does it again!

A shop without complete tape protection is working without a net.

For example, how far would your organization fall if a master file was scratched?

The UCC-1 Tape Management System solves the problem of tape protection. Completely. That's why it's the market leader, with over 1,300 installations around the world.

This software package effectively manages all your tapes, preventing the accidental loss or destruction of your valuable data. UCC-1 also eliminates costly handwritten records and the expensive mistakes they breed.

Working without a tape protection net may be daring, but is it worth the business risk? Call us toll-free at 1-800-527-5012 (in Texas, call 214-353-7312) or circle 31

And, why not ask us about:

A DOS Under OS System that lets you execute DOS programs without conversion (UCC-2). Circle 32

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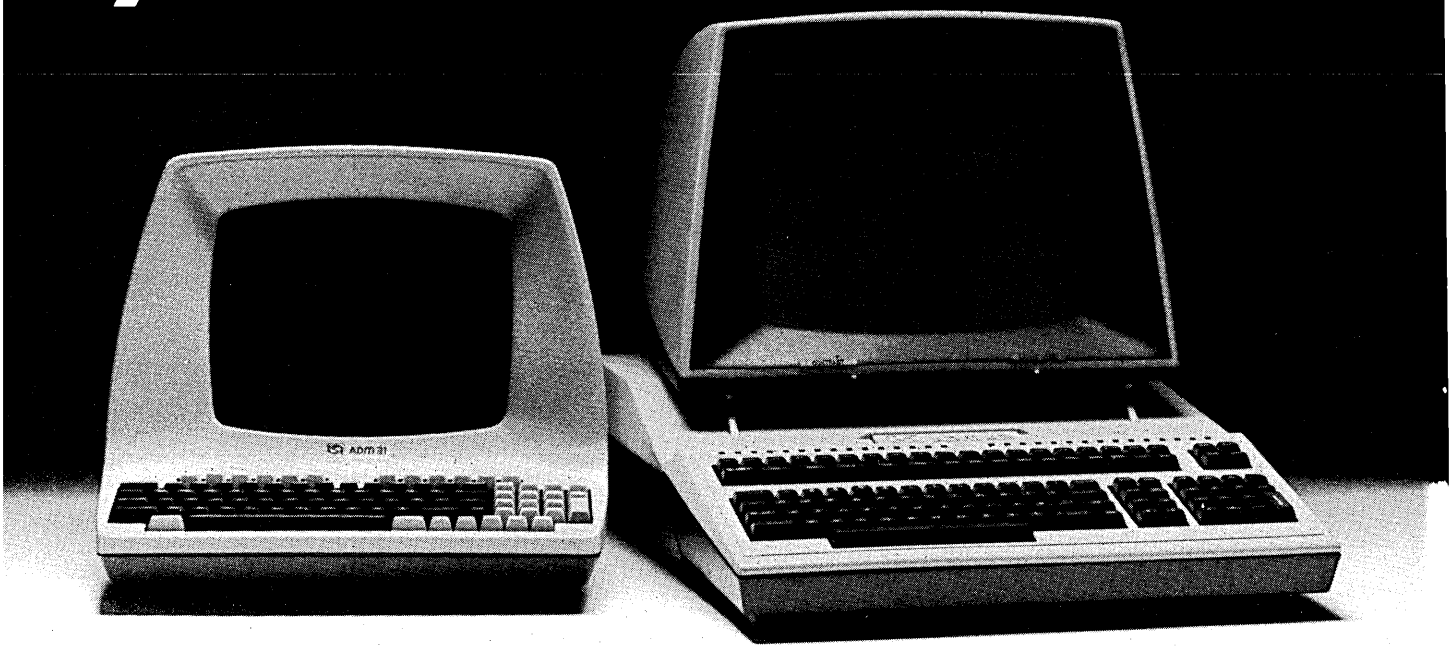
Lear Siegler brings you two steps closer to exactly what you need in a smart terminal.



PERSONALITY PROMS AND FACTORY ASSISTANCE MAKE USER-REPROGRAMMING A SNAP.

At Lear Siegler we've learned our lessons well.

We don't overpower you with the broadest line of terminals on the market.

That's not smart. You already have enough problems.

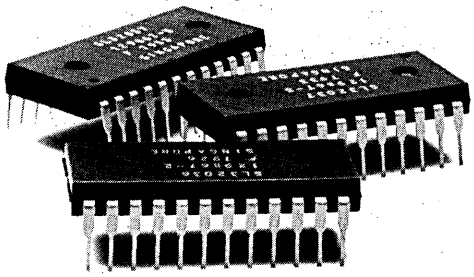
We have only two models, the ADM-31 and the ADM-42, in our line of smart terminals. But they can handle applications other manufacturers need an arsenal of terminals to accomplish.

The ADM-31 and the ADM-42 are so versatile, in fact, you can't make a wrong choice.

NOW YOU CAN TEACH YOUR TERMINALS HOW TO BEHAVE.

We understand how frustrating it can be trying to please everybody by including or leaving out specific capabilities. So we gave both our terminals user-programmable behavior modification.

ADM-31 and ADM-42 have firmware (the instruction sets inside their PROMs) that you can easily reprogram. So you end up with a terminal that's exactly what you want it to be.



And, if you run into problems our special Applications Engineering Staff will help you through any difficulties with reprogramming, interfacing, setting the terminal's personality, special applications, or understanding the features and functions.

THE ADM-31 AND ADM-42. TWO TERMINALS, DOZENS OF FEATURES.

We built the ADM-31 and ADM-42 with all the standard smart terminal features.

For instance, you get full editing capabilities. Reduced intensity for identification of protected fields. Blinking, blanking, and reverse video. Formatting. High resolution monitors. Even limited line drawing capabilities.

Both terminals include the latest in microprocessor technology. So both are reliable and, most importantly, easier to use.

Don't worry, we didn't forget to put function keys on either terminal.

With the ADM-42, for example, you get 16 function keys, shiftable to 32 functions and optionally programmable to store up to 64 characters per key.

SMART TERMINALS. SMART CHOICES.

So there you have it. Two very good reasons why you only need to look at two very smart terminals.

Sound interesting? Then call or write us at Lear Siegler, Inc./Data Products Division, 714 North Brookhurst Street, Anaheim, California 92803, (800) 854-3805. We'll tell all you want to know about the ADM-31 and ADM-42.

And then you'll see why your search for the right smart terminal just ended.

LEAR SIEGLER, INC.
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CIRCLE 170 ON READER CARD

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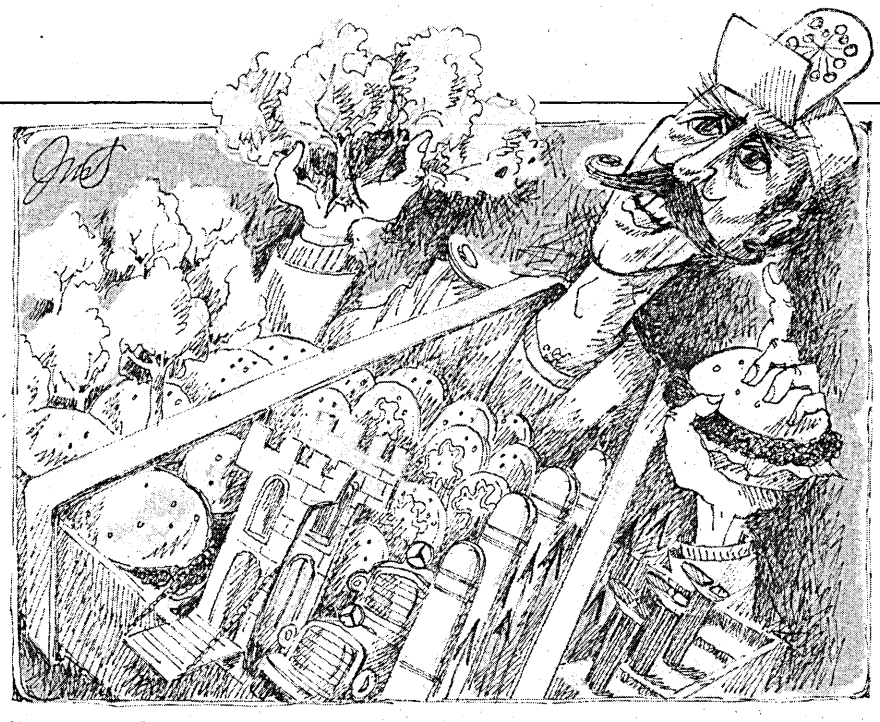
EDITOR'S READOUT



MELON IN FANTASY-LAND

Responding to an urgent phone call from our old friend, Persiflage Melon, noted management consultant and amateur ornithologist, we recently found ourselves entering his midtown Manhatten office in a state of bewildered anticipation. Melon had underscored the need for secrecy on the phone, disguising his voice by speaking through an argyle sock and using his code name of "Flipper."

Melon was nearly hidden by the object on his desk. Looking carefully at the minarets and battlements, we realized with a start that it was a beautifully detailed replica of the castle at Disneyland in Anaheim. But, instead of the gateway, there gleamed the familiar face of a crt and below it a standard ASCII keyboard.

We were speechless. Melon was not.

Rising angularly to his full height from the ornate Peacock chair that flared behind his desk, Melon exclaimed, "Behold the next innovation in computer architecture!"

Melon, we said, you've finally gone round the bend. That last trip to the coast was too much for your overheated brain. We suggest you take a Qualuude and call us in the morning.

"My boy," Melon said expansively, adjusting the lapels of his orange safari jacket, "your concern does you credit. But you have obviously failed to grasp the full significance of this little toy. This is no mere nod to computer kitsch. This is the wave of the future."

Pouring us a cup of coffee and pointedly ignoring our skeptical expression, he explained, "Haven't you noticed that all data processing products are pretty much the same? Every time IBM makes a move, a hundred companies produce a carbon copy. And if the technical differences are slight, the visual differences are virtually nonexistent. You can barely tell one terminal from another; if you've seen one cpu, or printer, or disk drive, you've seen them all. Bland, bland, bland.

"Therefore," he said, "a large mainframe manufacturer—who shall remain nameless—has retained my services to conceive of one dramatic stroke that will put them eons beyond their competition.

"Here," he said, pointing dramatically to the terminal with his fly whisk, "is the answer. Creative packaging has come to the computer industry! And look at these." He emptied the contents of a large cardboard carton on his desk. Hundreds of small models of computers and peripherals, in an incredible variety of shapes and sizes, cascaded across the teak surface.

"For the conservative banking industry," said Melon, arranging a tiny system. "You'll note the cpu and peripherals are garbed in a quality blue pinstripe. The machines rest on feet that are clad in tasteful wing-tip cordovans. And this distributed system for the forestry industry is a subtle reminder of organizational structure; the central cpu is in the shape of a mighty oak, the nodal computers are cute little shrubs.

"You might enjoy this tweed minicomputer, or one of my favorites for the fast food industry, a printer that is a precise replica of a Big Mac.

"And here," he said, proudly pointing a lean finger at a brightly colored set of models, "is my California collection."

Melon, we said. rummaging through equipment shaped like surfboards, palm trees, white Mercedes convertibles, the entire cast of Ben Hur, and the MGM lion . . . you've gone too far.

"Not at all," said Melon. "Not only is my client more than pleased, but he has asked me to take the next logical step—designing the decor of the entire computer room to match the equipment. The possibilities are endless."

While visions of dp shops that looked like Frontierland and Toad Hall lurched through our head, we drank some more coffee and absently munched a Girl Scout cookie.

You know, Melon, we said, it's just crazy enough to work.

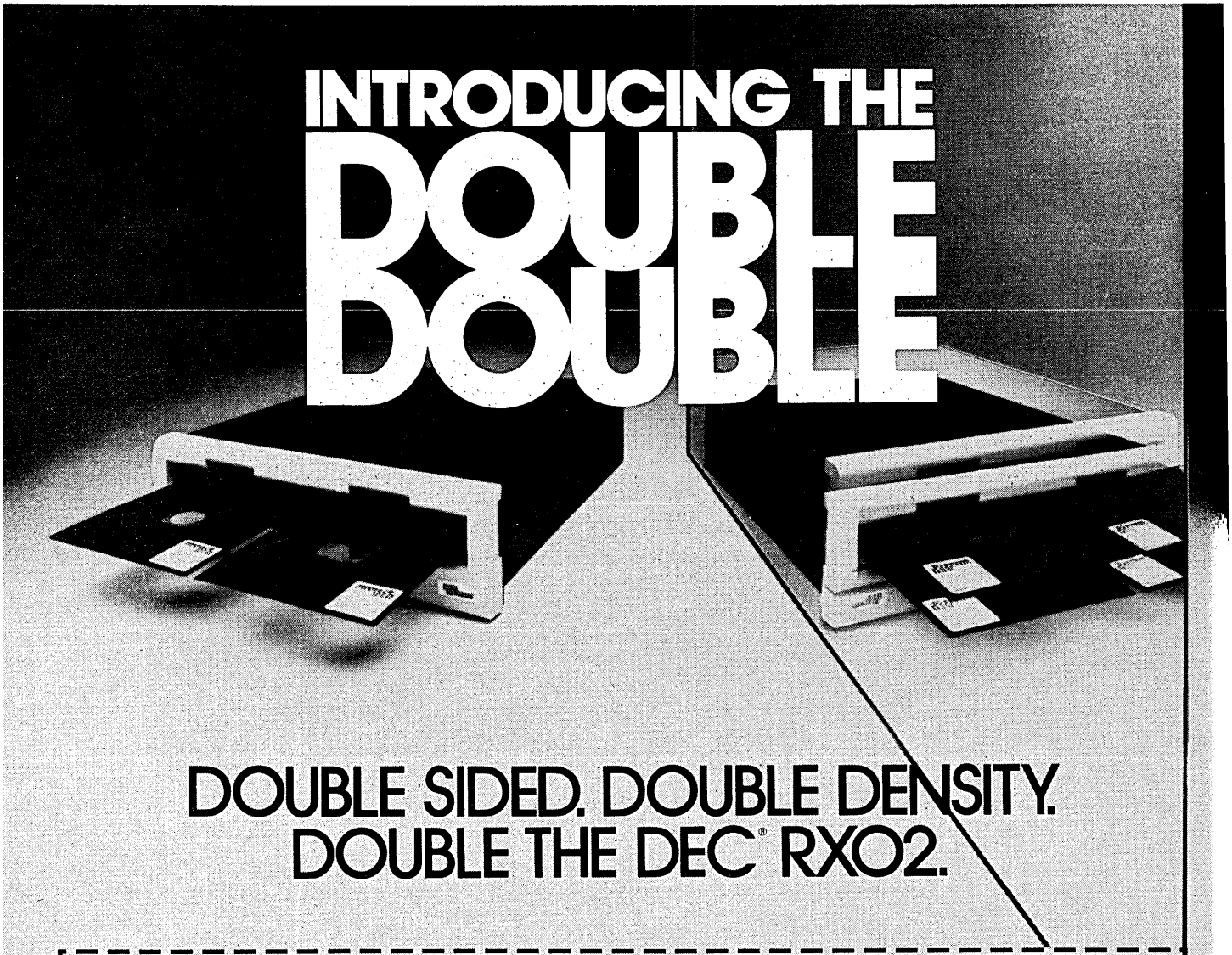
"I thought you'd come around," Melon said. "And just now you have inadvertently pointed up a problem that I must solve."

And that is? we asked.

"Making our products too realistic." he said. "You have just eaten a perfectly good disk pack." ✲

ILLUSTRATION BY HAL JUST

INTRODUCING THE DOUBLE DOUBLE



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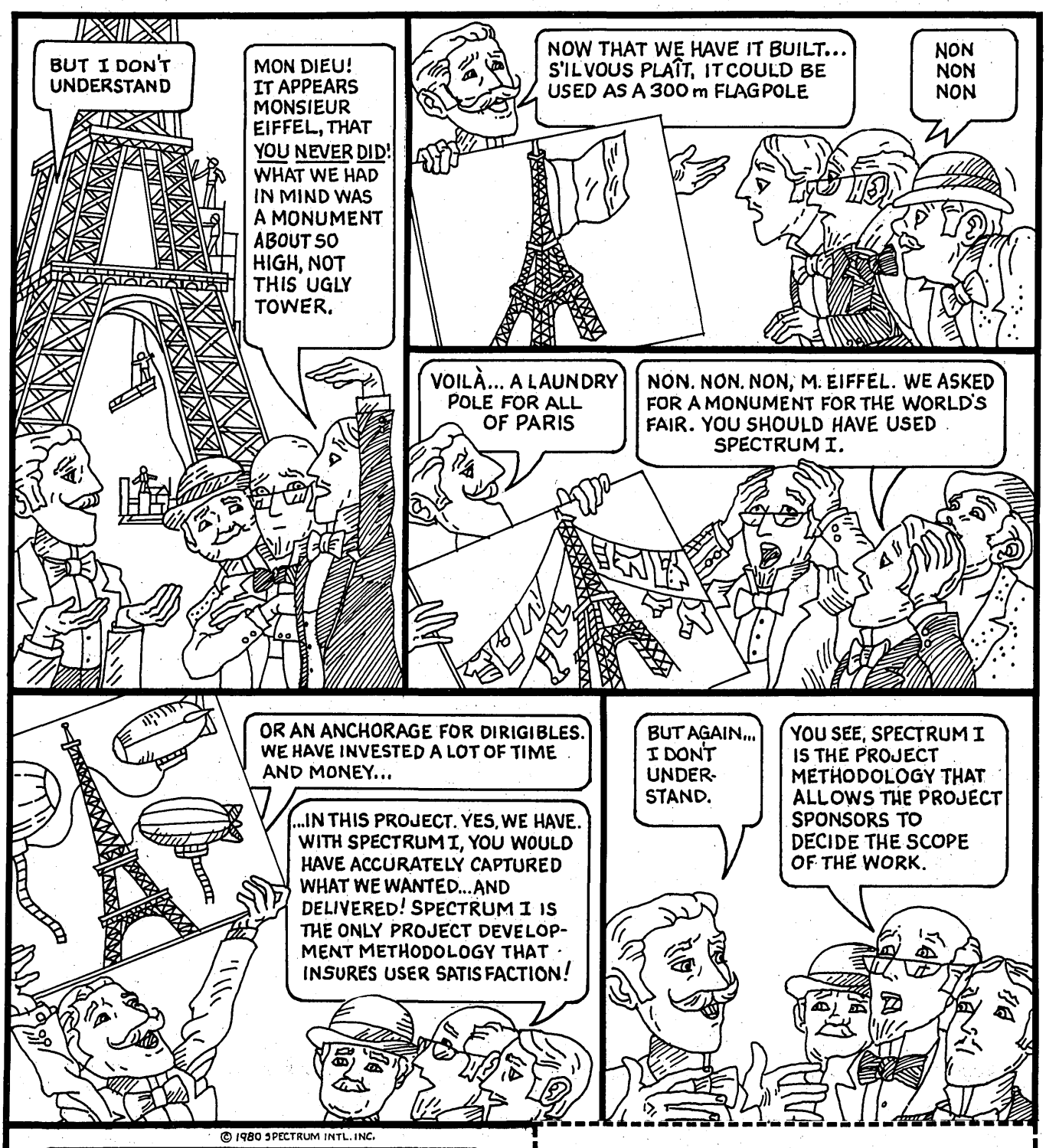

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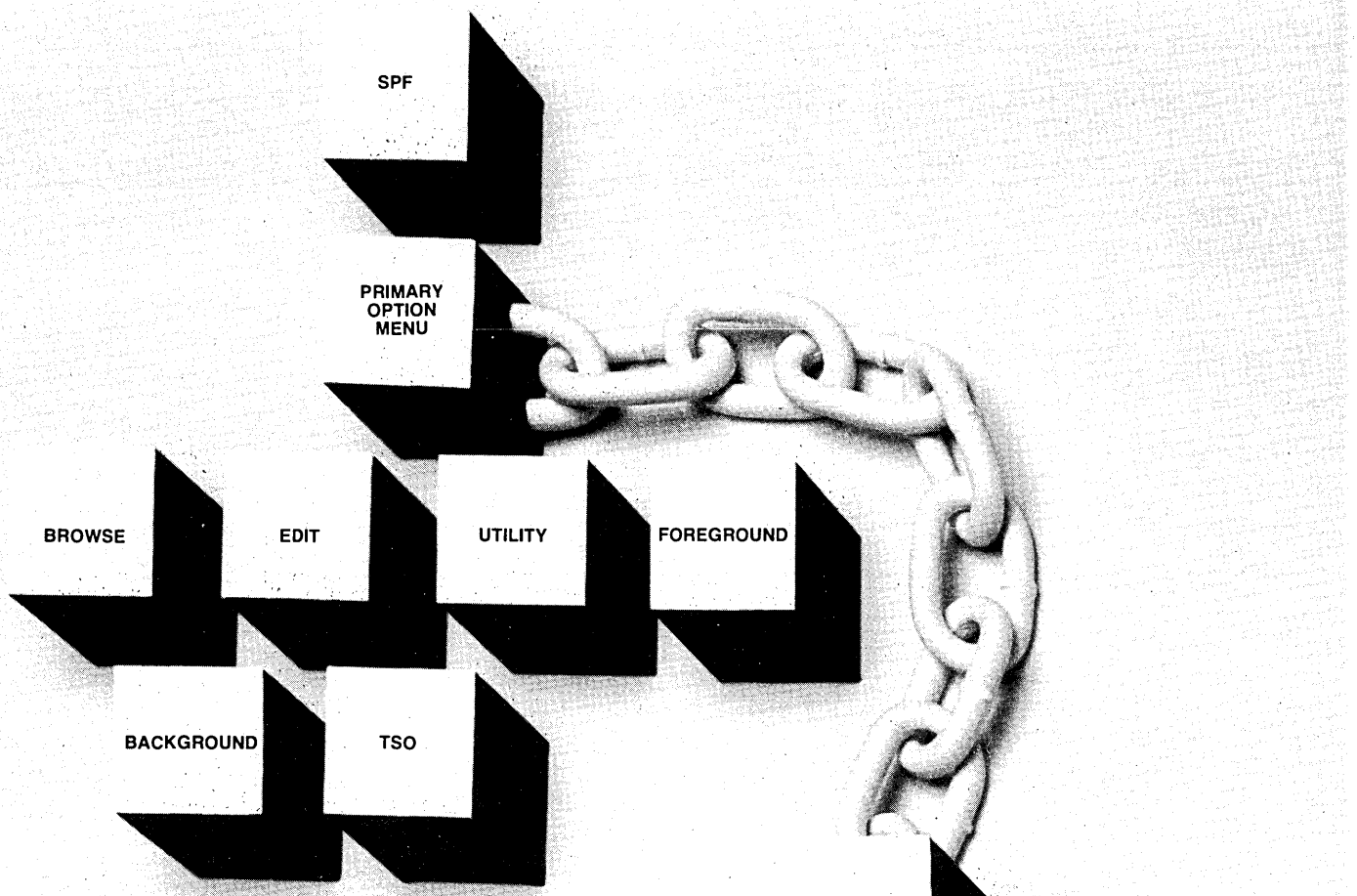

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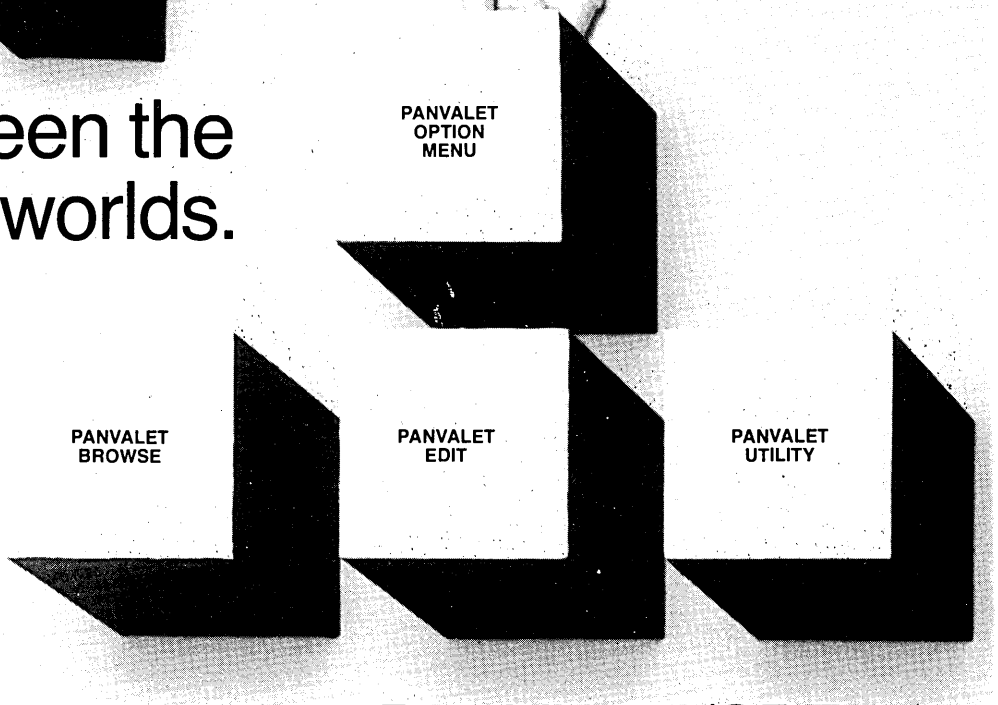

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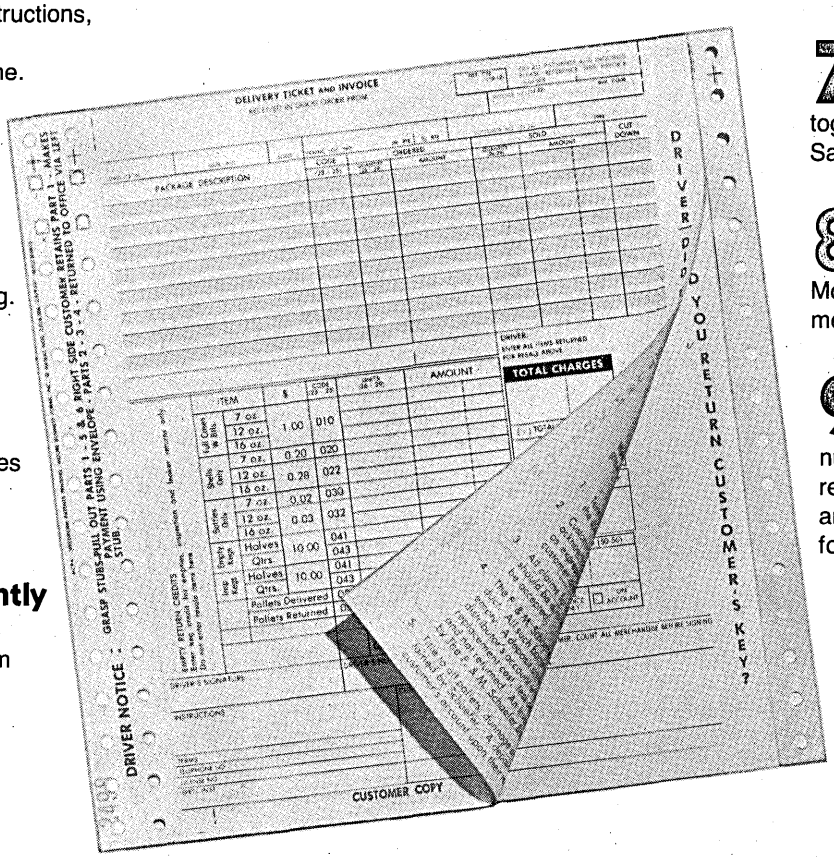

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WAITING FOR THE JUDGMENT DAY

In the second decade of the government's antitrust case, a look at what antitrust is and its implications for IBM.

ANTITRUST AND IBM

Antitrust decisions are not made in a vacuum. Congress, the economy, and plain old politics all play a part.

In June 1969, the top executives of IBM—the brothers Watson, Thomas and Arthur, and T. Vincent Learson—received an important memorandum from the company economist. A new outbreak of that virulent pestilence, antitrust, had been sighted.

The company was already infected in the form of a frontal antitrust battle with the U.S. Justice Department, which had filed a civil antitrust action against the company earlier that year.

The memo discussed a new antitrust development in the legislative area. A report by a Presidential committee on antitrust urged the passage of legislation aimed at breaking up firms in highly concentrated industries. While antitrust suits with the Justice Department had become something of a way of business life for IBM over the years, the so-called Neal Task Force on Antitrust Policy, named after its chairman, Phil C. Neal, then dean of the University of Chicago Law School, represented a new, potentially more dangerous threat to IBM.

"It would seem to me here," wrote IBM chairman Thomas Watson Jr. to an associate at IBM headquarters at the time, "this is one you and I ought to talk about and follow closely."

With traditional IBM efficiency, the company economist succinctly summed up the matter of the report on concentrated industries. "Its findings," he wrote, "will encourage government officials, Congress, the judiciary, and, perhaps most significantly for the longer run, 'informed public opinion' to equate market power and economic behavior with market share to an even greater extent than is true today."

The concentrated industry issue was a particularly sticky one for IBM because the Neal Task Force suggested that in any industry in which four or fewer firms accounted for 70% or more of the business in that industry, the dominant firms should be required to divest themselves of assets to reduce each firm's market share to no more than 12%. At the time, IBM's critics and indeed some of the firm's internal documents placed the company's market share of general purpose computer systems at 70%.

As far as the Neal report was concerned, however, there was a ray of hope for big companies in concentrated industries. The Neal report had been commissioned during the administration of Lyndon Johnson, and when the report was released, the new administration of Richard Nixon had no comment on it.

Such matters can be important, if not crucial. Not only did the Nixon Administration go on to oppose any new efforts at antitrust reform, but Richard Nixon personally was opposed to many antitrust efforts in his own administration's Antitrust Division. (In the celebrated Watergate tapes released by the U.S. House Judiciary Committee, Nixon didn't mince any words when discussing his Antitrust Division and its chief, Richard McLaren. "The problem is McLaren's a nice little fellow who's a good little antitrust lawyer out of Chicago," said Nixon. "Now he comes in and all these bright little bastards that worked for the antitrust department for years and years and years and who hate business with a passion —any business—have taken him over.")

There were few complaints, of course, that the Nixon Administration was tough in antitrust. The IBM case had been filed by Attorney General Ramsey Clark on the last working day of the Johnson Administration and was left like an unwanted orphan on the doorstep of the incoming Nixon Administration.

Virtually nothing happened in the IBM case during the first three years of Nixon's reign. The only Justice Department lawyer on the case, for instance, was blind. And while he was an able attorney, he was understandably fettered by the fact that he couldn't read documents relating to the case. What's more, the chief Justice Department investigator in the early days of the case during the Nixon Administration was a distraught man who openly voiced the opinion that he was under the manipulative influence of behaviorial scientist B. F. Skinner, who was maneuvering him into a position to become the next President of the United States.

With the Nixon Administration reluctant to do much on antitrust, it was not surprising that the concentrated industry torch was carried by U.S. Senator Philip Hart, Democrat from Michigan. The issue gained some credence on the strength of Hart's massive intellect and reputation for integrity. The Senator zeroed in on the computer and communications industries. Hart, however, was sick, and when he died in 1976, meaningful efforts in the issue of concentrated industry died with him.

The foregoing vignettes illustrate that the antitrust cases by the Justice Department and private firms do not operate entirely in a vacuum. Indeed the antitrust fortunes of IBM and the computer industry may also rise and fall with the ebb and flow of public opinion, new academic investigation, and plain old politics.

What is antitrust anyway? Economic historians have always vigorously debated what the Congress of 1890 actually had in mind when it passed the Sherman Antitrust Act, that sweeping and vague piece of legislation. Senator John Sherman, who was said to have been somewhat reluctant about the whole antitrust matter himself, may well have put it best when he said of the law that was named after him: "All that we, as lawmakers, can do is to declare general principles."

The IBM case was left like an unwanted orphan on the doorstep of the incoming Nixon Administration.

The passage of time has done little to clarify the antitrust law of the land. It has been invoked more during times of economic stress than during times of economic boom. Thus, there was stepped up antitrust activity during the Depression, most notably under the aggressive direction of Thurman Arnold, but antitrust trailed off during the Second World War.

Moreover, Americans have become accustomed to bigness. As historian Richard Hofstadter observed in a classic study of American antitrust in the mid-1960s, "What has really made bigness palatable more than anything else is the remarkable performance of the economy since the beginning of the Second World War."

That palatability has remained since then, but double digit inflation and the economic stress of the last few years have brought stirrings of a new malaise about business although there are no indications

ILLUSTRATION BY RICHARD BOBER

that it is yet mobilizing public opinion on antitrust. Few consumers know who is responsible for antitrust enforcement. Ellen Haas, president of the Consumer Federation of America, which has been trying to drum up support for the Federal Trade Commission in its battle with Congress, finds that consumers "know about the abuses in the marketplace, and they know that someone in Washington is supposed to protect them. But they don't know who that someone in Washington is."

The antitrust law has been invoked more during times of economic stress than during times of economic boom.

There has never been a consensus on what antitrust is and there seems to be nothing in the offing to indicate that a consensus will be arrived at in the near future. Richard Hofstadter observed that many historians have always felt antitrust was a "charade." On the other hand, big U.S. business would have us believe that the antitrust dragon is omnipresent, belching fire at the American free enterprise system while foreign devils take over the U.S. marketplace.

Antitrust, then, is antitrust. What you want to see is what you get.

Whatever it is, antitrust is out of favor at present. The public has little interest in or understanding of the issue. The feeling in Congress on antitrust might best be described as anti-antitrust, as evidenced by the current drive in Congress to emasculate the Federal Trade Commission. And, ever since the appointees of Richard Nixon joined the Supreme Court, that body as well has taken a sharp swing away from antitrust, tending to favor larger firms over smaller firms, and ruling against the Justice Department and the FTC.

At present, there seems to be little in the legislative arena on antitrust that will have much impact on the computer industry. The Senate's most influential member, Senator Edward Kennedy, Democrat from Massachusetts, has dropped most of the central ideas of the concentrated industry issue and is focusing instead on antimerger legislation—a subject of virtually no interest to the computer industry, since all firms other than IBM are so small that mergers are easy to accomplish.

Kennedy, as chairman of the Senate Judiciary Committee's Subcommittee on Antitrust and Monopoly, raised eyebrows when he chose David Boies as his chief council. At the time Boies was representing IBM in its antitrust cases.

Academic investigation continues to influence thinking on antitrust and this can involve the computer industry. Harvard economist John Kenneth Galbraith years ago championed the idea of corporate big business in his books, notably in *The New Industrial State*. Essentially, the rationale here is that only a big firm can bring to bear the financial and manpower resources that are required to bring new technologies and new technological products to market. The idea was embraced by IBM as early as 1966, when T. Vincent Learson, in referring to an economist who had praise for bigness, observed that the economist "must have had System/360 in mind." While Learson may have had a point, there remains the question of innovation. With the exception of its pioneering work on the disk drive, IBM, like many large companies, has not been a major innovator over the years.

The sheer size, length, and importance of the IBM cases have caused many eminent academicians in law and economics to examine various theories and concepts about antitrust in the context of the IBM cases and the computer industry. Since the academic studies are relatively new, however, and presumably the IBM cases will come to a close in the next year or two, these recent studies are likely to have little impact on the computer industry.

At present, there seems to be little in the legislative arena on antitrust that will have much impact on the computer industry.

There is one exception, though. A series of volumes entitled *Antitrust Law* by professors Phillip Areeda and Donald F. Turner of the Harvard Law School promote leniency in product price-cutting regardless of intent on competition—provided certain easy criteria for profitability are maintained. The idea would be a great assist to IBM and other dominant firms. Indeed, the Areeda/Turner concept was cited in the recent decision in the IBM-Calcomp case.

A view opposing Areeda/Turner is taken in another recent study, *The Handbook of the Law of Antitrust*, by Lawrence Anthony Sullivan. The latter scholar, a law professor at the University of California School of Law at Berkeley, takes a stricter approach to price-cutting by dominant firms. He argues that a definition of predatory practice should apply to behavior "that has the purpose and effect of advancing the actor's competitive position, not by improving the actor's market performance, but by threatening to injure or injuring actual or potential competitors, so as to drive or keep them out of the market, or force them to compete less effectively." In short, Sullivan would be tough on firms whose primary intent in price-cutting was to bring about losses by other firms.

—W. David Gardner

Mr. Gardner, a former DATAMATION editor, is now a freelance writer in New York.

DIVIDE... AND STILL CONQUER?

IBM has already begun making preparations for dividing itself ... into three, and possibly as many as six, separate companies.

With the IBM antitrust suit already moving through its second decade (the original Department of Justice filing was in 1969), continuing to support legions of lawyers, and threatening to drain financial resources for another five or six years, a compromise seems plausible. And, with the appeals court's recent rejection of IBM's request to have Judge Edelstein removed from the case, one more barrier to an out-of-court settlement has crumbled.

Any compromise would result in IBM signing a consent decree wherein it would promise to cease perpetrating business activities that the Department of Justice (DOJ) claims have been "monopolistic and predatory"—but which IBM has always contested. One of the major relief provisions of such a settlement would undoubtedly be the "restructuring" of the computer industry giant . . . into three, and possibly as many as six, smaller companies. The relationship between these companies could range from distinct divisions under a single corporate entity (a la General Motors), to arms-length subsidiaries (a la Congressional proposals for AT&T), to separate and distinct companies.

While the Justice Department had originally been pressing for IBM's divestiture into as many as eight separate and distinct companies, this demand has softened for a number of reasons, including:

- It would *never* win IBM's consent, thereby prolonging the trial and the appeals process.
- In times of increasing national (governmental) subsidization of computer/communications enterprises abroad, as well as declining U.S. balance of payments, the government might be reluctant to severely disrupt a company that generates a great deal of foreign revenue, and has, in some ways, become a national resource—not withstanding a few questionable practices.
- The computer industry climate has changed substantially since 1969, and IBM's dominance has been successfully challenged by a number of minicomputer companies that continue to flourish.

Thus, it is likely that the Justice Department would consider modifying its demands for settlement of the antitrust case,

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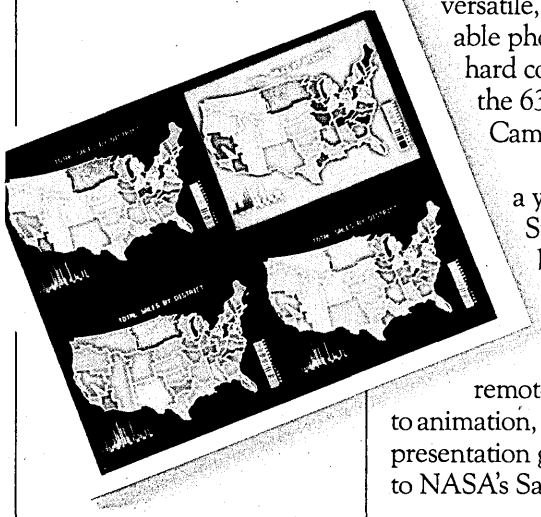

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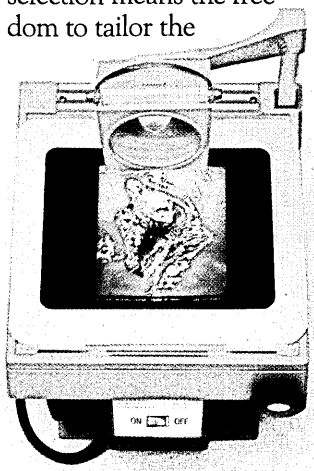

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while IBM may now be willing to accept a modified divestiture plan that would create three or four arms-length subsidiaries. Although the Justice Department might concede to this lesser division of IBM, a major issue yet to be resolved is the relationship that the "new IBMs" will have with each other.

Indeed, IBM has already begun making preparations for dividing itself; the metamorphosis within IBM has been apparent for the last five years. In 1974/1975, IBM split its computer marketing organization into two essentially separate divisions—General Systems Division (GSD), which had been formed in 1969, and the well-established Data Processing Division (DPD). Soon thereafter, GSD was united with Office Products Division and three smaller divisions under General Business Group International (GBG). This group's charter was and still is the development, manufacturing, marketing, and service of "small" computer systems and office products. Additionally, within DPD, the Systems Communication Division (responsible for the 8100) has increasingly diverged from the rest of the division in terms of products and market orientation.

Thus, IBM has prepared three divisions for possible autonomy:

- General Business Group
- Systems Communication Division
- Data Processing Division

Other possible companies that could emerge from an IBM settlement are Data Processing Software (370-orientation), Peripheral Devices, and Research and Development.

The distinctions between the three primary IBM groups—GBG, SCD, and DPD—are most apparent, and divestiture along these lines would serve IBM's long-term interests.

GBG's two major divisions, OPD and GSD, have undergone some profound changes during the past few years that have brought them closer together and further separated them from DPD. OPD's current major product lines include typewriters (electric and electronic), copiers (standard and intelligent), office-oriented printers, low-end word processors, and media.

Up until late 1977, IBM's word processing systems were marketed almost exclusively by OPD's Office Systems Group. The Magnetic Card/Selectric Typewriter (MC/ST) family and the Office System/6 (OS/6) were the major products. The MC/ST's popularity had given IBM a dominant position (over 75% market share) in the word processing market throughout the early to mid-1970s. But IBM was slow in following the wp industry trend to display systems, and it began losing market share. The OS/6 was introduced late, it offered only a small display, and it was vastly overpriced (due to bundling with the expensive ink jet printer); it exacerbated OPD's woes.

In 1978, OPD "sold" its Austin, Texas advanced development facility to GSD, and relinquished its claim to the next generation word processing product—a shared logic system code-named "Alameda" (which was introduced by GSD in late 1979 as the 5520 word processing system). A number of OPD planners and sales reps moved down to Atlanta (GSD headquarters) to become a part of a new *advanced* office systems team. OPD will continue to sell entry-level office products.

GSD's primary province has been and continues to be the small business computer market, which it has successfully penetrated (35% market share) with the System/32 and its upgrade, the System/34. GSD also markets a smaller system, the 5110, and a larger one, the System/38. A "naked" minicomputer—the Series/1—is GSD's entry into the oem market; the recent introduction of the 5520 puts it into the shared logic word processing market, while the 5280 challenges the intelligent terminal market.

GSD's mainline small business computers, the System/34 and the long-awaited System/38 (to be shipped in July), use unique operating systems and different program languages from DPD's mainframe computer products. They are further distinguished by their user-orientation (GSD systems are aimed at users who do not want to have large, sophisticated dp departments), as well as by their architectures and their interactive nature.

The obvious groups set for autonomy are the General Business Group, the Systems Communications Division, and the Data Processing Division.

While processor size and power was once another distinguishing characteristic, this is no longer the case; GSD's System/38 is more powerful than DPD's 8100 or 4331. Indeed, these machines will sometimes be competing for the same customer. However, different applications-orientation and migration paths between the 4331 and the System/38 are quite clear; the 4331 is a distributed processing-oriented machine with 370 compatibility, while the System/38 is more of a standalone workstation-oriented processor with an innovative, unique architecture that is virtually incompatible with all other IBM computers.

Thus, GSD is prepared to expand upward through the burgeoning small business computer market and to support a variety of different applications and user requirements. As an independent company, GSD/GBG would no longer be relegated to "second-class citizenship" behind DPD. Today, GSD is sometimes "locked out" of major accounts controlled by DPD. In 1979, GSD announced quantity discounts (the first for IBM) on the Series/1 minicomputer, the versatile processor aimed at the oem market. The Series/1 can function as a small business computer, a front-end processor, a communications processor, a cluster controller, etc. Moreover, the Series/1 easily attaches "foreign" peripherals.

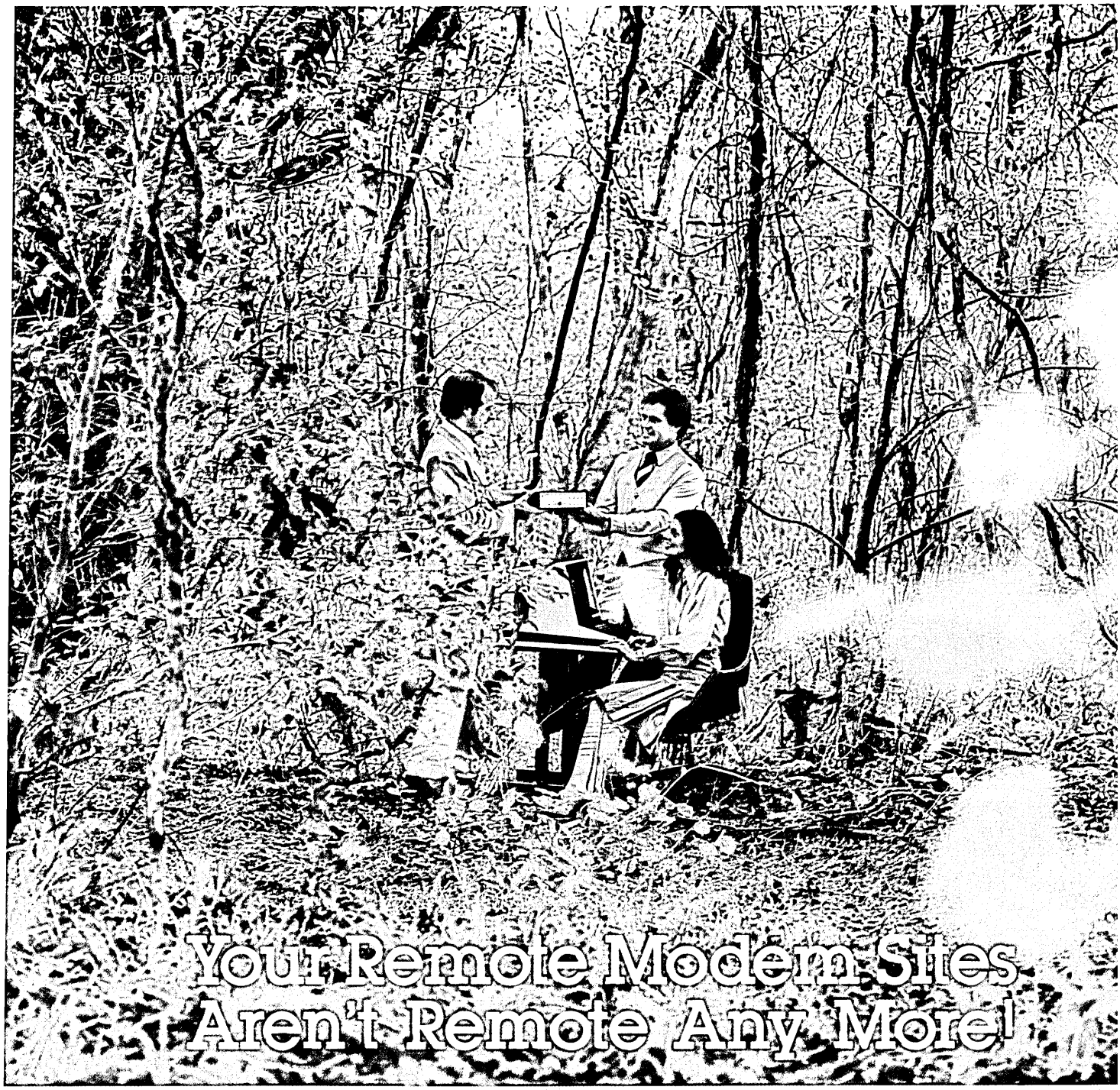
The 5520 shared logic word processor is aimed directly at Wang Labs, which dominates that market; the office automation area will be a major battleground in the future, with emphasis on communications, electronic document distribution, executive support, and data base access. The 5520 begins to address these important applications.

GSD has also developed a downward thrust into the very small business computer market, which could turn out to be its most important area for future expansion. In 1978, GSD began converting some of its sales offices into "Business Computer Centers" (BCCs), which function as retail outlets (currently selling the 5110 small computer) and education and service centers. The philosophy behind the BCCs is to offer IBM a less expensive approach for marketing small computers.

Currently, IBM uses its BCCs to hold demonstrations and training/educational seminars for small businessmen and other potential users. The sales pitch is made at the culmination of a session, and if a customer can be persuaded to purchase a system, delivery is made almost immediately. Peripherals and software packages are also sold through the BCCs, and in the near future other terminal products and services will be added to the shelves.

The BCC's shared approach to marketing and user education is an excellent means for improving small computer profit margins. People who are willing to sit through a seminar on small business computers are undoubtedly better sales prospects than many of those who turn up through sales reps' "leads." Moreover, seminar attendees leave with a better understanding of small computers and their utility, as well as a greater familiarity with GSD's offerings ("IBM doesn't make only large computers and typewriters"). This visibility will become increasingly important as GSD seeks to expand its BCCs and its small computer, component, and peripheral lines. As of year-end 1979, there were 55 to 60 BCCs in operation.

Thus, GBG is well on its way to establishing itself as an autonomous entity within IBM. All of GSD's products, however, do provide users with the communications interfaces necessary to be a part of IBM's grand network strategy—SNA/SDLC (Systems Network Architecture/Synchronous Data Link Control). That is, GSD computers can function as "satellite processors" to DPD's 370/303X/4300 host computers. But GSD also has its own networking plans—using System 38s as hosts,



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and linking System 34s, Series/1s, 5280s, etc.—that will offer users an attractive alternative to the "traditional" IBM approach.

As IBM looks to divide its Data Processing Division into two, or possibly three, different subsidiaries/entities, the Systems Communication Division (SCD) is an obvious choice for one of the positions. Currently, the major SCD product is the 8100, which boasts an entirely new real-time, interactive operating system—DPPX—that is totally incompatible with the 370/303X/4300 lines, and is thus an alternative for small- and medium-size users. Indeed, the 8100 is essentially a Class I or Class II minicomputer that uses minicomputer architecture for flexibility, ease of use and cost considerations. The 8100 is initially targeted to function as an intelligent communications controller/processor node at remote SNA sites. Recent upgrades boosted main memory to 1 Mbyte, and added additional disk capacity as well.

However, the 8100 obviously has future applications in the office automation market; the large-screen 8775 terminal, the ease-of-use/ease-of-installation features, the "loop technology," and the DPPX operating system facilities (like an English language COBOL generator) portend a future in office automation applications.

Other 8100 models, both larger and smaller than the two that have been introduced (8130, 8140), will offer users an upward migration path that avoids the 370 line and its layered software, and an 8100-based network alternative (peer-coupled) that can accommodate first-time, small- and medium-size users. Small 8100s could even compete in the standalone very small business computer marketplace. Near future upgrades to the 8100 will certainly include word processing and small business applications packages, an electronic document distribution package, and likely an X.25 packet switching interface. The latter will not only serve as an alternative to IBM's mainline approach to networking (SNA), but it is a crucial development for IBM's international users, and would greatly spur 8100 sales.

But the most promising area for SCD will probably be the development and marketing of digital voice/data PBX. IBM currently markets two analog PBXs (3750 and 1750) in Europe, but the prototype for an advanced model has already been developed at the La Gande, France, research facility. Introduction to the U.S. market is slated for early 1981. The new PBX will probably be marketed by SCD and will function as a "supercontroller" or "Integrated Office Controller" that acts as a switch for both intraoffice and interoffice voice/data communications.

This PBX-based network will be an important element in developing advanced office automation systems (such as voice/data electronic mail). It could also serve as the voice/data image device that multiplexes concurrent signals for satellite earth stations (e.g., SBS). Moreover, the PBX/integrated controller approach provides users with a sophisticated, multi-access local network that can be used in conjunction with SNA, X.25, an autonomous PBX-based network, or any combination of these. This integrated controller approach, coupled with 8100s and other applications processors, and even mainframe computers (370/303X/4300 variety), would further distinguish SCD from the Data Processing Division mainstream, and would offer IBM users yet another network architecture.

As for DPD, it would be primarily responsible for promulgating IBM's 370-based systems, their software, network architecture, and future progeny, including the 4300 and the upcoming H Series. This is the "traditional" IBM that most users are familiar with, and little would change as the result of a restructuring—although the name may be changed to Data Systems Division (DSD). System architectures will undoubtedly evolve in the 1980s to facilitate higher data transfer speeds, better data base management systems, faster throughput, more efficient I/O, more unified operating systems, and more communications orientation . . . but migration will be evolutionary from current 370/303X/4300 products. DPD will take advantage of users' huge investment in 370-based software (estimates of this software lock-in range from $75 billion to $85 billion) to introduce both higher and lower-end systems.

DPD is the "traditional" IBM that most users are familiar with, and little would change as the result of any restructuring.

Smaller 4300s (e.g., 4331s and 4321/4325s) will become satellite applications processors that can run a variety of programs, including office automation. That is, DPD's major operating systems (especially VM/CMS) will migrate downward to give users host program compatibility, and thus enable large users to save software development costs. Indeed, DPD already has a prototype VM/CMS office automation package (including wp, electronic messaging, executive support, etc.) that could be made available sometime this year.

The 370/303X/4300 program compatibility will be DPD's trump card in keeping users tied to its systems, its software, and to its network architectures. DPD systems will eventually cover the entire range of user application requirements, so that DPD can offer single-vendor solutions. SNA/SDLC will be an important part of DPD's plans through the mid-1980s, and possibly beyond, but SNA will become much more flexible, more accommodating to "foreign" devices, more distributed, and more data base oriented; it may even incorporate voice transmission.

Further division of DPD into two or even three other entities/companies is possible—370-oriented peripherals, applications software, and research and development. Of these, a peripherals company or subsidiary is the most likely. It would be responsible for all magnetic storage products (disks, tapes, etc.), printers, and possibly even some terminals. While peripherals are generally device- or system-specific due to interface requirements, the cpu manufacturer does not (should not) have any inherent advantage over plug-compatible makers, other than advance knowledge of interface specifications. At a minimum, this advantage will be eliminated; that is, DPD will have to release its future systems' interface standards to competitors as soon as these standards are developed in the cpu system architecture.

Establishing a separate software company/subsidiary may present more of a problem, since operating system software is inextricably linked to system architecture. To wit, there is a synergistic effect between system architecture and operating systems; system and software engineers must cooperate to insure system coherence.

Thus, a separate DPD software company would maintain an unfair advantage over competitors unless the future systems architecture and specifications were also released to them. Such open releases would cause wild speculations among both vendors and users, and would be a competitive disadvantage to DPD unless other vendors also revealed their future plans. Therefore, a separate DPD subsidiary/company for operating system development is unlikely.

The third possibility for a DPD spin-off is in the research and development area, but as with operating system software, this would unfairly expose proprietary information about future DPD developments.

In conclusion, IBM has already made extensive preparations to direct itself into three, and possibly four, separate entities—GBG, SCD, and DPD (with the latter possibly spinning off a peripherals entity). Each of these groups offers some unique solutions to address users' future computer/communications requirements; each of the three (or four) would also have the resources and market strength to be competitive. It is unlikely that IBM would consent to any greater diffusion of its resources.

—Dale Kutnick

Mr. Kutnick is director of research at the Yankee Group, management consultants in Boston, Mass. He has given a number of presentations on IBM's future strategy.

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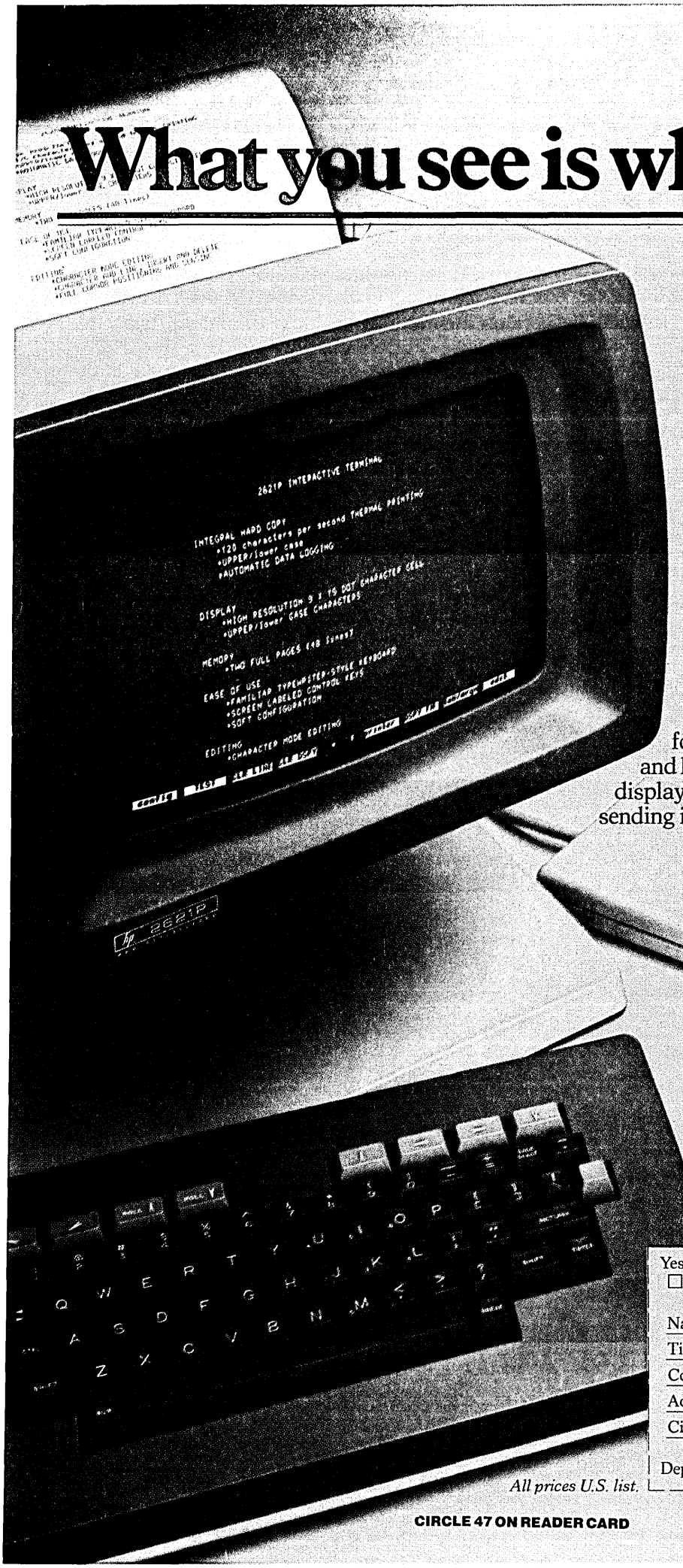

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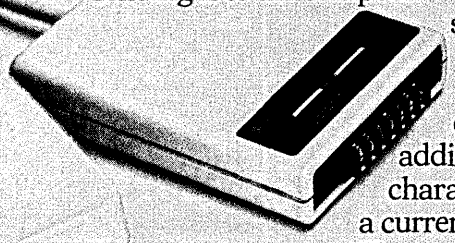

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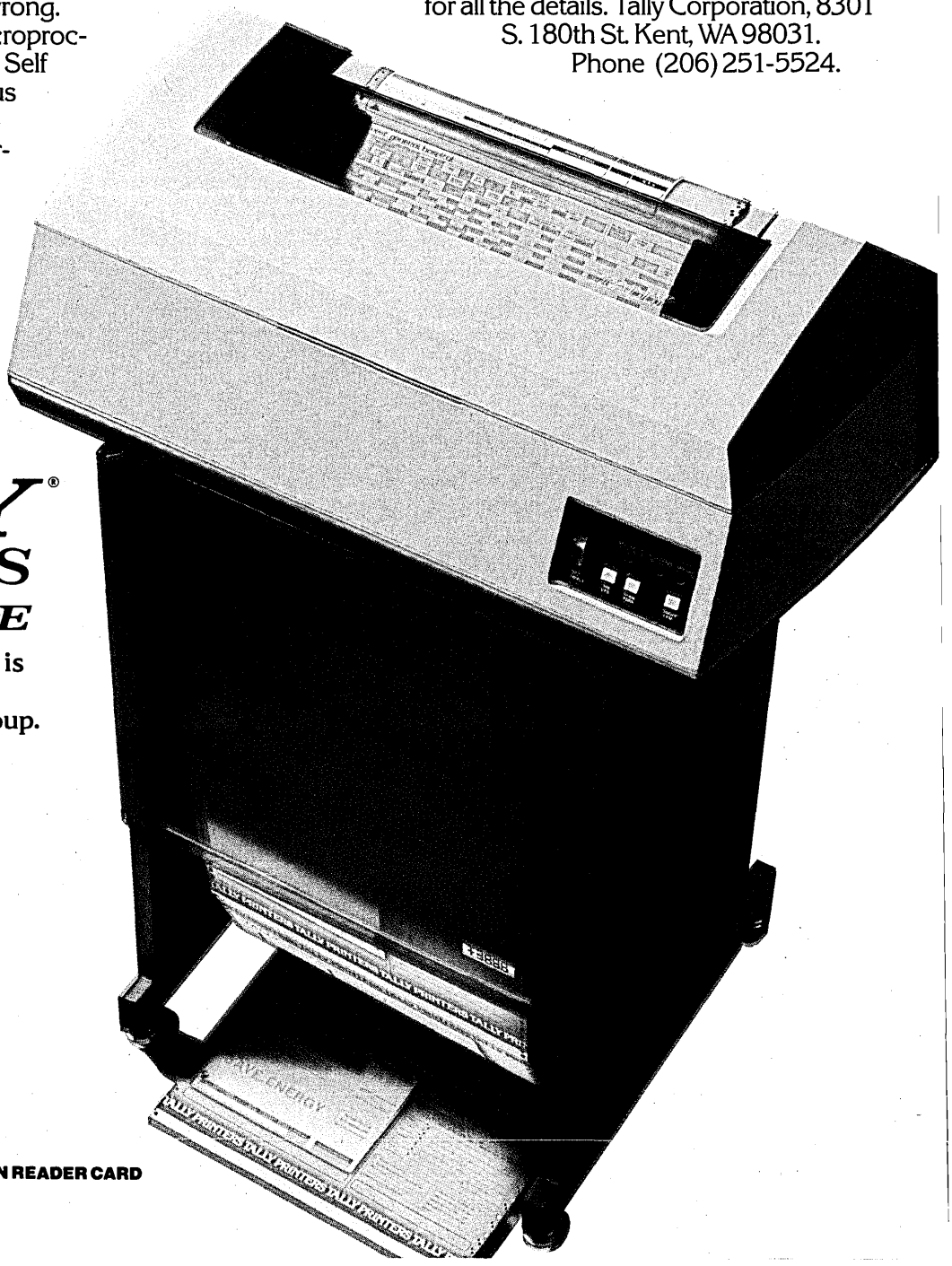

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CIRCLE 48 ON READER CARD

LOOK AHEAD

(Continued from page 22)

month employees were being interviewed on a one-by-one basis by no less than Ed Gallagher, president of Xerox's Western Union International subsidiary, which took over the Xten activities from Xerox Development Co. late last year. It was expected that only a handful of employees would be offered the opportunity to transfer, and consensus had it that a lesser number would be willing to do so. The decision to make the move was said to be Gallagher's.

AFIPS LOSES ITS HEAD

The somewhat sudden resignation in mid-March of Jack Kinn as executive director of AFIPS left many wondering if the group would be headless at NCC time. Jerry Koory, chairman of an AFIPS committee liason group and who donned a second hat as acting director when Kinn resigned, didn't think so. He said he would submit a plan to AFIPS' executive committee April 3 which would "drastically" reduce the time needed to select a new executive director. It took AFIPS two years to pick Kinn to succeed Dr. Robert W. Rector.

Koory wasn't willing to divulge his speed-up plan in mid-March when the exec committee had yet to hear it. He said Kinn's resignation was "for personal reasons," but others close to AFIPS indicated Kinn was asked to resign. As for his successor, some think it may be his predecessor. Rector, who currently works for Conference Management Assistance Co., has been attending NCC steering committee meetings, although not in an official capacity. When asked if Rector was considered a possibility, Koory offered a "no comment."

IT'S IN THE CARDS

President Carter's inflation directives may put the hex on the latest device for plastic hungry public, but it was still in the works in mid-March. It's a gambler's card being readied by Freeman Plastics. If changes in gambling regs being considered in Florida and New Jersey pass, they will allow use of such a card to place "in absentia" bets on casino games from hotel rooms or any remote location connected to a casino via closed-circuit tv.

RUMORS AND RAW RANDOM DATA

Roger Mills of TRW, a candidate this year for the presidency of ACM, is making good use of his name. On the campaign trail he promotes "Mills-spec," his own label for acceptance testing...Expect no relief for the shortage of Digital's popular LA 120 DECwriter this year, although DEC's oft-cloned VT 100 may be easier to get in the third and fourth quarters...We hear ICL will distribute its big DAP through the Advanced System Div. in Washington, D.C.

NEWS IN PERSPECTIVE

THE PCMS

NATIONAL EYES NEW OPTIONS

Some question the effectiveness of semiconductor companies moving into end-user marketing, but National has an upbeat attitude.

It required more than five years for National Semiconductor Co. to establish a service/support operation for its Datachecker point-of-sale systems business, one that was large enough to be self-sustaining. But virtually overnight that company has acquired an installed base of more than 350 mainframes, a respected field engineering and software support staff numbering about 1,400, and a worldwide payroll of something in excess of 1,800—all parts of what is now called National Advanced Systems (NAS).

The new operation, acquired from Itel Corp. last Oct. 1 following the sudden collapse of this segment of the San Francisco company's operations, is headed by E. Floyd Kvamme, one of five cofounders of National Semi back in 1967. With less than five months' experience in the computer business, Kvamme exercises his newly acquired knowledge by recalling just how widespread his operation is. "What did someone tell me—in 18 countries? Whatever," he says, chuckling like a man who couldn't recall whether his Irish Sweepstakes winnings were $800,000 or $900,000. "We have an opening for three FEs in Tehran," he adds. "We have some machines there."

The executive hasn't made it to Iran yet, but says he has visited with some of his field forces and customers. The customer base wants the PCMs to succeed, he says, and he tells them the PCMs are the reason IBM announced the 4300s in the first place. "I have met data processing managers from major corporations whose prime goal this year—by which they will be measured by their managements—is to become vendor-independent," Kvamme says. "That's an opportunity."

He says vendors will have to pursue that opportunity with cost-effective equipment and with reliable gear, and will have to support that equipment. "But it's nice to know that when you've done all the right things there's a customer base out there that's kind of anxious to have you around."

Not everyone is bullish on the plug-compatible mainframe business, however (see following stories). Some close observers of the business remain high on Amdahl Corp., but are critical of the National-made hardware, one saying that it's only the Hitachi machines that "give them credibility." Others find it difficult to imagine that a semiconductor company could make it in this business. Says Steve Bishop of Input, "With the exception of Texas Instruments, semiconductor companies have been notoriously ineffective in going directly to the end-user market."

E. FLOYD KVAMME: "I think it's very dangerous to judge computer companies, where leasing is a factor, by their quarter-to-quarter P&L statements."

But Kvamme remains upbeat through it all. He won't disclose any figures on his operation, but others have estimated revenues from systems and services at upwards of $150 million, compared with total corporate sales of $720 million. And Amdahl Corp. last year chalked up revenues of $300 million. The latter, of course, has been showing lower revenues of late because it is putting more hardware out on lease, and that's what NAS wants to do, too.

"I happen to believe that having a lease portfolio is fundamental strength in this business, long term," says Kvamme.

Kvamme wants to build a lease portfolio that NAS owns, saying this should be part of the financial strength of every PCM.

He points out that Itel didn't hold any of its lease papers, instead selling all its leases to financial institutions. And NAS will do the same with leases that qualify, this for cash generation reasons. But Kvamme also wants to build a lease portfolio that it owns, saying this should be part of the financial strength of every PCM.

National currently has no systems out on lease, so he claims he doesn't know what it will take to finance his lease portfolio. But he thinks he might want to retain 20% of shipments as operating leases.

"I think it's very dangerous to judge computer companies, where leasing is a factor, by their quarter-to-quarter P&L statements," he says. "Maybe you'd better look

at the balance sheet." This, he explains, is because the right way to run a company may be to delay putting fat profits on the bottom line, pushing those profits to some later date and replacing them today with a larger and better lease portfolio.

Kvamme says he can understand why Itel did only finance leases, since the company had to buy its mainframes from the manufacturers at prices that allowed the maker to take his profit first. This left Itel with slimmer margins than would be available to the manufacturer, such as National, while still pricing below IBM. And that's the advantage accruing to National, which is both manufacturer and seller—except for the upper end of its product line, comprised of Hitachi hardware.

At the time of Itel's withdrawal from the business, the company owned a considerable inventory of mainframes for which there was no buyer and for which the company owed the manufacturers. According to Kvamme, the Hitachi machines are "largely worked down." Those are the largest 7000 series processors. Still in warehouses are large quantities of the 5000s, but the smallest class, the 3000s, are apparently just about all worked down. "We're out of that class of machines," he says.

Down in San Diego, Calif., where

The systems Hitachi has under development and those in development by NAS are "very compatible."

National has been making the 3000s and 5000s, employment peaked at some 900 people last year, hit bottom last November when the market for those processors went to pieces, and now is said to be back up to the 650 to 700 range. But some of this is accounted for by the transfer there from Santa Clara of National's add-on memory business—add-ons for the 370/158s, 168s, 3031, and 3033. In addition, the memory operation for the 3000s and 5000s moved down late last year.

As this is being written, Kvamme is in Japan, purportedly discussing with Hitachi the arrangements under which that company will continue to supply disk and tape drives to NAS as it had been doing with Itel. Another disk drive supplier, ISS/Sperry Univac, last month disclosed that its employment had dropped from 2,100 to 1,800 when the pipeline to Itel had overflowed.

Under a new agreement between NAS and Hitachi, a one-year renewable relationship has been established. Kvamme points out, however, that it calls for NAS to continue supporting the Hitachi hardware for seven or eight years after the last machine is installed by NAS.

He says the systems Hitachi has under development and those in development by NAS are "very compatible." In terms of a broad product line, he says, they mesh well. "At this time, they're staking out the upper end of the line. We have a product under development that's above their current announced product, but they have a product under development that's above that one."

Itel earlier also had an arrangement with IPL in the European market, but NAS couldn't come to any agreement with that supplier and thus did not pick it up. That leaves but one outside supplier, Hitachi.

Kvamme leans back in his chair, silhouetted against an expansive window that affords a view of some rolling hills in the high-rent Stanford industrial park, plush quarters inherited from the luxury-loving folks at Itel and a sharp contrast to the austere quarters usually occupied by National employees. Like so many others in the industry, he tends to call semiconductors "technology." And he says, "There's an opportunity for technology in this [com-

"There's an opportunity for technology in this industry like I haven't seen for 12 years."

puter] industry like I haven't seen for 12 years. And that's my bag. I happen to enjoy product planning. That's what I did at National in its early years. I was the product planner . . . From a technology impacting standpoint, it rivals what's going to happen in the telecommunications business."

He contends that technology hasn't done much for the computer industry with the exception of memory products. He cites the dramatic drop in the price of a megabyte of main memory, comparing that with the comparatively drab performance of the cost of cpu performance.

"The true available performance hasn't been demonstrated yet, even with the E Series," Kvamme says. "The E Series begins to scratch the surface, in my mind. I think there's an opportunity," he says as a smile crosses his face.

—Edward K. Yasaki

TREADING ON THIN ICE

From its very inception, the IBM software-compatible mainframe business has been based on the rationale that the user should not lose his very considerable investment in IBM applications software. What the hardware supplier provided was lower priced equipment on which that software could be run, or more power at the same price as IBM's.

"That was the name of the game for PCMs. And I foresee that in the reasonably near future that line of argument is just not going to be valid anymore," says Omri Serlin, president of Itom International Co., a consulting firm in Los Altos, Calif.

For the PCMs, he explains, the business plan called for the ability to produce hardware that could be priced below IBM's. The software was available from IBM, which had placed its operating systems in the public domain. But things have changed.

"I think the outlook for PCMs in general is somewhat clouded by the new software strategy undertaken by IBM and exemplified by DOS/VSE and VM/370," he adds. "I think the indication is very clear that contrary to previous policy they have embarked on a policy that now will make all software, including operating systems, move into the licensed-for-charge area." And that pretty much eliminates the major element in the strategy of the PCMs.

Serlin acknowledges that sizable software support staffs have been built up at Amdahl Corp. and National Advanced Systems, a recognition of this aspect of the business. But he notes that the main element of software is development, rather than support, which comes later. There first must be an ability to develop the software.

Of course, independent software companies could well fill this void, coming up with their own versions of IBM operating systems, as has been seen with DOS. But it may take awhile before anyone develops more sophisticated operating systems along the lines of MVS.

But if this is the new scenario, Serlin observes, one has to look at the extent to which there is divergence from IBM software and whether users will go along with this.

"Assuming the PCM has decided to bite the bullet and go into its own software, then the biggest sales obstacles would be, 'Are you going to follow IBM?' and 'Can I rely on all the software available from independents playing on your operating systems, just as they will on IBM's?' This, then, becomes a major issue."

And that's the way Serlin sees the business going. In order to survive, he believes, PCMs will have to develop their own software—that parallels but isn't necessarily compatible with IBM's—and convince users to switch to it. Unfortunately that leads to a tougher question. If the PCMs are successful in that pursuit, why would they have to develop IBM—compatible hardware?

"So the whole issue is clouded by the software question," says Serlin, who thinks this is what the PCMs have to worry about, much more than hardware price/performance.

"The only operating system that still remains in the public domain is MVS," he reminds us. "It's my considered opinion, based on what they have done to date, that as soon as IBM has announced the H Series it will do the same exercise on MVS as it did on DOS/VSE and VM. Maybe even earlier." And at that point, there will be no more free software.

—E.K.Y.

USER FEAR MARS PCM SUCCESSES

In a soon-to-be-released study, Creative Strategies cites the "FUD" factor —Fear, Uncertainty, and Doubt—as the current user perception of the IBM/PCM market.

The PCMs—those IBM-compatible mainframe vendors who survived the doomsday knell of the 4300 announcement—are boisterously scornful of any cautious Cassandras. And, even as IBM production hits stride and reports of upgraded 4300 delivery dates increase, the PCMs at the low and medium ends of the market often boast capacity production and claim that market expansion and volume sales more than balance their now-lower profit margins.

Yet, among users and along Wall Street, the conviction that IBM can manipulate the PCM market almost at will is gaining currency—despite the PCM successes. What makes this conclusion all the more unsettling is the fact that seldom has there been less certainty as to IBM's future plans; possible trends and IBM options are splayed before the analyst like the points of a nautical compass.

A senior Wall Street analyst, intimate with PCM finances, went off the record to suggest he wouldn't invest in PCMs today without first buying a heart and lung machine for the inevitable crises. Yet a rising wave of interest in the top-line PCMs, particularly Amdahl, brought a surge to the stock. And a number of smaller PCMs reported successfully gathering millions in private financing. Even the Amdahl investments, however, were reportedly bet on 1983 returns. The lease trend of the whole industry indicates a more capital-intensive business with a longer payout.

A vendor-weighted survey of 8,000 mainframe users by Creative Strategies International of San Jose, Calif., captured nothing so clearly as this user uncertainty about IBM's direction and future plans. The life cycle of the 4300, IBM product announcements, the functions, capability, and architecture of the H series, the product life cycle of the 303X—users had most of the questions but none of the answers, says CSI's Greg Lavielle. "Most could simply not understand what IBM was up to," explains Lavielle. "They don't know what to believe, who to believe. And because of this confusion, the claims and comments of the PCM vendors are simply not effective in many cases. It's extremely difficult for a salesman in the field to push a PCM product in the face of this tremendous uncertainty!"

Lavielle has coined a phrase—the FUD factor—to refer to the "fear, uncertainty, and doubt" common in user perception of the IBM/PCM market. Based on his survey and a successive series of phone interviews with major users, Lavielle describes the FUD factor as IBM's most successful weapon against the PCMs. Not even the H announcement—now variously "predicted" for anytime from this month to December—will likely dispel the FUD, says the CSI survey director.

Surprisingly, most users (about 80% of survey respondents) believe that the PCMs compete with IBM on an equal technological basis.

"Users haven't the foggiest idea how low the H series will go," he notes. "They know that H will be above and on top of the 303X, but they don't know if H will dip into and cover perhaps the entire span of the 303X. Some are even worried the H will overlap the 4300.

"The more sophisticated the end users, the more perplexed they are," declares Lavielle. Amid rumors of a new 4300 operating system from IBM, some users recall the original 370 announcement, when the 145 and 155 came out a year before the 168 and VS were unveiled in the true 370.

Among users who responded to the survey, says CSI, most agreed that the PCMs exist only by IBM's tolerance. Admittedly influenced by the Itel failure, about 65% of the respondents were now "seriously concerned" about the financial standings of the PCMs, and predicted a shakeout among the PCMs in the near future, sparked by the H announcement and more readily available 4300s. Most users, according to CSI, believed the PCMs reacted far more rapidly than IBM to developments and changes in the market—but generally didn't feel that flexibility could compensate for IBM's superior finance and marketing capabilities.

Surprisingly, most users (nearly 80%) believed that the PCMs compete with IBM on an equal technological basis—a view, says CSI's Lavielle, which has few converts among independent industry analysts like himself. Mainframe users overwhelmingly believe that IBM did not try to crush the PCM industry with the 4300 announcement (many citing IBM's antitrust problems), yet most agreed that the E Series' price/performance was meant as an attack on the PCMs, something to slap them down and keep them in their place. Industry analysts commonly view the PCMs as IBM's allies against the independent mainframe and mini vendors in that they maintain IBM

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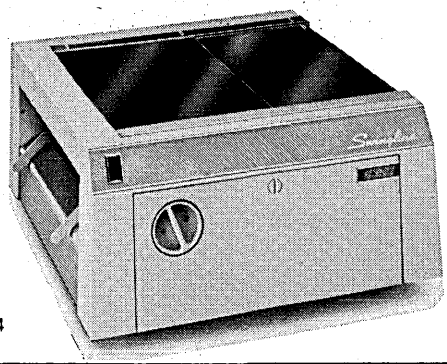

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account control through reliance on IBM operating systems. Lavielle says, however, that most users seemed insensitive to this relationship and viewed the market struggle as one between IBM and the PCMs, generally underestimating the independents.

In the original survey—taken before IBM announced its long delivery schedule—a full 50% of those users who had PCM equipment on order said they were then considering canceling and going to the 4300s. Lavielle said the telephone survey, subsequent to IBM delivery announcement, indicated a rapid turnaround, firming perhaps 85% of those PCM orders—yet the switch inclination was there. "Most IBM users," he says, "remain true-blue IBM users."

CSI also found that 32% of their survey respondents were simply not interested in PCM equipment—whatever the price. Another 20% of respondents required PCM prices 40% or more below IBM prices before they would consider going IBM-compatible.

In such a climate, a number of PCMs are seeking niches in the market—submarkets in which they can optimize their machines for user applications—as they await the window in the IBM product cycle.

Magnuson Systems provided a special assist feature for its Storage Technology oem contract—"an additional board that lets them do something faster." With the University of California at Berkeley, Magnuson developed a cpu assist for a library catalog system that the PCM can now market. For the Exchange Bank in Florida, Magnuson developed an optimized interface with IBM check sorters that the company can now offer "every medium-sized bank in the country."

Similar strategies are acknowledged by other PCMs, although few have Magnuson's direct field input, preferring oem marketing. "In most applications, we offer a two-to-one advantage over IBM," explains Magnuson president Joe Hitt. "But in this sort of situation, we probably offer a four-to-one advantage."

Even Two Pi, the sole active survivor among the low end PCMs, doesn't confront the 4331 directly—preferring to sell its systems as powerful minis which run all IBM operating systems. Two Pi has introduced a complete series of controllers that emulate IBM's peripheral controllers, allowing users to attach less expensive minicomputer peripherals to its cpu. Two Pi president Jared Anderson says the development of the controllers was as much if not more of an engineering feat than building a new cpu, but the controllers add 40% to the price of the Two Pi sale. It's the sort of value-added development that many PCMs consider necessary to maintain future growth and healthy margins.

—Vin McLellan

OFFICE AUTOMATION

OFFICE IS WHERE IT'S HAPPENING

AFIPS' first Office Automation Conference drew only about half the crowd that was anticipated, but most attendees agreed that the show was a success.

Nearly all the elements of an automated office have been built. The next and critical step is to integrate them into a system that can be used by managers to get their work done more efficiently.

These conclusions were voiced by speaker after speaker at an Office Automation Conference during three unseasonally cold days in March at Atlanta's spacious World Congress Center. The conference was sponsored by the American Federation of Information Processing Societies (AFIPS), which also sponsors the National Computer Conference, and it included an

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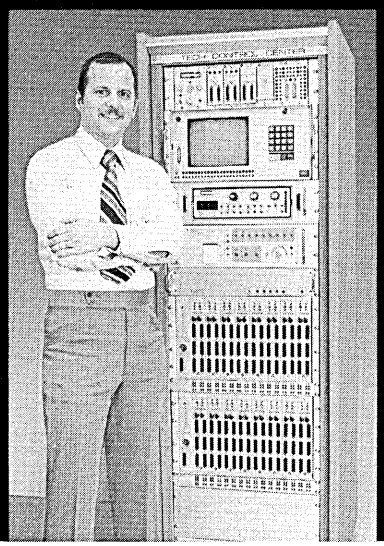

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exhibit by 112 companies that hope to be supplying equipment and services to what some market forecasts indicate will be a $50 billion business by the mid-'80s.

It was the first such conference of this size and it drew standing room only attendance at virtually all of the 50 sessions, which ranged in subject matter from photocomposition and the implications of memory technology on future office systems to such broader subjects as word processing and the implications of change in tomorrow's offices.

In a keynote address, on a day when the temperature outside was 11 degrees, Dr. C. Jackson Grayson, who heads the American Productivity Center in Houston, presented a chilling case for the use of automation in the office of the '80s. He said gains in U.S. productivity have been declining every year since 1968 and reached a minus growth level last year. Although U.S. productivity still is higher than that of every other nation in the world, he predicted that by 1990 the U.S. could slip from number one to number five, behind France, Germany, Japan and Canada.

Grayson, who was chairman of the federal wage and price controls commission during the Nixon Administration, said industry has become bogged down with what he called federally inspired "work disincentives" such as price controls. What is needed, he said, is "a national effort at the government, business and individual levels" aimed at increasing productivity. In an information age, one avenue would be office automation; but he warned that any effort should be aimed at the professional, technical and managerial areas, not the clerical area, where costs aren't soaring as much as are managerial costs.

In a highlight session on office automation management, John J. Connell, executive director of Office Technology Research Group, said that of the $800 billion total costs of office operations in U.S. businesses in 1979, $600 billion went to salaries and fringe benefits. "No other segment of business operations is so labor-intensive," he said. Office costs, he added, could double over the next six years, and "if major steps are not taken to arrest this growth, the health, and in some cases the very existence, of many enterprises will be threatened."

Office costs could double over the next six years, and "if major steps are not taken to arrest this growth, the health, and in some cases the very existence, of many enterprises will be threatened.

Thomas Lodahl, of Cornell Univ.'s school of business, said a shortage of secretaries is putting heavy burdens on highly skilled professionals who otherwise could be delegating up to 30% of their work. Without that support, "we have a situation where industry finds itself with $30,000 to $40,000 a year clerks."

Lodahl, who is an industrial psychologist, said he dreams of an "interactive design laboratory" where office automation systems could be developed by designers sitting down with prospective users. In a talk entitled "Will we manage technology, or will it manage us?" Lodahl said whoever introduces automated systems in the office should do so with an attitude of patience, stressing to the users that it is being done on an experimental basis. "Avoid premature conclusions of huge savings," he said, "because the organizational learning curves are long and strange."

And there is no "cookbook prescription" for automating office procedures, said Michael Hammer in a session entitled "What is Office Automation?" Discussing the behavioral aspects, Hammer said that during the implementation process, two views always will come up. The first is, "you are talking about eliminating the drudgery so that people can be elevated in their jobs; and their skills will increase as their frustration goes down because they

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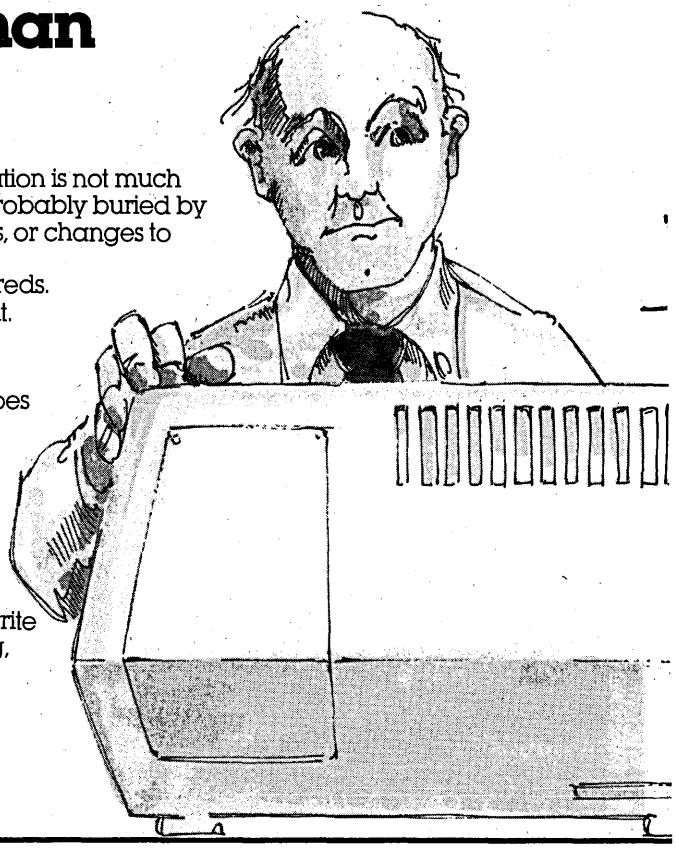

will have more autonomy." But right behind that observation, Hammer said, is another—the view that these new systems and functions are merely slave making procedures where people become mere attachments to a machine and can be more closely monitored by their bosses.

Hammer said that "unfortunately, both trains of thought are true. How you manage and design the system is going to determine which view is supported."

Said Connell, "Whatever we may know about predicting system changes, we know next to nothing about predicting behavioral changes." For that reason, he said, "we must factor into our thinking and planning the idea that new systems, technologies, and processes should be introduced into the office in a test environment so that we can determine by actual experience how people will react to the change."

Although it's a new concept in the office, funds should be budgeted to bring in machines and test them to determine how they will perform, how people will react to them, and what they will accomplish in a particular office environment. "Only through such testing can management be sure that the steps being taken to improve productivity have a reasonable probability of success," Connell said.

The question of who will do the testing and who eventually will be in charge of the office of the future still is very unclear. Connell said it is the most controversial issue of all. He said the jockeying for position and the infighting are fierce and "to the extent that choices are being made, they are seldom being made on rational grounds."

A panel on the subject concluded that the "user" would be in charge of the automated office, but the panelists were hard put to define him. Robert Benjamin, manager of corporate systems planning with Xerox Corp., said the user in the office isn't as easily defined as the factory worker or the accountant. "Until we've defined the

OFFICE AUTOMATION CONFERENCE, first ever staged by AFIPS, drew close to 8,000 at World Congress Center in Atlanta. Second conference will be held in Houston in March 1981.

user more clearly, we'll have to rely on requirement planners—surrogates for the real user—who will be specialists experimenting in the office environment."

The conference and exhibit drew a total of 7,640 persons, which included 2,300 exhibitor personnel, some 500 complimentary admissions for speakers and other officials, and about 2,000 who registered only for the exhibits. AFIPS had predicted a turnout of 15,000, most of them going to the exhibit.

The show organizers scrambled to get a crowd to the exhibit by setting up a bar that offered free drinks in the exhibit area, and announcing it on the public address system on the second and third days of the show. Chairmen of the sessions also were instructed to invite the attendees to go downstairs to the equipment exhibit at the end of each session. But such efforts weren't successful.

Said Laird Weagant, with Electrohome, Ltd. of Kitchener, Ont., an exhibitor that displayed a lightweight viewer that projects crt displays onto large screens for group viewing: "We came down here to exhibit to exhibitors. I've never had so much time to talk with them. I'm delighted."

A salesman for 3M, Dave Mead, summed up the comments of many exhibitors: "There are no big crowds. But that gives me more time to explain my products." And if exhibitors hadn't a reason to be excited over crowds, there was evidence of excitement for the office automation market. At the end of the Atlanta show, more than 300 exhibit spaces had been sold for next year's conference in Houston.

—Tom McCusker

Also contributing to this story were Bill Musgrave and Louise Shaw

Bit-Slice NIGHTMARES

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#4	Charlie's home built simulator didn't break down until after he left for Germany.	Project Delay + $32,000?
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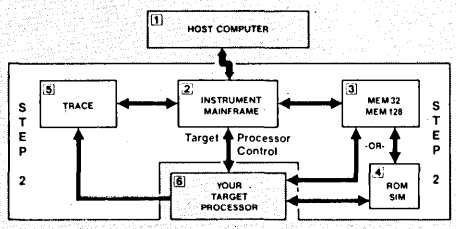

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THE FUTURE

A LOOK AT THE NEXT DECADE

The vote was in at ACT's Future Systems Forum: the decade of the '80s will be one of "great transition."

Transition was the byword at Future Systems Forum II, presented last month in Phoenix by Advanced Computer Techniques Corp. (ACT).

A video film prepared by Dr. Herman Kahn, cofounder and director of the Hudson Institute, described "The Great Transition"—a 400 year period beginning with the industrial revolution. The film predicted that if technology and the economy are properly managed, mankind should move into a more prosperous world in the next two decades.

ACT's founder and president, Charles P. Lecht, didn't go back 400 years. "We are beginning 'A Great Transition,' " said Lecht, "to a new era where computer and communications technology will represent a driving force for a new and beneficial industrial revolution."

The '80s definitely will be a decade that will see increased involvement with computers. Neal Gorchow, vice president, Sperry Univac, said, "One out of every five people will be involved with computers by 1990."

And it will be a decade in which IBM will continue to set the pace in the computer industry, in the opinion of Dr. Ulric Weil, vice president edp research, Morgan Stanley, Inc. "If IBM's growth rate falters, IBM is aroused," said Weil, "and an aroused IBM is like an aroused woman—very dangerous. If growth is good, IBM is dangerous too, for it feels it can cut prices."

He added, "IBM can raise prices. They've shown that they can do that and I

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believe they're going to do it again and again." When IBM does raise prices, Weil said, "it's good news for the Japanese."

Both Weil and Robert T. Fertig, president of ACT's Technology Analysis Group, agreed there will be an IBM H Series in the decade, although they disagreed on introduction time. Fertig believes it will come in mid-'80 and Weil said early '81.

Weil, who earlier had said H would be announced in the third quarter of this year, said he'd revised his thinking "because IBM is a living, breathing thing. They can change their minds."

Fertig, asked how he knew H exists when IBM keeps denying it, listed his reasons: "One, an IBM High (H) Series organization was put in place three or four years ago; two, details are too specific to be ignored; and three, IBM leaks a little."

Fertig predicted that full unbundling of MVS would come with H, and that more applications generators "are in the works," as is PLS "or some version of it" as a software development tool. He believes H will have a relational data base capability implementable under IMS. He also feels IBM may call the first two H machines "3034 and 3035 for psychological reasons."

There will be "no more plumbing with H," said Fertig, as the machines will feature external cooling units. He said the first H machine, H 4A or "Adirondack," which was to offer 10 to 11 MIPS (millions of instructions per second) was cancelled in favor of H 4B, which will offer 12 to 15 MIPS. Succeeding models, which will be introduced through the first quarter of 1982, will offer up to 27 MIPS, he said.

And after H? Fertig sees the Sierra Series as an H Series extension to be introduced in the first quarters of 1983 and 1984. He said Sierra machines will offer from 10 MIPS to 50 MIPS.

Fertig said the H Series will be introduced by midyear; Weil argued not until early '81.

He predicted the G Series will be offered beginning in the first quarter of 1982 through the first quarter of 1984 to fill the gap between E (the 4300 series) and H. "I believe G will be a technical improvement of E and not a completely new product line," Fertig said.

An additional follow-on to E, he said, will be the Olympia series, to be offered in the fourth quarter of 1984 with .3, .7 and 1.7 MIPS.

Mainframers other than IBM had their say about the '80s at the ACT Forum. Fred Bauer, NCR Corp., said it is his company's intention in the decade "to bracket IBM in every sense of the word."

John Selman of Honeywell sees user spending patterns changing to "more service-oriented purchasing." He also expects the linking of office automation with traditional data processing, leading to a trend "toward more multifunctional terminals."

And Gorchow of Univac said, "Multiprocessing hardware and software is definitely in our plans." He said system security is becoming an increasingly important consideration.

ACT's Fertig spoke for Amdahl Corp. in answering a question: "Will Amdahl survive the H Series announcement?"

"Absolutely yes," said Fertig. "Amdahl has anticipated it and is ready with a product. The key to Amdahl's survival is becoming a systems company in the 1980s instead of just a cpu company. It has tried this by acquisition."

AT&T will be in there too. Roger Moody, vice president, AT&T, said he is often asked if IBM is going to be AT&T's biggest competitor in the future. "My answer: no, they already are."

The forum also offered talks on user experiences with the 4300.

James B. Woods, associate director of communications and data processing with Hughes Aircraft Co., said that his firm presently has four 4331s and three 4341s installed, and planned for installation this year are one more 4341 and four more

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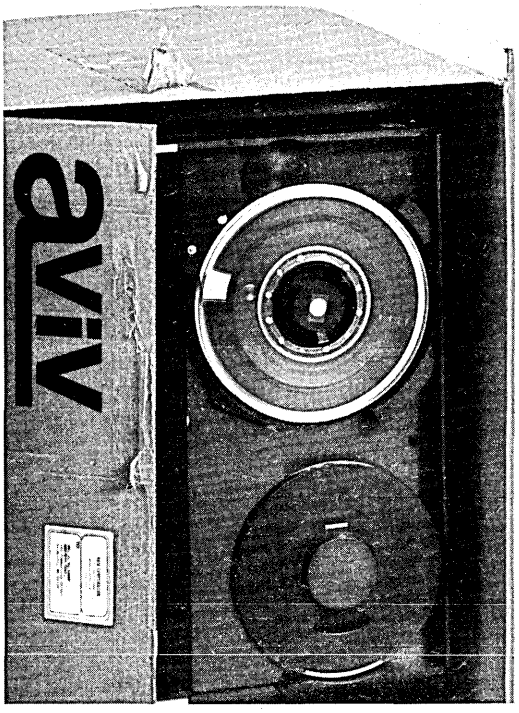

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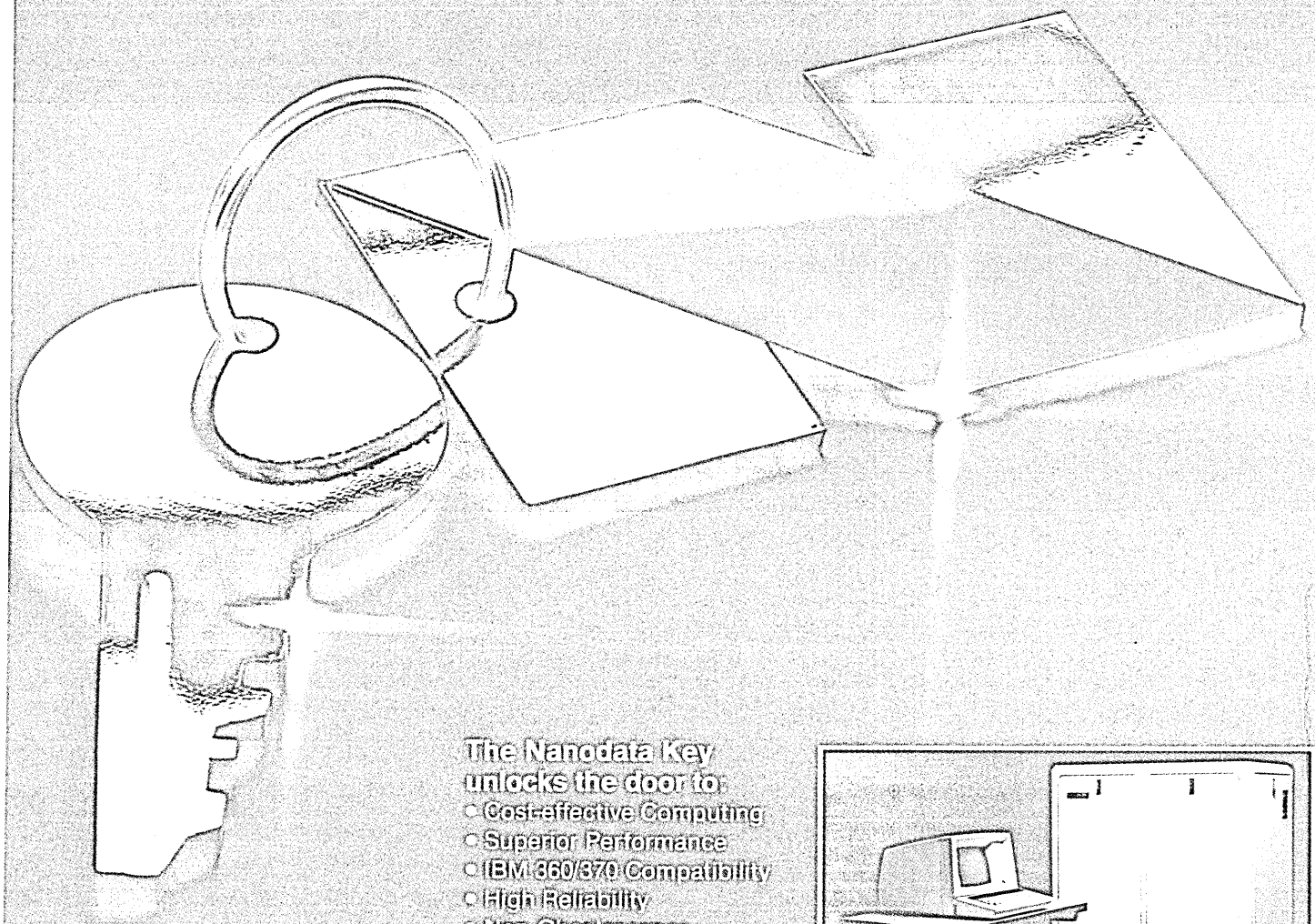

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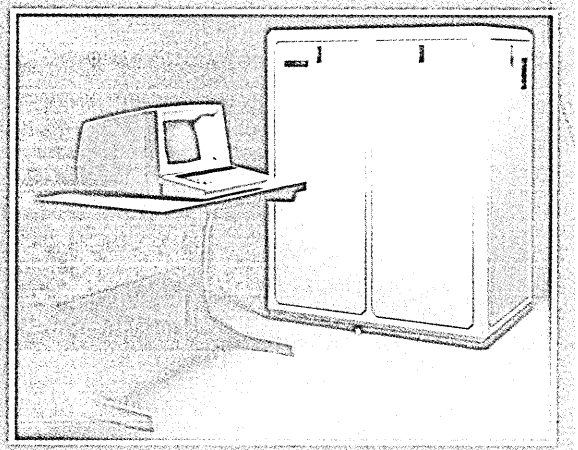

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4331s. He said of the models, "There's more in the box than we're able to get to."

Woods said he'd had problems with DOS and DIDS and with lack of trained customer engineers, lack of spare parts, and lack of trained program support reps. But he said he has received good service engineer support. "I'm not disappointed. Our problems have been what could be expected for an early user."

David W. Smith, senior technical executive in Computer Technology and Training at the Communications and Computer Sciences Dept. of Exxon Corp., said of the 4331: "If you're going to try to use 3340 disks, you're going to take a beating."

He said the 4331 works best when it's only trying to do a couple of things. Its microcode he termed "extraordinarily robust. It is clearly a box you can hook a lot of things onto."

A number of the forum participants were asked what they'd do if they were given $10 million to invest in software productivity tools. NCR's Bauer said he'd invest in a transaction processor monitor for query generator type functions. Fertig opted for data base software. "That has to be productive assuming the proper languages interface with it."

Lecht liked natural languages or quasi-natural languages "to spread out the ability to program to more people."

Fertig chose his closing statement at the Forum to restate his belief in the predicted summer date for the H Series introduction. He invited attendees to ACT's next forum . . . "a post H Series Forum, in London in July."

—Edith Myers

ANTITRUST

EDELSTEIN KEPT ON IBM CASE

IBM failed to prove its claims that Judge Edelstein should be removed from the federal antitrust case, the appellate court ruled.

A federal appeals court has rejected IBM's attempt to have the presiding judge in the 11-year-old U.S. vs. IBM antitrust suit removed from the case. In its lengthy written opinion, the court almost scornfully brushed aside the computer vendor's highly publicized charges of undue bias and prejudice on the part of U.S. District Court Judge David N. Edelstein, for most of a decade the judicial ringmaster in the huge monopoly case in New York.

A three-judge panel from the prestigious Second Circuit Court of Appeals bluntly rejected IBM's arguments as wholly insufficient to justify Edelstein's removal, and declared IBM's "evidence" of unfair prejudice to be largely specious, subjective, and irrelevant.

In mid-March, IBM filed a petition requesting the entire 10-judge panel of the appellate court to rehear the case and review the findings of the three-judge panel. Some court observers speculated that IBM was loath to give up the considerable leverage the Edelstein petition gives them—with its threat of a new trial, perhaps a new decade in court—in their ongoing settlement discussions with the Department of Justice.

In its initial appeal, IBM had argued that Judge Edelstein had adopted a querulous, often hostile attitude toward IBM attorney Thomas Barr and many IBM witnesses, and that this "bias and prejudice could not have come from any source other than an extrajudicial source." (The allegation of an "extrajudicial" basis for the judge's attitude—that it was based on something other than Edelstein's courtroom experience with the IBM attorney and his witnesses—is the crucial argument to be proven in demanding

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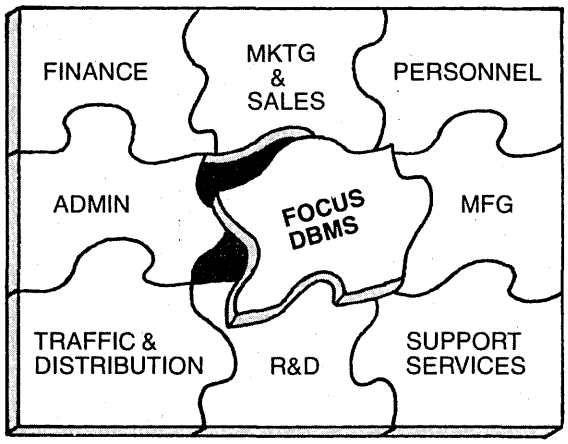

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the removal of a sitting judge.) Finding no evidence of extrajudicial bias in the IBM brief, the court bluntly rejected the petition to dump the judge—noting pointedly that it was ruling not on the merits of the case, or the judge's management of it, but only on the IBM charge of unfair prejudice.

"The question," said the court, "is not whether the trial judge has abused his discretion, but whether he could exercise any discretion because of a personal, extrajudicial bias which precludes dispassionate judgment." Yet, declared the panel, "IBM has not shown and does not purport to establish or identify any personal connection, relationship, or extrajudicial incident which accounts for the alleged personal animus of the trial judge. IBM's claim of prejudice is based completely on Chief Judge Edelstein's conduct and rulings in the case at hand."

The appellate court made it clear that it did not consider neutrality to be the posture of a sitting trial judge. "Chief Judge Edelstein is the sole finder of fact here. His role is not that of a passive observer. His role is to determine the facts in a field which is exceedingly complex and technical," said the court. He is required to judge the reliability of witnesses, to ascertain motives, and to perceive the strategies of the opposing lawyers. He "has an official obligation to become prejudiced in that sense. Impartiality is not gullibility. Disinterestedness does not mean childlike innocence. If the judge did not form judgments of the actors in those courthouse dramas called trials, he could never render decisions."

The appellate court noted IBM's complaint that Edelstein had treated its attorney and some witnesses with "asperity, incivility and hostility." Witnesses complained of Edelstein's "stares," "glares" and "scowls." Edelstein allegedly interrupted the government's 52 witnesses only 846 times and interrupted IBM's first 19 witnesses over 1,200 times; he allegedly asked IBM witnesses "too many questions," and required them to "draw meaningless charts and diagrams," and to answer complex questions with simple yes or no replies. "Accepting all these contentions at face value," declared the court, "we do not find them to be of the stuff upon which one can sensibly premise extrajudicial bias."

"If the judge did not form judgments of the actors in those courthouse dramas called trials, he could never render decisions."

Edelstein's "asperity and incivility may well be due to his feeling that a witness is not forthright, that he is trying to protect a position, or otherwise attempting to obfuscate the fact-finding process," declared the court. "His questioning, his interruption, his insistence on clarification may well be prompted by his struggle to determine the truth . . . . His asperity may well be prompted by a feeling that the witnesses for IBM (three are longtime employees) are dissembling." IBM, said the court, offers no evidence that Edelstein's reactions were anything other than a legitimate and justifiable response to the testimony before him.

Examining the record of Judge Edelstein's comments to IBM attorney Barr, the appellate judges said they were "persuaded that while occasional flareups toward counsel have undoubtedly occurred, there is no indication that this is other than sporadic. Such isolated instances are undoubtedly endemic to a trial of this dimension, and do not provide any basis for finding personal prejudice against IBM, as distinct from its counsel."

"Judges," said the Court, "while expected to possess more than the average amount of self-restraint, are still only human. They do not possess limitless ability, once passion is aroused, to resist provocation." And, given the "seemingly interminable length" of the IBM case, said the court, even "the most stoic might well lose patience . . . ."

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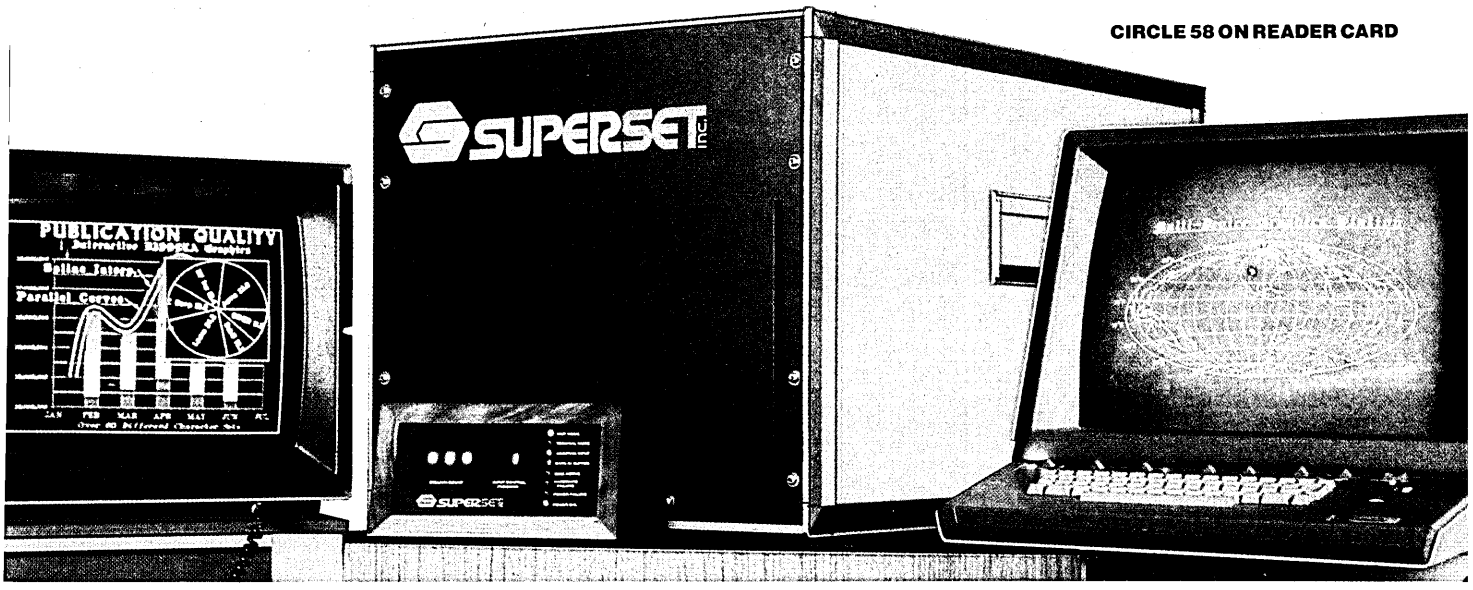

NEWS IN PERSPECTIVE

Confronting an impressive statistical display from IBM which purported to show Judge Edelstein's inclination to reject IBM courtroom objections and motions, as well as similar compilations from the government arguing the opposite, the court barely restrained its sarcasm: "While the computers have obviously been running overtime, the relevance of the statistics they have spawned to the issue of judicial bias is highly questionable." It added, "There is no authority for, and no logic in, assuming that either party to a litigation is entitled to a certain percentage of favorable decisions."

The appellate court made no attempt to hide its distaste—indeed, horror—at the length, scale, and cost of the ongoing IBM case, and once again urged a settlement as in the best interest of all concerned. The three-judge panel repeatedly made clear, however, that they could not consider displacing Judge Edelstein—barring evidence of extrajudicial bias—anything but a "catastrophe" for the interests of justice and all parties. Noting IBM's suggestion that a new judge be appointed to purge the court record of parts which reveal Edelstein's bias, the court warned, "The labors of Sisyphus pale by comparison to those that would be imposed upon a new judge, and in the end, the attribution of extrajudicial bias would require extrasensory perception."

"IBM complains in gist of erroneous rulings and judicial mismanagement of the trial," concluded the court. The attempt to displace Edelstein is, however, "not the appropriate vehicle to relieve IBM of the burdens it sets forth . . . ." Until a decision on the merits has been made, "the material issues fixed, the wheat hopefully separated from the chaff, we cannot make any determination as to the propriety of any ruling in this monstrous record, much less divine its motivation."

—Vin McLellan

INTERNATIONAL

SWEDEN FEARS DP RELIANCE

Sweden's attack on computer-related vulnerabilities is lauded by some, loathed by others.

Under the guise of safeguarding Swedish industry, government, and society in general against overreliance on computer systems, the Swedish Parliament may entertain a bill this fall which could make licensing compulsory for certain types of computer systems. This so-called "Vulnerability Act," proposed in a recent report from the Swedish Defense Ministry, notes that all computer systems are vulnerable to acts of war, terrorism, economic embargo, malfunction, and unintentional errors which can lead to a system breakdown. And for certain systems, such breakdowns can be catastrophic.

The controversial report, "The Vulnerability of the Computerized Society," suggests that the Swedish government has not exercised enough control over developments that have led to "today's computerized society." Conceding that a low probability exists for some of the cited risks, the SARK Committee report nonetheless is adamant that "vulnerability is unacceptably high." And giving added weight to the report, a recent survey published in the Swedish press states that only 14% of all companies using computer systems could continue to carry on business with manual standby systems.

While the report is full of horror stories on computer-related risks, it is dismissed as insignificant by spokesmen for two of the largest U.S. computer vendors. One source says, "It's all a bit of a yawn," while another comments, "Our Swedish staff says it's just another of many Swedish

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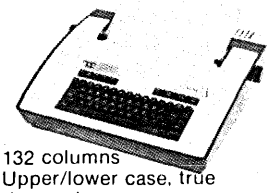

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government reports which will soon be put away and forgotten like the rest."

And one U.S. government official involved in international information policy finds the thrust of the Swedes' report foolish: "Basically, their position is analogous to that of the monks who objected to the coming of the scientific revolution. They can't turn back time just because change creates new risk profiles. The world changes and risk profiles change—that's just the way it is."

The fear in some quarters is that vulnerability will become another issue like transborder data flow which could clip the wings of U.S. multinationals.

But the issue is not one of agreement or disagreement with the report's conclusions; it's a matter of repercussions should the report's recommendations be put into law. The fear in some quarters is that vulnerability will become another issue like transborder data flow which could clip the wings of U.S. multinationals—both vendors and users. By tightening up security requirements on foreign hardware, software, and service sources, by insisting on local expertise for systems, by limiting the amount of foreign processing a multinational may do, and by limiting system complexity, a new Swedish Vulnerability Act could set a pace popular with some politicians and others anxious to limit dp activity as a possible social danger.

Measures proposed by the Swedish report include licensing for public sector computer systems as well as some private sector operations. For businesses designated "K-enterprises" (included on the National Board of Economic Defense list), a system of notification and advice should be established. The report notes that such special business sectors, which include banks, insurance companies, certain parts of the manufacturing industry, communications and transport concerns, and distributive trades, are considered crucial to the functioning of the country in wartime.

Such companies would be required to report to a newly established vulnerability authority such details as the particulars of computer equipment, its location and uses, system structure, dp security provisions, emergency plans, and the nature of file content. What's more, notifications "shall always contain particulars of processing operations abroad."

The proposals also cover service bureaus, which would have to report dependence on staff, documentation available, and standby routines. "If [a user] employs the services of a computer service bureau," the report says, "the possibilities of reducing vulnerability are somewhat curtailed."

The SARK document is largely defense-oriented, a bias which has earned it

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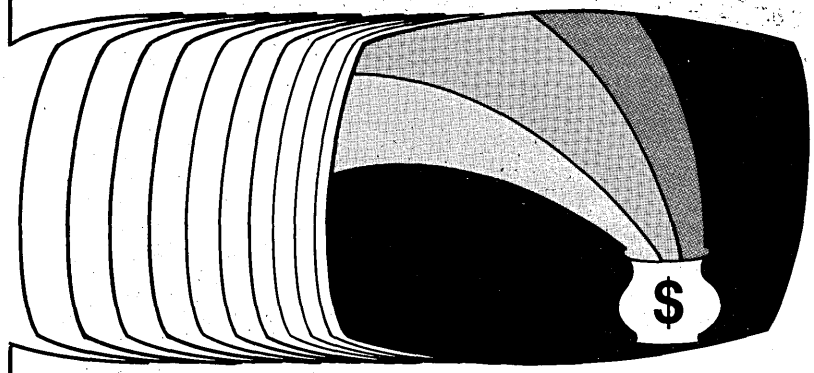

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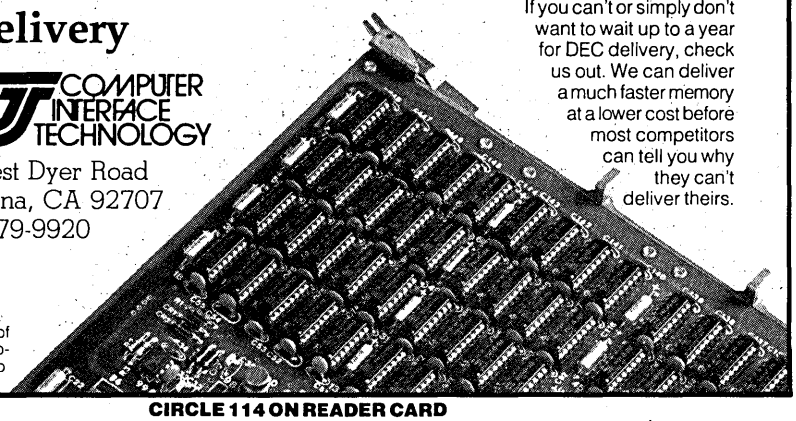

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some criticism in Sweden. The authors argue that in the event of war—with near neighbors the Soviet Union or anybody else—Sweden's very high concentration of dp installations around Stockholm would make the country's infrastructure very vulnerable to enemy attack.

But an essential element of the report is its concern with events which may take place without a full scale war. "Various events and forms of interference may cause excessive disturbance and damage even in times of deepest peace," it says. But even though it admits that dp is only one of several causes of vulnerability of modern society, the report says this "must not be taken as a pretext for omitting to limit vulnerability due to the use of adp, so long as such limitation can be achieved by reasonable means."

One source suggests that Sweden could limit its dependence on imported dp products and services by stockpiling spares.

Another area of vulnerability cited by the report includes economic embargo—already practiced by NATO countries through COCOM, and used by the U.S. in particular in recent months. The report points to Sweden's dependence on imported dp products and services as a likely target in any embargo. One possible remedy to this dependence, suggests a Swedish financial sector source, may be the building up stocks of spare parts and components in Sweden. "But will this take care of the skilled personnel problem needed for maintenance—and what about the speed with which technology changes?" he asks. The source adds that such a practice would provide an excuse to limit U.S. vendor sales, though the stockpiling of spares would increase their sales over the short term.

Some Swedes want to see the bill equally tough on the private sector, arguing that the economy and society have become so dependent on dp without realizing it that it is time to look much more closely at the applications which are being implemented. Kjell Holmström, an independent Swedish consultant who made a lenghthy contribution to the report, says, "Many of the points made in the SARK report refer to war or related threats of terrorism or economic embargoes. But these and many other issues are not really brought home to the public." Holmström talks of "know-how loss" brought about by total reliance on dp.

"What happens if we forget how to make a certain product or provide a certain service because we become totally reliant on computer systems?" he asks, arguing that this is another form of vulnerability. The report echoes this sentiment in its criticism of overcomplexity in systems. "Often with the same level of service, information can be collected in a simpler way, and thus without any advanced data communications procedure." The report, however, does not appear to take an *a priori* anticomputer stance, as it states: "Technically developed society cannot do without adp."

While no other country has as yet undertaken an official investigation of vulnerability, the report itself observes that there is "an increasing interest in these questions." One insider says France, Norway, Spain, and Switzerland are all taking an active interest in the implications of the vulnerability question. And Swedish consultant Holmström suggests that French thinking has even gone beyond Swedish conclusions in some respects.

"What happens if we forget how to make a certain product or provide a certain service because we become totally reliant on computer systems?"

What many outside observers are noting is that it was Sweden that provided the model for much of the data protection legislation that has been passed in many European countries—and that it seems in the cards that other countries will follow Sweden's lead on the issue of vulnerability.

The issue has already begun to attract attention in the Organization for Economic Cooperation and Development (OECD), where an expert group has been looking at international data protection guidelines. "Ten years ago, the issue here was privacy," says one source. "Now, it's vulnerability."

—Andrew Lloyd

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MEETINGS

OF TAXES, TELECOM & ANTITRUST

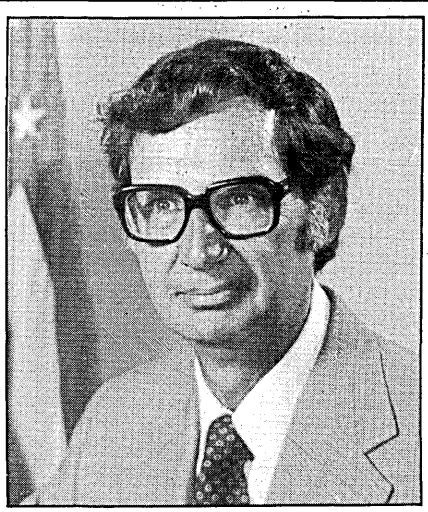
CCIA's annual Washington Caucus touched on many topics, but the underlying aim was to form a united front against giants IBM and AT&T.

United we stand, divided we fall, because AT&T is against us all.

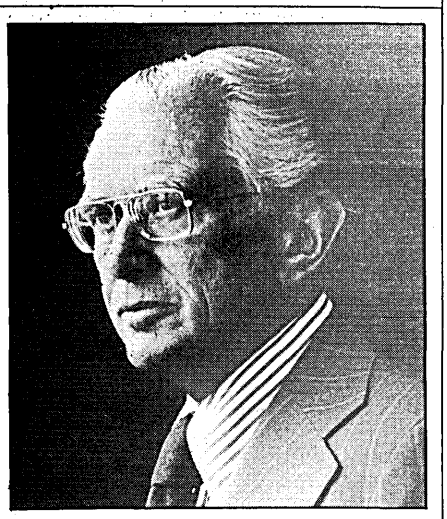
Neither the speakers nor the attendees actually uttered that statement during last month's two-day, seventh annual Washington Caucus of the Computer & Communications Industry Association. They didn't need to. That theme pervaded.

"We try to help our members understand how important the political process is," explained CCIA president Jack Biddle, "and that an ill-informed Congressman is a dangerous Congressman. If we don't inform Congress, who will? We already know the answer to that. AT&T and IBM will,and their interests are not the interests of the rest of the industry."

Certainly not of CCIA's perception of the industry. That group's paramount interest was lofty and Herculean: meet with each CCIA member's Congressperson and convince him or her to change the evil ways of H.R. 6121, a House communications subcommittee bill that would, depending upon one's persuasion, either start to break up or further solidify AT&T's dominance. In lieu of divestiture, which Assistant Secretary of Commerce for Communications and Information Henry Geller unequivocally promised "is politically unfeasible," CCIA members would agree to legislation that places an iron grip on AT&T's move into unregulated markets.



HENRY GELLER: "The bill isn't a panacea, but we've improved the situation tremendously."



SEN. HOWARD METZENBAUM: "Nothing in this legislation will inhibit AT&T in the slightest.

Topics at the caucus ranged from foreign trade to procurement to trials and tribulations of the Federal Trade Commission, but two that roused members most were tax policy and communications law.

"The success of your business depends on the tax laws—not what you can take out of them but how you can manipulate them," acknowledged Representative J.J. Pickle (D.-Texas) in a stunning burst of candor. "We ought to be appalled at the lack of voluntary compliance that our citizens give the government."

Pickle then elucidated some reasons

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for that purported lack of concern, noting that the emphasis in the early 1970s was to close tax loopholes and try to prevent business from getting more deductions. Since the Tax Reform Act of 1976, however, it's comparatively been a businessman's holiday, culminating in the Tax Reform Act of 1978, which lowered rates on capital gains and corporate taxes on small businesses. "That wouldn't have happened four or five years ago," Pickle said. "But the new members turned out to be not as liberal as some may have thought—or feared."

Those who anticipated a tax cut this year will be in for a surprise, according to Pickle's forecast. There won't be one. He also predicted that Congress will recommend a balanced budget for fiscal year 1981, although he wasn't quite sure where the proposed $20 billion reduction would occur or whether that sum would do the job adequately. He indicated prospects are good for a dividend reinvestment plan; that the 10-5-3 depreciation bill "will take off like a scalded cat"; that a proposed venture capital tax reform act was coming on strongly; and that when he returned to Capitol Hill he would tell his colleagues, "I just talked to Moses and he told me what to do."

Those who anticipated a tax cut for business this year will be in for a surprise; there won't be one, predicted Rep. Pickle.

Not even that stellar pathfinder could have led Henry Geller out of the wilderness. From his introduction by Biddle—"a man who never worked for private industry and, like all good bureaucrats, believes that good men will always do good things"—until his departure, the encounter probably was not one of the Assistant Secretary's more pleasant outings.

Geller staunchly defended the telecommunications legislation, and his listeners were equally steadfast in their denunciations of it. Geller outlined three principles of the Administration's telecommunications policy: competition should return wherever possible, and it is more effectively accomplished through a law rather than through dependence on commissions or courts; some amount of deregulation clearly is necessary; and there has to be some way of preventing AT&T from gaining an unfair competitive advantage under deregulation.

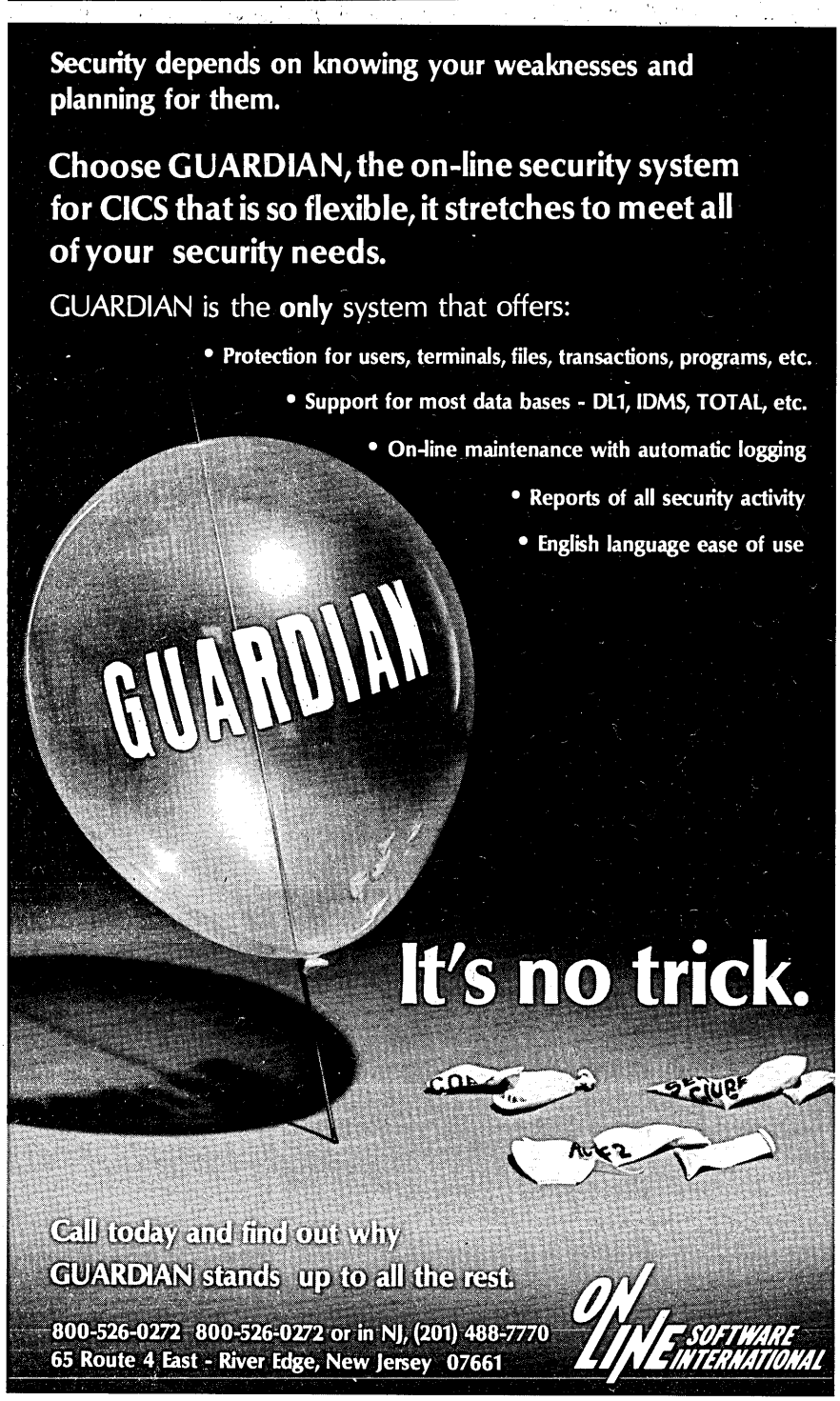
"We're very committed to reform," Geller told his skeptical audience. "The failure to move forward now means years and years of proceedings and litigation. We want to put the industry in the best possible position to compete with itself and with foreign competitors. H.R. 6121 should, whatever else it does, give the FCC great flexibility and wide powers to assure fair interfacing among competitors. The bill isn't a panacea, but we've improved the situation tremendously."

Geller staunchly defended H.R. 6121, and his listeners were equally steadfast in their denunciations of it.

Not according to Sen. Howard Metzenbaum. The Ohio Democrat, who as chairman of the Senate antitrust subcommittee will play a major role in the bill's future in the Senate, warned that the bill would allow AT&T to destroy competition.

"I will flatly predict here and now," he said in a speech extolling the virtues of small business while bemoaning its lack of support by the Administration, "that unless the protections written into this bill are greatly strengthened, an unleashed AT&T will literally wipe up the floor with its smaller competitors.

"Nothing in this legislation will inhibit AT&T in the slightest from using its huge resources, drawn primarily from mo-



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nopoly telephone service, to undercut its competitors' prices. I don't oppose AT&T moving into competitive areas, free from rate and profit regulation. But I think there ought to be some outside agency, like the federal court where the consent decree was filed or the FCC, to decide in which markets AT&T entry would be useful."

Metzenbaum further noted that AT&T vs IBM would be a legitimate contest, but AT&T vs any small business would be comparable to the lions vs the Christians. In that situation, he urged regulation on a case-by-case basis to increase competition and prevent extension of Bell's monopoly.

"The issues raised by this proposed legislation go far beyond the immediate question of your industry," he concluded. "Those issues touch upon the kind of economy we are going to have in this country. The gauntlet has been thrown down. The fight is on. I welcome your support in the battle to make our antitrust laws work more effectively to stimulate competition—while at the same time protecting the small businessman from unfair competition."

By then, his listeners would have tried to walk on water for him. They settled for giving him a standing ovation.

—Willie Schatz

VERVEER CALLS FOR MODIFIED '56 DECREE

It was obvious that Philip Verveer knew his audience.

First, the former lead attorney for the Justice Department in its antitrust suit against IBM and now the chief of the Common Carrier Bureau of the FCC empathized with the problems of competing in the same field as AT&T and IBM. Second, he summarized, rather than read, his 19-page speech. And third, he told his listeners what they wanted to hear.

"I'm especially happy to be with this group because it confirms a theoretical proposition advanced by Alexis de Tocqueville in his classic *Democracy in America*," Verveer began. "He believed that the best and the brightest of American society went into business not so much for the money as for the excitement. I've never been sure that his proposition is generally correct, but I know that it must be for the members of CCIA. The voluntary taking of positions in markets in the vicinity of IBM and AT&T is bound to produce some sense of excitement —perhaps even a little anxiety. And to make your careers in this sector of the economy must reflect a studied decision to seek not only excitement, but cheap thrills."

Verveer then offered a little excitement of his own, calling for the modification or elimination of the 1956 consent decree, which purportedly built a wall around AT&T's monopoly to prevent it from spreading into what were then markets far removed from its base of telephone service and attempted to restrict Western Electric to the manufacture of certain types of equipment. "Let me summarize my views as to the effect and future of the decree: little and none," Verveer said.

After discussing several flaws in the decree and analyzing certain of its substantive portions, Verveer argued that Bell's actions indicating it is limited to selling communications gear to Bell operating companies and Long Lines are the result of corporate policy decisions more than any legal restraints of the decree.

He then advanced several reasons for changing the decree, foremost among them being "the violence which the decree does to basic Sherman Act concepts" because AT&T's monopoly power drastically reduces the type of competition the Sherman Act was designed to promote.

"What is at stake in the arguments on both sides of this issue," he stated, "is the competitive process itself. If a consensus is not reached, if the decree is not modified, who loses? In a word, everybody."

—W.S.

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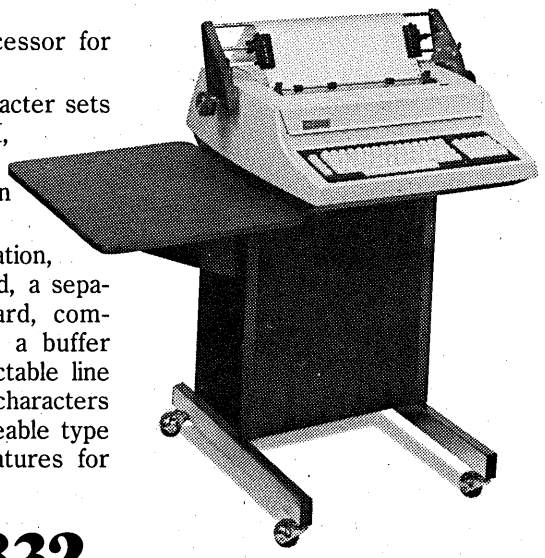

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CONFUSION MARKS EDP AUDITING

It's Catch 22 for today's edp auditors—privacy laws often preclude their accessing personnel files while liability laws can hold them responsible.

All auditors are expected to protect company assets and to protect that company from liability by assuring that proper controls are in place and appropriate methods are followed.

For edp auditors, this is becoming a more complex task every year because of both advancing technology and new legislation. Some of the new laws, said Gary Tudor, an attorney for McDonnell Douglas Corp., "are putting the auditor between a rock and a hard place."

Tudor told a Systems Development Conference of the EDP Auditors' Assn. in Salt Lake City of a case in Columbus, Ohio, in which officers of a company were found guilty of negligence and fined because a faulty computer system caused gas to be shut off in winter months. "The auditor should have been there."

He recalled a case in Tennessee in which a Federal District Court ruled "the auditor has a duty to inform management if there are problems with a computer system. If he doesn't, the auditor may be liable."

On the other hand, Tudor pointed out, "Most new privacy legislation generally will state that nobody can have access to private information. Auditors are not excepted. So, how do they audit a corporate personnel file? It's a real Catch 22."

Tudor didn't paint a hopeless picture, however. He suggested two ways around the personnel file problem: either have all employees sign releases or encrypt all data.

As for auditor liability, he said that can be avoided if the auditor reports systems problems to his management. But that isn't always easy. "You people," Bob Kukrall, Advanced Computer Techniques Corp., Phoenix, told the edp auditors, "are responsible for the adequacy of controls, but you don't have the responsibility for putting them in there."

William H. Murray, manager of data security support programs in IBM's Data Processing Div., said, "Auditors have contributed as much to the problem of bad systems as they have to the solution. You have given tacit agreement, approval. You've tolerated the absence of documentation." He urged auditors to "develop a rigorous set of expectations against which we can compare."

"Auditors have contributed as much to the problem of bad systems as they have to the solution."

He advocates control of risk by separation of duties "such that no one has access to a sensitive combination of resources. There should be a separation of originators and approvers so that approvers can't originate and originators can't approve."

Murray said too many managers contend they don't want to stifle the creativity of their programmers. "We have as much use for creative programmers as we have for creative draftsmen." Other managers say they can't afford the luxury of separation of duties because their shops are too small. "If you have only one programmer, you have outstanding accountability. Your need for separation comes when you have two programmers or more."

Murray believes also that "improved programming technologies are not for programmers; they're for managers. Don't send your programmers to school. Send your managers. Most new programming technologies are contrary to the interest of the programmer, who generally gets compensated for complexity."

The IBM exec told a tale of Complex Charlie, a programmer who rarely wrote a program with fewer than 1,000 lines of instructions, put progams into production before documentation and testing, and was the most sought after programmer in his shop.

And then there was Simple Simon. "Simon understands that he is only human; he rarely exceeds 50 lines of code. Simon tends to document. Who gets paid most? Charlie, along with all the psychic rewards. When a new programmer comes into the shop, who does he emulate?"

John C. Gazlay, a principal in the San Francisco office of Arthur Young & Co., worried about the current shortage of good programmers. "The universities are not turning out all that many." He said this is leading to increased use of packaged software and to different systems auditing techniques.

With both in-house developed software and purchased packaged software, he said, auditors should consider the expected utility of the system, effectiveness, acceptability, efficiency, cost, conversion, flexibility, accuracy, power of the edits, documentation, portability, and maintainability.

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All these, he said, are concerns with purchased software too, with the added concerns for impact of the use of the purchased software on competitive position in the marketplace, viability of the vendor, question of who owns the software, responsibilities for the system, privacy of the system and the data, and element of training.

Areas of audit activity with purchased software, Gazlay said, should include participation in the selection process and review, actual design of data to be processed by the system, and participation in installation. For purchased software, he said, there can be no involvement in the development phase.

ACT's Kukrall feels that auditor involvement in in-house development of software is imperative. He said government, with many of its new laws, is saying, "Hey, get it together out there or we'll do it for you."

He urged auditors to "provide audit input in the design phase. You can't effect the adequacy of anything if you don't participate." Kukrall says the control element is not given sufficient emphasis in the design process. "Nobody gets too excited about controls until something happens."

Kukrall urged the auditors to get management support for their participation in the system development life cycle. "Management should say 'thou shalt.' "

"If we do it at the front end, then we can be more effective," Kukrall said. "I don't mean wallow around in COBOL code. Get into a skull session long before a pencil has been put to a line of code. Say, 'This is what I want in there.' "

Tudor of McDonnell Douglas urged the auditors to bring statutory considerations into the design phase. "Know what regulatory agencies might be involved. Generally the user doesn't know. Keep in reasonably good contact with your legal counsel."

IBM's Kukrall urged auditors to get management support for their participation in the system development life cycle. "Management should say 'thou shalt.' "

One of the stated purposes of the Systems Development Conference, which was sponsored by the EDPAA's Utah chapter, was: "to promote better understanding on the part of edp auditors, auditors, edp management, and management of their respective roles in the systems development process."

IBM's Murray interpreted this to mean "increasing harmony between edp auditing and edp. I don't believe that kind of harmony is in our best interests. God intends it to be an adversary relationship."

—Edith Myers

COMPANIES

SPC SEEKS NON-AT&T MARKETS

In 1980, 95% of SP Communications' revenue will come from services that compete directly with Bell, but the company expects that number to drop to 20% in five years.

In the early 1970s competition began to intrude into the well-patterned domain of the telephone companies. One of the most dramatic of the competitive thrusts was the advent of the specialized common carriers that vowed to duplicate and expand on the private line services offered to business communications users.

Originally each of the specialized carriers planned to build its own network and offer business services at costs below the conventional phone companies. But there proved to be too many contenders for a market that required very high initial expenditures associated with building nationwide communications networks. Today only a few specialized carriers have survived, and some of them are planning services never envisioned when the industry began.

Among the more bullish of these specialized carriers still operating today is SP Communications Co., which moved into the black for the first time in 1979 with an operating income of almost $15 million. As a subsidiary of Southern Pacific Railroad, SP Communications was able to construct its nationwide network using much of the railroad's right-of-way for microwave sights instead of having to find new and costly overland routes. But today the relationship with the railroad exists mostly in name only, and from there SP Communications takes off on its own.

In recognition of its East Coast orientation, SP Communications is building a new headquarters site outside Washington, D.C., where the carrier can better serve customers and also keep closer tabs on the Federal Communications Commission. The firm plans to move East from its present base in Burlingame, Calif., later this year.

In order to be well positioned for what president C. Gus Grant believes will be burgeoning telecommunications markets, SP Communications has formed four new subsidiaries in key service segments.

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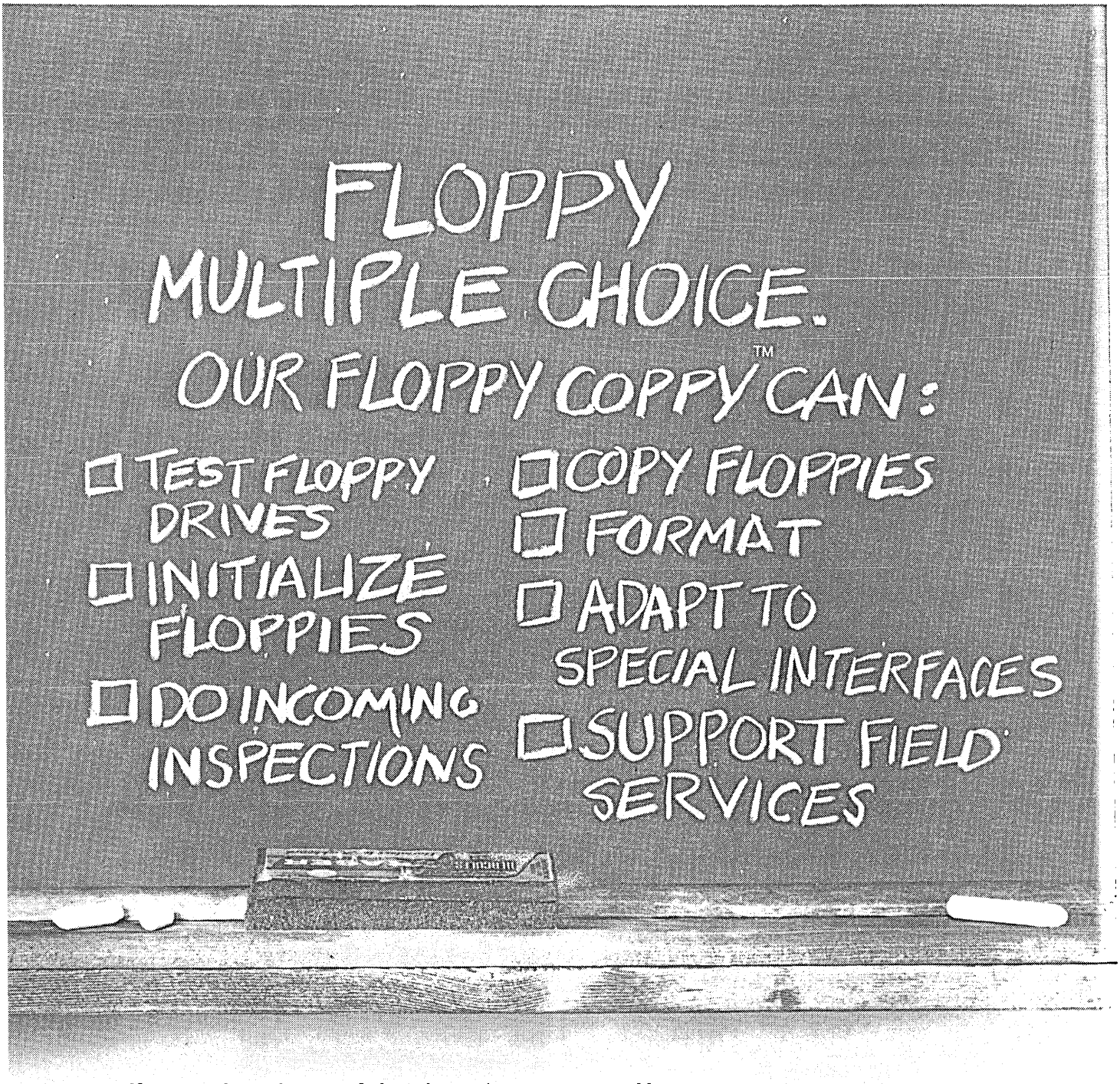

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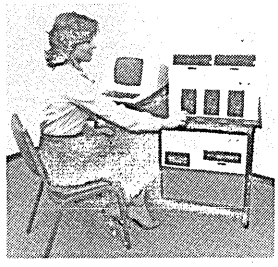

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Grant feels that the best way his carrier can grow is to go after market areas that don't compete with AT&T. In 1980, 95% of SP Communications' revenue will come from services that compete directly with Bell, but in five years Grant sees 20% of the revenue coming from "areas of opportunity" where the telephone company does not operate.

While staying within the broad framework of telecommunications, SP has already strayed into some unconventional areas for a specialized carrier. In 1979, SP Telecommunications Processing Co. (SPTP) began offering a 30% discount to Telex users by handling these messages over its domestic long-distance Sprint network. The service adds a store-and-forward capability and connects with facilities in London to provide Telex and other low speed message users with a new international service. Message rates from London to other European points are less costly than sending direct from the U.S. to overseas destinations.

While staying within the broad framework of telecom, SP has already strayed into some unconventional areas for a specialized carrier.

To access the SPTP Telex service, a user with Telex, TWX, or ASCII terminals must install a TELPRO translator box which provides access to the SP Sprint network. The TELPRO box is specially built for SP and provides the necessary speed and code conversion to transmit over the faster 1,200 bps Sprint network. The box costs $35 per month, but the savings come from the Sprint rates, which are lower than Telex or TWX charges from Western Union, according to SPTP. Based on microprocessor control, the SPTP service is described by the company as data processing rather than communications, thus making it exempt from regulatory tariffs. But some competitors in the international carrier area view this description as merely an attempt to steer the service away from regulation.

Thus far the Telex service is available only through London, but additional agreements will be made with overseas telecommunications authorities soon and, by the end of 1980, domestic Telex and TWX messages will also be handled. While initially the Telex service is designed to handle messages originating at customer terminals, cpus can also communicate directly with the SPTP store-and-forward nodes for high volume traffic.

Such bulk message needs fit in with the Datapost service which SP Communications purchased recently from Cable & Wireless, another carrier. Datapost is similar to the Western Union Mailgram service, but Grant sees it going further with an orientation to facsimile. SP Communications has an agreement with Hitachi to provide a subminute facsimile machine that will cost about $325 a month.

By 1981, Grant plans to have a store-and-forward capability added for facsimile users, and a slower two-minute machine will also be introduced. The facsimile machines will access the SP network via dial-up connections, but Grant foresees access coming later from less conventional methods. Already some corporations have word processing equipment connected to SP message services, and Grant sees a relationship between this office automation area and more traditional message nets like Telex and Datapost.

"This whole combination is going to involve facsimile, high speed printing integration with the postal system and communicating word processing centers," Grant said. Although he did not rule out an expansion into electronic mail, Grant said the entire service area is under careful study and new offerings will be based on user need.

With another subsidiary, SP will build in-house private networks, specifically tailored to handle voice and data traffic, for very large users. This operation will include full engineering installation and servicing to large corporations.

With so many services planned, SP Communications is currently stymied by a lack of long haul transmission capacity. The company plans to add 20 million circuit miles in 1980 at a cost of $150 million. This means effectively doubling the size of the present network but, even when completed, it will only be enough capacity for less than a year, Grant predicted.

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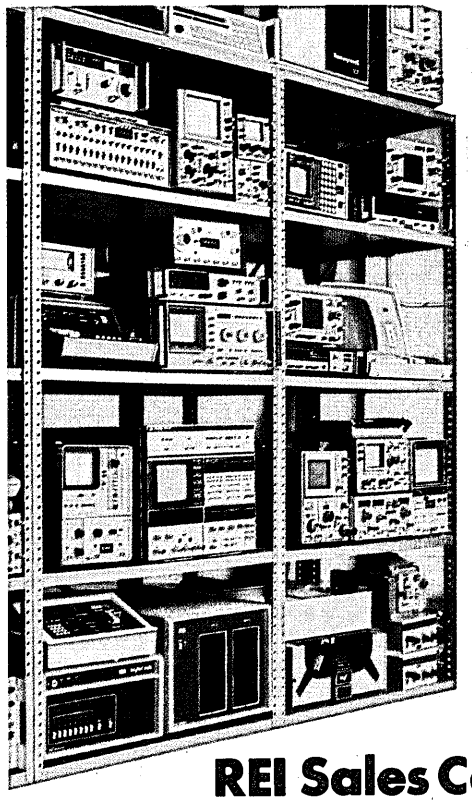
And SP has also taken to the air, signing up with RCA for about 1,000 satellite circuits; it also filed with the FCC for authorization to put up its own satellite. Meanwhile data traffic has been growing on SP's conventional private line routes and data speeds have been increasing as users install more sophisticated equipment.

Admitting that SP Communications oddly falls into the category of a conservative railroad subsidiary, Grant says flatly that in the telecommunications business, "You have to keep moving." If SP Communications can expand its network and not run into any unforeseen regulatory roadblocks, it seems destined to offer more innovative services to users in the months to come.

—Ronald A. Frank



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BUILDING A NAME

The son of a Japanese firm, California-based C. Itoh Electronics is building the company and its image, partly by recruiting "Americans well known in the computer industry."

How is it a small, high technology company that started up in 1973 in Los Angeles with nine employees has been able to maintain an even balance between imports and exports when so many nations can't do it?

Perhaps, in part, it's because the company, C. Itoh Electronics, Inc., while small in one sense, is really large in another. Its parent, C. Itoh Ltd. of Tokyo, is a $32 billion-a-year company with more than 10,000 employees, 41 offices in Japan, and 120 locally incorporated subsidiaries, branches, and offices in 75 other countries.

Maybe it's because, while C. Itoh Electronics, Inc. is new, it also is old. Parent C. Itoh Ltd. was founded 121 years ago.

And it's probably due in part to the fact that maintaining a zero balance of trade is part of the company's operating plan.

The fact that C. Itoh Electronics doesn't limit its activities to import and export could also be a factor. The company is engaged in research and development, licensing, and venture capital.

The Los Angeles company by itself has experienced considerable growth since 1973. It has plans to accelerate that growth rate, plans which include a concerted attack on the computer peripherals marketplace.

C. Itoh Electronics is a wholly owned, autonomous subsidiary of C. Itoh America, Inc., New York City, which in turn is a wholly owned subsidiary of the Japanese parent firm.

The electronics operation once was one of nine branches of C. Itoh America. "It was spun off in 1973 because they [the top management of C. Itoh America] didn't understand the electronics business. It's highly technical," said Mark M. Takeuchi, president of C. Itoh Electronics.

By 1974, the Los Angeles company was doing $19 million a year. By 1979 they were up to 45 employees and $51 million in yearly sales. This year, Takeuchi said, with 50 employees, they expect to do $100 million in sales.

From 1973 to 1979 the major products sold in the U. S. by C. Itoh Electronics were small printers for cash registers and calculators. "We have 85% of the U.S. market for such printers," said Takeuchi. "Now we're getting into computer peripherals." Among the products imported from Japan for sale here are computer printers, crt monitors, keyboards, magnetic card readers, and floppy disk drives. Some are manufactured for them in Japan to their specifications and sold here under their name.

And theirs is a name they'd like to build. "We are adding to our marketing and support activities," said Robert J. Cowan, vice president-marketing. In mid-March they were on the verge of hiring Eastern and Western regional managers, "both well known in the industry."

Their sales in the U.S. are primarily to oems and through reps. In March they had five reps and were planning to up that to 15 within three months.

The products they export from the U.S. to Japan are sold primarily to end users through still another C. Itoh company, C. Itoh Data Systems of Tokyo. This company employees 400 people and has one head office electronics department and two large subsidiaries, CID Systems and Century Research Center. The research center last January took delivery on the first Cray computer in Japan, exported by C. Itoh Electronics, and has another on order. Takeuchi said Century Research is the largest software house in Japan, employing 150 scientific programmers.

C. Itoh Electronics exports both military and commercial products. Its military exports include products from Hughes Aircraft Co. and Bendix Corp. In the commercial sector they export products of Qantel, Inforex, Xynetics, Calma, Optimetrix, and Control Data Corp.

C. Itoh Electronics' research and development efforts take two forms. "We want to have more of our own products," said Takeuchi. "So we get ideas and ask third parties, computer designers and consultants, to develop a prototype to our specs." The other way is to buy all rights to products developed by third parties "like garage type operations."

He said they are experiencing new product development start-ups at the rate of one per week.

As for the future, "a lot of Japanese computer companies want to get into the U.S., and we want to help them," said Takeuchi. He also said he'd like to get into third country business. And he'd like to get into systems sales to end users, "not this year, but starting from next year."

Cowan said their research and development activities include "all kinds of software packages," which represents another possible future direction.

And the company is actively recruiting. "We are concentrating on Americans," Takeuchi said, "particularly people well known in the computer industry."

—Edith Myers

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NEWS IN PERSPECTIVE

BENCHMARKS

DATRAN SETTLEMENT: Wyly Corp. is taking steps to beef up its University Computing Co. subsidiary, which was heavily drained in the mid-'70s, as the company sought cash to bolster its Datran digital transmission service. Wyly recently acquired Digital Systems of Florida, Inc., for more than $20 million and is actively examining other acquisitions in the software field. Digital, which provides turnkey systems for accounting firms, reported a net income of $407,000 in its fiscal year on sales of $7 million. Two factors will help Wyly in the acquisition program. It will realize $25 million out of the $50 million out-of-court settlement of an antitrust suit against AT&T in which Wyly had asked for $285 million. Also, while building the Datran (Data Transmission Co.) service, it incurred hugh losses, which give the company tax loss carry-forward benefits of $50 million that will run into 1984. In its recently settled suit, filed in 1976, Wyly alleged that AT&T forced Datran into bankruptcy by instituting unreasonably low rates. AT&T countersued, charging Wyly with having conspired to monopolize and restrain trade in the digital data communications market.

SBS GETS GO-AHEAD: A recent appeals court decision confirmed the Federal Communications Commission's 1977 approval of Satellite Business Systems. The FCC's okay to SBS had been appealed by potential domsat competitors (among them, Western Union, AT&T, and American Satellite Corp.), as well as by the Justice Department—all of which charged that SBS received the go-ahead without "full evidentiary hearings." Pending the legal proceedings, however, SBS was allowed to continue work on its domestic satellite communications system, and its first satellite is now scheduled for launching this October. While original SBS service plans were geared toward large corporate users with massive communications requirements, plans now call for leasing lines from carriers (AT&T and Bell Canada International) to provide interconnection skills and support, and enable users of smaller size to receive the SBS services and applications they require.

IBM/JUSTICE NEGOTIATIONS: Ongoing Washington negotiations on the 11-year-old federal antitrust case against IBM showed some progress toward possible settlement last month when U.S. Attorney General Benjamin R. Civiletti reported that the two sides had reached "a satisfactory resolution of the ground rules on which discussion of the merits of the case can begin." Procedural debates had stalled discussion of the substantive issues in the three formal meetings held since the latest round of settlement discussions were begun at the urging of the Second Circuit Court of Appeals. In New York, the appellate court reported that it had been kept appraised of the status of the discussions, and "while there is reason to be somewhat optimistic so long as the parties are meeting, there is little reason to expect a settlement in the immediate future." With the breakthrough on procedure, however, Civiletti said the government should know within the next two months if substantive progress is possible. Back in the U.S. District Court in New York, IBM and the government reported a negotiated settlement on the prosecution's bitterly contested 1979 subpoena of IBM Chairman Frank Cary to produce, according to IBM, "virtually all computer-related documents in the files of the IBM Corp. for the years 1974 to some unspecified time in the future when Mr. Cary's trial testimony would be complete." IBM had claimed that the government's demand would cost the company $1 billion and require 62,000 man-years of effort just to gather existing documents. Last month, however, the U.S. withdrew its subpoena as IBM agreed not to have Cary testify. Both parties agreed instead that Cary's previous testimony in the Telex, Transamerica, and Memorex antitrust cases—and portions of some 45 days of Cary depositions from the U.S. and private antitrust suits—could be entered into the record by IBM.

GENE AMDAHL RESURFACES: Expected to retire in early 1981 from the company he founded, Amdahl Corp., Dr. Eugene Amdahl is definitely not planning a quiet retirement. He and John Ellenby (formerly the manager of advanced programs at the Xerox Palo Alto Research Center) have started a new company, Grid Systems Corp., in Palo Alto, Calif. The company is going after the office automation sector of the industry, and is presently completing business plans and tracking funds for microcomputer-based office equipment. Dr. Amdahl's role in Grid Systems Corp. is not exactly clear at this point, but he is expected to take an active part in the new venture.

COMMERCE REPORTS: The computer industry will continue to prosper through 1984, though growth for 1980 will be moderate. The momentum is slowing due to the general economic slowdown in the United States. So says the "U.S. Industrial Outlook," an annual report from the Commerce Department. The report predicts computer shipments will reach $23.3 billion in 1980—a 10% increase over the 1979 figures. The prediction through 1984 is an annual increase of approximately 12%. The slowdown is more visible when the projected 12% figure is compared with the 26% annual increases seen between 1976 and '79. Demand topped supply during 1979 in skilled labor, such as programmers and systems analysts, causing salaries in these job categories to rise. The shortage of 16K RAMs caused an increase in chip prices, although this increase should not have much effect on computer prices in the coming years, the report said. The incredible semiconductor growth pattern (up 29% over 1978 figures) will begin to taper off in 1980 through 1984 to an average annual increase of 13.4%. Exports reached approximately $5.3 billion in 1979, which accounted for almost 25% of the value of domestic shipments. The percentage increase was 27% over the 1978 numbers. Imports rose about 26% to $490 million during 1979.

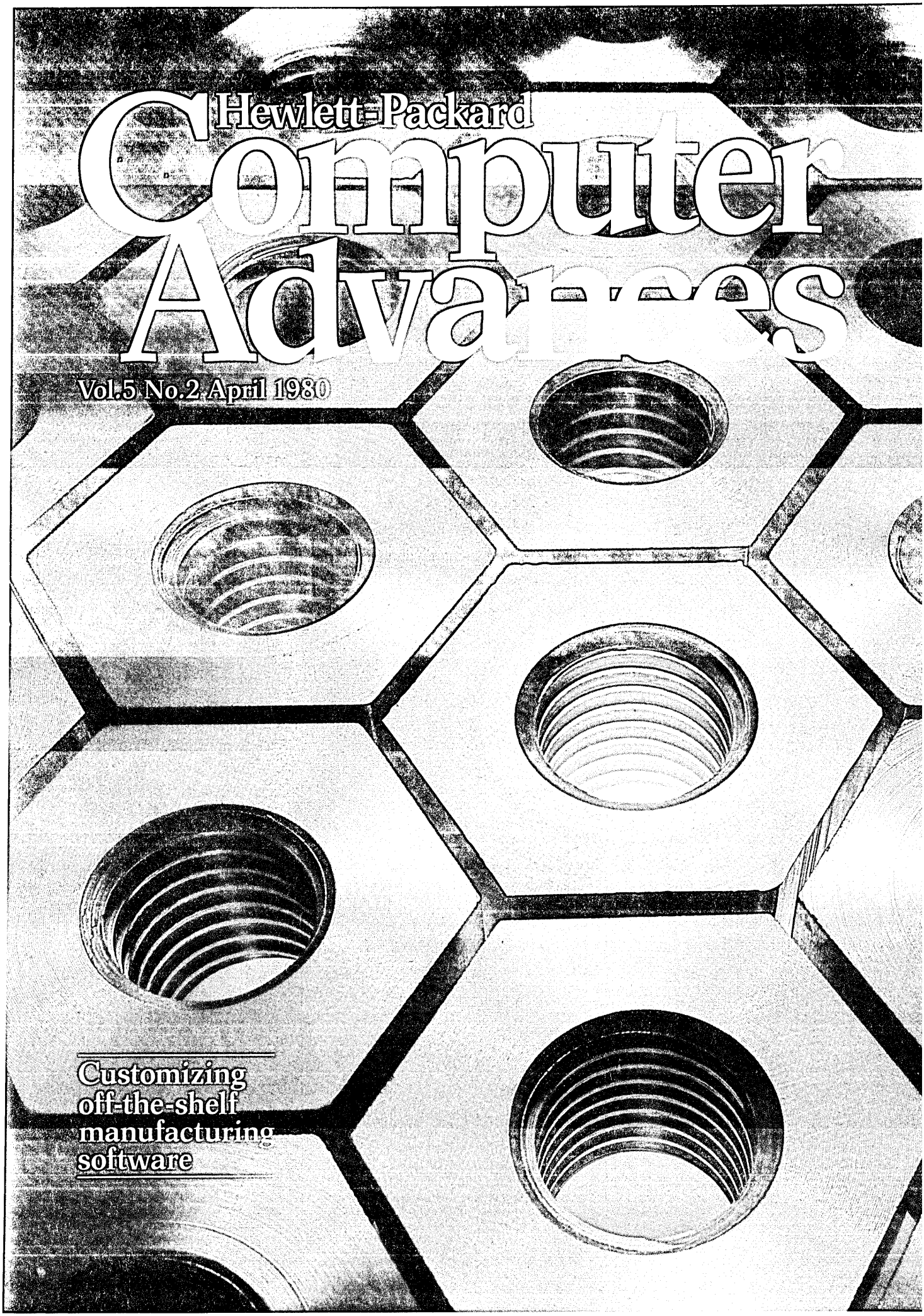
IBM BORROWING AGAIN: IBM's Paul J. Rizzo, senior vp, revealed to analysts a probable need for more borrowing this year. In 1979, capital spending hit $6 billion and additional borrowing seems inevitable for 1980, he said. This $6 billion was divided between financing rental equipment ($4.2 billion) and development of IBM facilities—four million square feet of office, lab, and plant space constructed last year, along with 11 million square feet still under construction. Last year, IBM made a public borrowing of $1 billion in debentures and notes; it then arranged for $300 million in notes with Saudi Arabia. IBM also secured a $1.5 billion multibank line of credit. Rizzo stated, "We would anticipate having to go to capital markets again in 1980 but that will also depend a great deal on our customers' decisions as to whether they choose to purchase equipment or lease it." When asked about the lease swing that was, to a large extent, responsible for IBM's reduced earnings in '79, his reply was that the lease status "masked the real success we achieved in growing our business volumes during 1979." He did not comment on the current status of the lease trend.

LITTON VS. AT&T: Judge William C. Conner has denied AT&T's request that the antitrust case against it be dropped, recommending instead that the case be tried without "further substantial delay." In his statement Judge Connors said, "The court concludes that no implied immunity from the antitrust laws exists for the activities of AT&T alleged in the complaint." Thus far, AT&T has hidden behind the FCC's interstate communications regulation, claiming "implied immunity" from antitrust laws. As a result of alleged antitrust violations, Litton has charged, its BTS (Business Telephone Systems, Inc.) subsidiary went out of business in 1974. AT&T has attempted to use the 1934 Communications Act in its defense, but that was not accepted by Judge Conner. As he stated in his summary, "There is nothing in the 1934 Act or in its legislative history which suggests that Congress intended that the regulation of communications carriers by the FCC would exempt from the antitrust laws all of the activities of such carriers relating to the regulated business." ✻

Hewlett-Packard

Computer Advances

Vol.5 No.2 April 1980



Customizing off-the-shelf manufacturing software

Improved productivity through innovative software technology

In today's business environment, many manufacturers are facing the significant challenges of improving their productivity. Cost pressures, resource planning, inventory management, production line efficiency, and shipment scheduling are all factors familiar to anyone involved with manufacturing management. These challenges demand effective solutions for every aspect of your manufacturing operation.

With the recent advent of computerized application software systems, manufacturers now have an effective means of addressing their productivity problems. Two alternatives are most common—either develop software solutions in-house, or purchase off-the-shelf standard packages.

Applications software developed in-house can be expensive, considering the amount of time that must be devoted by company programmers to writing it. Another trouble with do-it-yourself software is that it can require extremely lengthy lead-times to develop. Once written, it is often inflexible and costly to change, requiring sophisticated programming skills to make even the slightest program modification.

On the other hand, many off-the-shelf manufacturing applications software packages available today can also be inflexible, restricting your implementation to someone else's design.

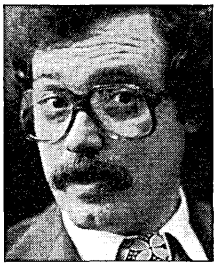
Now, Hewlett-Packard is offering a new concept to the industry—Materials Management/3000—which allows all the benefits of the off-the-shelf software with the flexibility to meet the changing needs of your business. It can go a long way toward solving your "make-buy" dilemma.

Materials Management/3000 can be modified by materials people without computer programming. It offers a significant breakthrough in applications software technology—a user customized, user operated, and user maintained solution for materials management that can significantly improve a manufacturer's chances for increasing productivity.

It can save both time and money and improve manufacturers' productivity; users not only can install it quickly, but can also modify it to meet their needs, and still benefit from the advantages of HP standard product support, updates, and maintenance.

◀ *Cover*
New materials management applications software from Hewlett-Packard can be uniquely user-customized to meet specific needs of a manufacturing company.

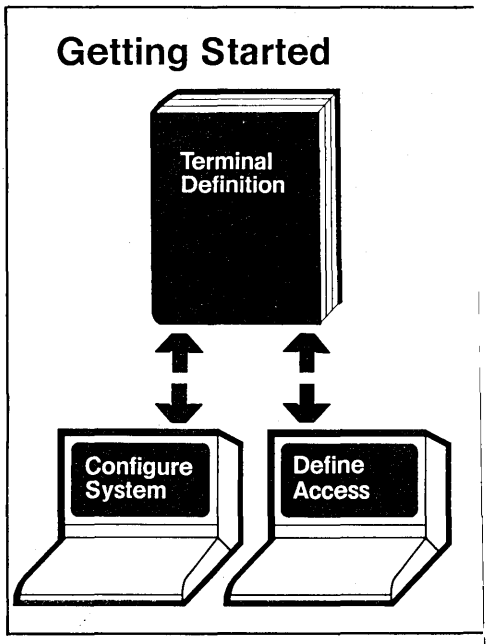
To process any transaction, Materials Management/3000 interacts between the application code and dictionary. For example, in order for the system to check security, the dictionary is read for a security definition for each user. In order for an application to read the information entered on the screen, the dictionary provides the layout of the screen. If the data fields must be edited, the dictionary gives a definition of each field. And to update the data base, the dictionary contains a layout of each data set.



Can HP back it up?

As a manufacturing company, HP faces the challenges of better materials management, just as you do. Having successfully used its own computers in manufacturing applications for years, HP has a practical understanding of the problems facing the manufacturer and how computers can be used to meet them.

With Materials Management/3000, HP offers manufacturers a comprehensive materials planning and control package that can help achieve more efficient utilization of company assets, while reducing



operating expenses. Designed for use on HP3000 computer systems, it is a completely interactive, database-oriented tool that helps you effectively deal with the complexities of managing your materials.

How does it increase productivity?

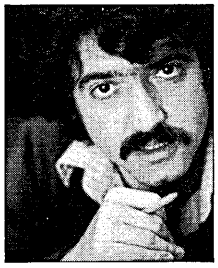
Materials Management/3000 is designed to be used and administered by your manufacturing personnel. It does not require programming to install or maintain. This means your manufacturing staff can implement the software, allowing your own computer professionals to concentrate on projects more unique to your specific business.

By generating a plan for the acquisition of materials that minimizes out-of-stock conditions, Materials Management/3000 keeps production lines going and increases people productivity. By establishing standard product costs for use in budgeting, pricing, and performance measurement, Materials Management/3000 gives you the opportunity to improve your market position as well as profits.

Reduced inventory investment

Materials Management/3000 makes available the information necessary to help manage your materials inventory. By combining the disciplines of accurate master scheduling and complete product description with the on-line tracking of inventory and order status, it generates the data required to build a material requirements plan. In turn, this plan provides the basis for reducing your inventory investment as a percent of sales.

With reduced inventory requirements, capital can be freed for use in other areas of your business. In addition, total inventory carrying costs—which can often run as high as 50% of the inventory investment—can be substantially decreased.

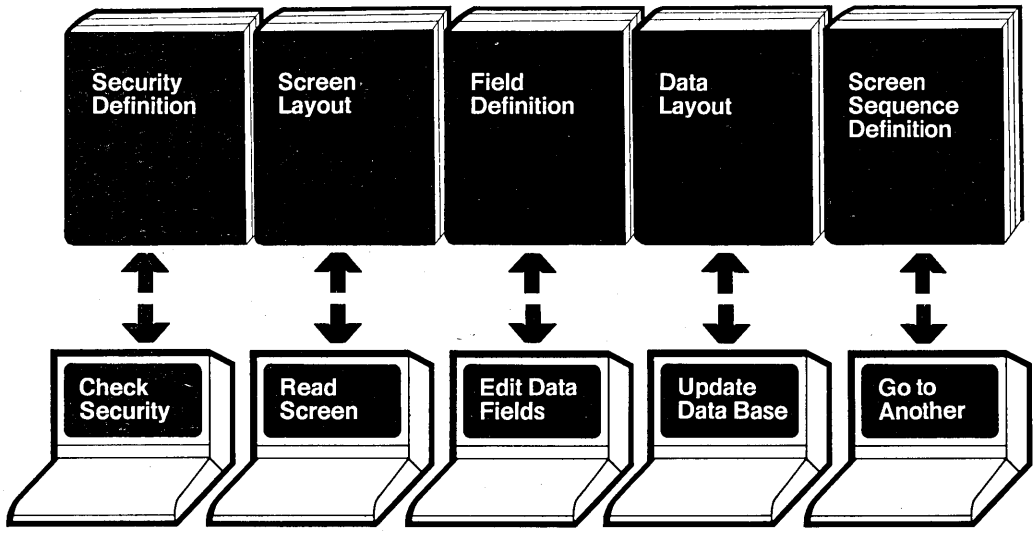


I'm not a programmer. Can I use it?

Materials Management/3000 provides the means by which the

Continued on page 4

Processing a Transaction



Application Dictionary
User Alterable

Application Code
Fixed Software

Customizing Materials Management/3000

Continued from page 3.

user—not necessarily a professional computer programmer—can tailor the program to fit the application. And, in the event your business changes or grows, the program can easily be retailored to suit your growing needs.

Some of the numerous advantages to this software technology approach you may receive by installing Materials Management/3000 are:

☐ The solution can be made to fit your company, requiring a minimum of changes in your way of doing business.

☐ Implementation time is short. This ensures a quicker and less-costly realization of the benefits from your manufacturing control plan.

☐ There is a lower cost of ownership through reduced development costs...also Hewlett-Packard will completely support and maintain the entire solution, including both hardware and customized application software.

But is it easy to use?

User (or terminal operator) functions have been designed to be easy to use. With only simple instruction, the customer will be able to enter, retrieve, and modify data via an easy-to-use HP 2640-Series interactive CRT terminal.

Easy operation is made possible by such design features as direct keyboard function keys to choose menu selections rather than entering lengthy transaction codes to establish information flow.

By calling up a variety of HP designed, but user-modifiable forms, a user can easily simplify many of the tasks associated with materials planning and control. To guide the operator in making entries, on-line transaction "menus" are displayed in sequence on the terminal screen. If the user is unsure of the proper entry, a "help" button provides assistance.

What about flexibility?

Behind the relatively simple operational procedures of Materials Management/3000 lies a versatility not found even on much more expensive systems.

In addition to its on-line data entry, update and retrieval, and customizable software capabilities, the system also automates batch job scheduling, manages backup and archival tapes, and can automatically recover jobs from system failures.

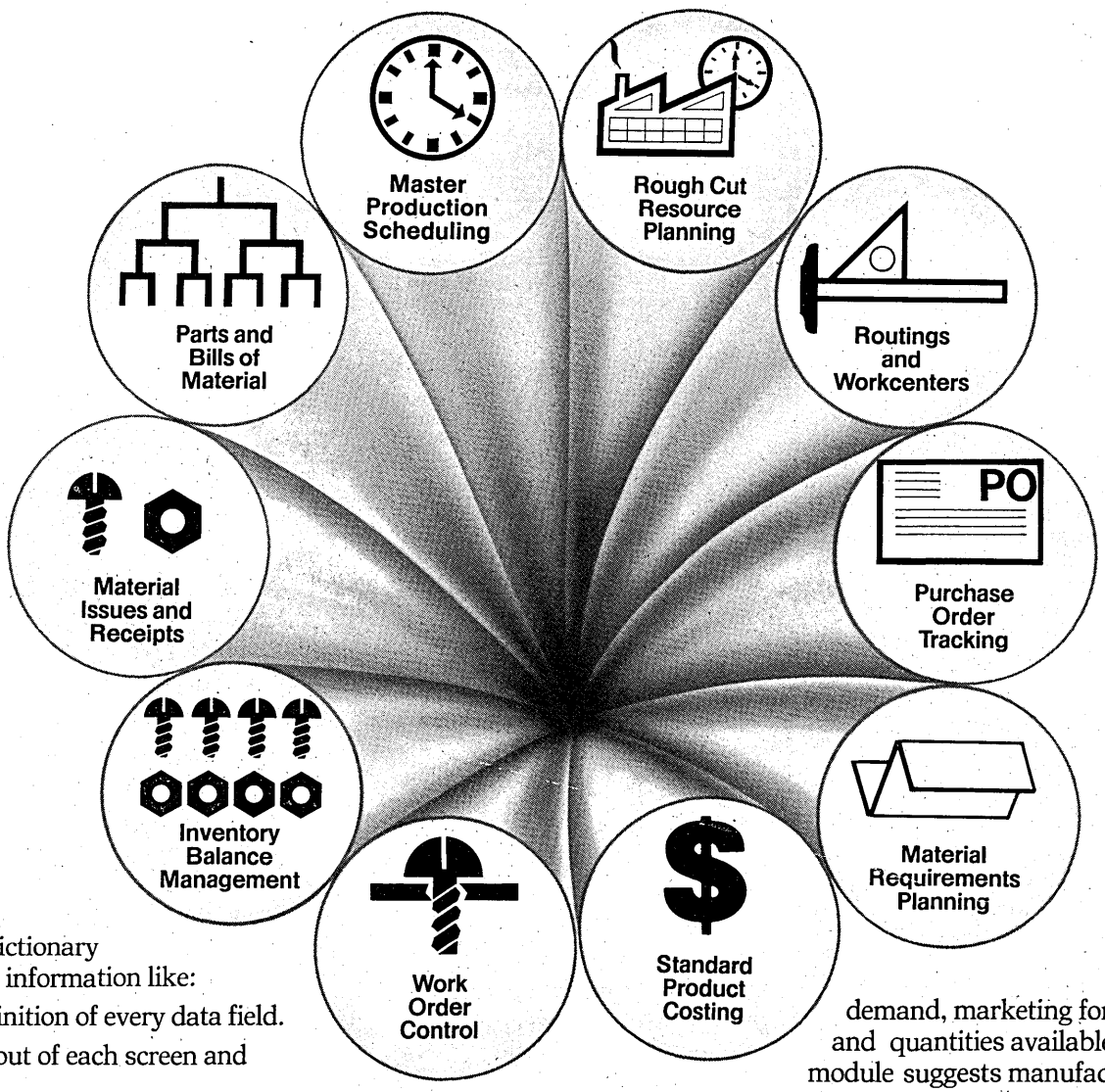
As a security precaution, passwords can be specified by the customer to allow access by only those persons authorized to update or review specific types of information.

For additional security, the system directly controls all application terminals, allowing only those to whom the customer's system administrator has given proper authorization to operate at the specified times.

How does it work?

Simply stated, Materials Management/3000 is implemented by separating an *application dictionary* from the traditional *application code.* While the application code is normally an unchanging set of logic defined by the task the user wants done, the application dictionary is really a definition of all the customizable information in the system, which can change according to the varying needs of the application and the company.

For example, since we know that the length of a part number can vary drastically from one manufacturer to another, this type of information goes into the dictionary. However, such standard application procedures as how to calculate the total on-hand quantity of a part based on receipts and issues are stored in the code.

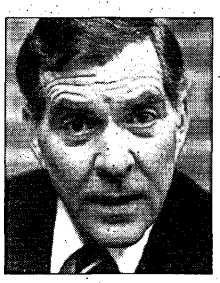


The dictionary contains information like:

- ☐ A definition of every data field.
- ☐ A layout of each screen and data set.
- ☐ Security for each user.
- ☐ A definition of each terminal's capabilities.
- ☐ Screen sequencing.
- ☐ Job schedules for all batch jobs.
- ☐ System values (the frequency of cycle counting parts, for instance).

Actually, the dictionary is an IMAGE/3000 data base (HP's award-winning Data Base Management System), and provides the information needed whenever the application is being run.

In effect, what HP has done is to eliminate the arduous programming steps necessary to change the application code. In addition to separating the application dictionary from the programming logic, HP made the dictionary easy to modify, and therefore more accessible to the appropriate user.



What are the modules?

In Materials Management/3000, the user gets a total of ten application modules, each of which is customizable and provided as part of the entire software product. Together, they represent the most significant stages of materials planning and control:

Master Production Scheduling

This module aids management in deciding which end products should be produced, how much, and when. Based on customer demand, marketing forecasts, and quantities available, this module suggests manufacturing runs, including quantities and starting dates.

Rough Cut Resource Planning

Designed to compare the amount of those labor, capital, and material resources determined by the manufacturer to be critical in carrying out the Master Schedule against the resources actually available, this module enables management to catch resource "bottlenecks" that may prove both unrealistic and costly to a manufacturer.

Parts and Bills of Material

This module defines what and how many parts combine to form other parts or products. It includes descriptive, cost, and planning information about each item, and how the items relate to each other. Once a bill has been defined for an

Continued on page 8

Graphics Printer with speed and forms

The first of a new family of high-speed, non-impact printers, Hewlett-Packard's Model 7310A is versatile enough to produce not only fixed, proportionally spaced, and embellished text, but forms and graphics as well.

Designed for speed (up to 500 lines per minute) and high resolution (100 dots per inch), the 7310A is quiet enough to operate in an office and rugged enough for a laboratory and manufacturing environment.

With the 7310A, forms or graphs can be set up on the user's video terminal to include every detail, then transferred to the printer as they appear on the screen. Typically, a full page report will take 5 to 20 seconds from computer memory, depending on the number of print enhancements used. Full screen graphics from an HP 2647A or HP 2648A graphics terminal will print in 47 seconds.

And when finished, the 7310A automatically trims printed pages to any standard length—8½" x 11", European A4 metric dimensions, or any programmed length from 2 to 20 inches—all neatly stacked.

No matter what your printing needs, there's a good chance that the 7310A will meet the challenge. For instance, the 7310A can be interfaced to many alphanumeric and graphics terminals, or to desktop and small computer systems—even those not manufactured by HP.

In the text mode, the user can employ a total of 30 character sets at any one time. This is accomplished by loading six ROMs (read-only memories) into the printer—three are dedicated to two 128-character ASCII sets (fixed and proportional spacing) and 25 Roman Extension sets, and the remaining three ROMs provide three of four optional character sets.

☐ For fixed or proportional spacing, a corresponding full 128-character ASCII set does the trick. With proportionally spaced text, lines can hold 15-20 percent more characters, resulting in greater capacity in addition to a more pleasing appearance.

☐ To accommodate the need for international languages, as well as special HP 9825A desktop keyboard symbols, there are 25 separate HP Roman Extension character sets, each of which is selectable at any time as the primary or secondary alternative via a simple escape sequence.

☐ The four optional character sets that are available include HP 2640 terminal-series line drawing and math sets, APL (A Programming Language) symbols, and Japanese Katakana characters.

☐ The 7310A can enhance headings, titles, data-entry fields, or any combination of text by underlining, reversing (white text on dark background), or printing in regular or boldface characters. And all three can be done in any combination, either line by line or character by character. Differential line spacing and extended character line heights are also programmable.

Printing it with dots

Perhaps one of the most significant advancements of the 7310A is its ability to print graphic images and forms at very high speed from information created and stored in a computer or "raster" graphics terminal.

Obviously, it takes less time to print simple text than complex graphics or even embellished or proportionally spaced text. The reason for this can be seen in the way the 7310A handles the actual printing.

In any one line, the 720 dots across the page (exactly the number in HP 2640 Series displays) are divided into 9-dot segments, each of which is part of a 9x15-dot character cell. When printing standard text with fixed spacing, however, the 7310A only concentrates on the information contained

HEWLETT PACKARD **********

OPERATION DESCRIPT

PART NAME OBTAIN:	PART NUMBER	PRT REF	QTY REQ	AS ST
"X" Motor Assembly	05227-60120	A	1	1
Frame-Accelerometer Mount	05227-40040	B	2	1
Elastomate-Short	T-32446	C	2	1
Elastomate-Long	T-32447	D	2	1
Transducer Assembly	05227-60020	E	2	1
Cable Assembly - "X" Motor	05227-60010	F	1	1
Stmpg-"X" Mtr. Accelerometer	1600-0745	G	1	1
Bumper "Y" Support	05227-40060	H	2	1
Wire WH/YEL-W/Solder Lug	05227-60050	J	1	1
"Y" Motor Assembly	05227-60121	K	1	1
Cable Assembly - "Y" Motor	05227-60011	L	1	1
Clamp "Y" Mtr. Accelerometer	1600-0746	M	1	1
Plate-Pen Solenoid Mounting	05227-40043	N	1	1
Solenoid-Pen Lift Assembly	05227-60042	P	1	1
Wires WH/YEL-WH/RED	05227-60052	Q	1	1

Actual size sample. Headings, titles, data fields, or any variety of text may be embellished either line for line, or character by character. Bold face, extended height, reversed printing, and underlining — all contribute to the new high speed printers overall impact in obtaining total text, forms, and graphic capabilities.

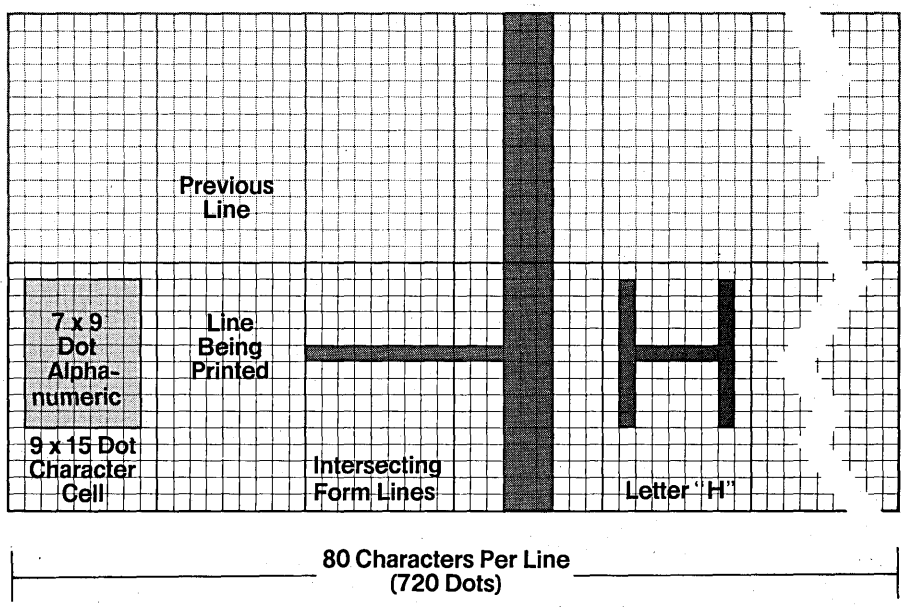
within a 7x9-dot interior matrix that contains the alphanumeric character.

With fewer dots to worry about, fewer thin-film resistor elements (to burn in the dots) have to be addressed, hence the rate of printing can be speeded up. Since proportional spacing introduces more characters to the line by narrowing the 7x9-dot format for smaller letters and numbers, it requires more processing, therefore the printing rate is slower.

More for the money

For maximum flexibility, the 7310A Text and Graphics Printer is available in four standard interfaces: standard HP-IB (IEEE-488) for HP graphics terminals (2647A, 2648A, and 2649I), desktops, and small computers; 8-bit duplex for HP alphanumeric terminals (2640B, 2641A, and 2645A; and RS-232-C and RS-423-A for remote printing applications on many computers.

For complete confidence that the 7310A is operating properly, a convenient rear-panel button is used to test all internal memory circuits. Should a failure be found, diagnostic patterns quickly help to locate the problem.



To assure reliable performance, print heads (there are six fixed heads arranged in a line in each machine, each with 120 printing resistors on 0.01″ centers) have demonstrated an average life of over 40,000 pages of printing. If a print head should fail, however, it can be replaced, adjusted to proper alignment, and put back into service within 30 minutes.

To suit varying needs, a continuous roll of either black-on-white or blue-on-white thermal paper is available in widths of 210 mm (ISO A4) or 8½″. To load, the user merely drops a roll of paper into the tray, closes the panel, and pushes the "top of form" button. From this point on, the 7310A takes over; it rotates the free end of the roll into paper guides, cuts and advances the paper into printing position automatically, and even stops printing at the end of the last page to wait until a new roll is inserted before resuming operation.

The basic price is $4750*; circle B on the reply card for descriptive literature.

*USA domestic price only

Materials Management/3000

Continued from page 5
assembly, it may be used for other products without redefinition.

Routings and Workcenters

This module describes the locations where parts, assemblies, or products are made (workcenters) and the sequence of operations in which they are made (routings). In addition, a user may enter descriptive, cost, and planning information about each workcenter.

Material Issues and Receipts

This module controls stockroom inventory by processing all of the activities that affect inventory balances. These include receipt of purchase orders and workorders, material issues, backorder filling, and maintenance of the audit trail.

Inventory Balance Management

This module is responsible for keeping track of the warehouse locations where inventory is stored, and manages inventory balances, cycle counting, and inventory locations. In this way, the amount and location of any stock can be ascertained, no matter how many locations it has been assigned.

Work Order Control

A work order is an internal factory authorization to build a specific part or assembly. This module determines planned issues by using the bill of material, monitors these allocations, and tracks scheduled receipts. It can detect shortages before they occur and begin to affect the production plan.

Purchase Order Tracking

Purchase orders represent future supply or scheduled receipts for the items being purchased. This module monitors such activity, maintains vendor information, and provides data on purchase order commitments.

Material Requirements Planning

This module generates the materials plan, recommending what and how much to order and when to order it. It accomplishes this by analyzing data from the master schedule, bills of material, inventory, and purchase orders.

Standard Product Costing

This module gives the manufacturer the capability of calculating the costs associated with each product at every phase of the production line through to completion.

Your partner in productivity

Installing an on-line, data-base-oriented materials planning and control system can easily turn out to be the single most important operational change a manufacturing company can make. It's important, therefore, that you have the support and experience of someone you can trust. As an experienced manufacturing and computer company, HP has been providing solutions for itself and its customers for many years.

Building upon the experience of HP's successful MFG/3000 (in use at many customer sites since 1978), Materials Management/3000 represents the newest thinking in applications software technology—systems that can be modified to match the application.

You have a means of achieving the benefits of materials planning and control without major changes to your business style. It means obtaining what may be considered the most adaptable and cost-effective computer software available today. It means knowing that you may have acquired an edge on your competitor with a system that can increase your productivity and save you money.

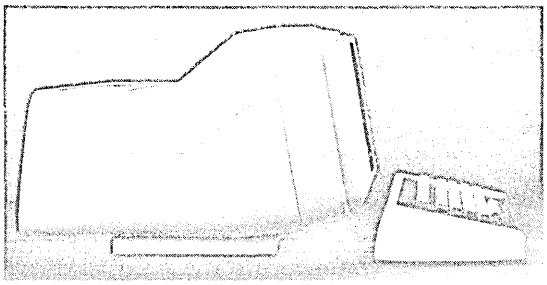
And, finally, it means that you can depend on a single vendor—Hewlett-Packard—for help in an increasingly competitive manufacturing marketplace.

The cost of Materials Management/3000 is $25,000. If you would like more information on HP's Materials Management/3000 software system, check A on the reply card.

Coming soon to Los Angeles, Dallas, Chicago, New York and Toronto:

"Productivity '80: The Computer —Its *New* Role." Hewlett-Packard seminars and practical demonstrations on using computers to get more out of your resources in the coming decade. Watch your local newspaper for details.

5953-0856 D 4/80



E C S 4 5 0 0

Beauty and Brains. In the history of the computer there has never been an intelligent terminal like the ECS 4500. It is singular both in its external design and internal architecture. Singular in its power to function as a stand-alone computer and as multiprotocol network computing terminal. Singular in its ability to interface immediately with virtually any mainframe or minicomputer. With a complete repertoire of software and high level languages. Information systems of the coming decade will emulate this architectural elegance. Only ECS 4500 makes it all available to you now.

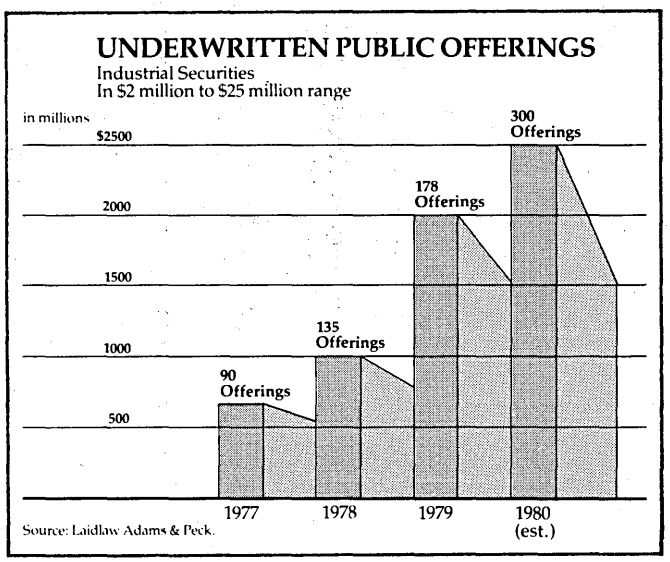
ECS MICROSYSTEMS. The Information Architects. Headquarters at 215 Devcon Drive, San Jose, California 95112. (408) 286-4200. Sales and service offices around the world.

For Growing Companies With Sales Under $100 Million.

Sound corporate growth requires a continuing supply of capital.

It may surprise you to learn that such capital, virtually unavailable to emerging and medium-sized companies in the recent past, is now available as never before. And the cost today is not prohibitive.

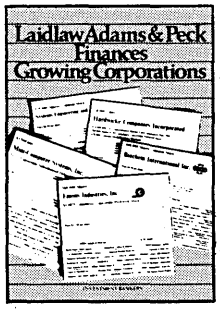
Laidlaw Adams & Peck is a prime factor in the upward trend of the availability of capital for corporations with sales under $100 million. In fact, over the last twelve months, we have become one of the leading managing underwriters of securities for growing companies.



We manage public offerings that range from $2 million to $25 million consisting of common and preferred stocks and debt securities of various types. We also manage mergers/acquisitions and private placements.

With origins dating back to 1842, membership on both the New York and American Stock Exchanges and 250 employees in the United States and Europe, Laidlaw has the ongoing investment banking capabilities you can employ most profitably.

Contact us and we will determine—at no obligation—the cost of raising capital for you. Write or call Jay Cooke, Managing Director, at (212) 363-3852.



Laidlaw Adams & Peck Inc. has a special review of the capital markets available to growing corporations. Ask us for a copy when you contact us.

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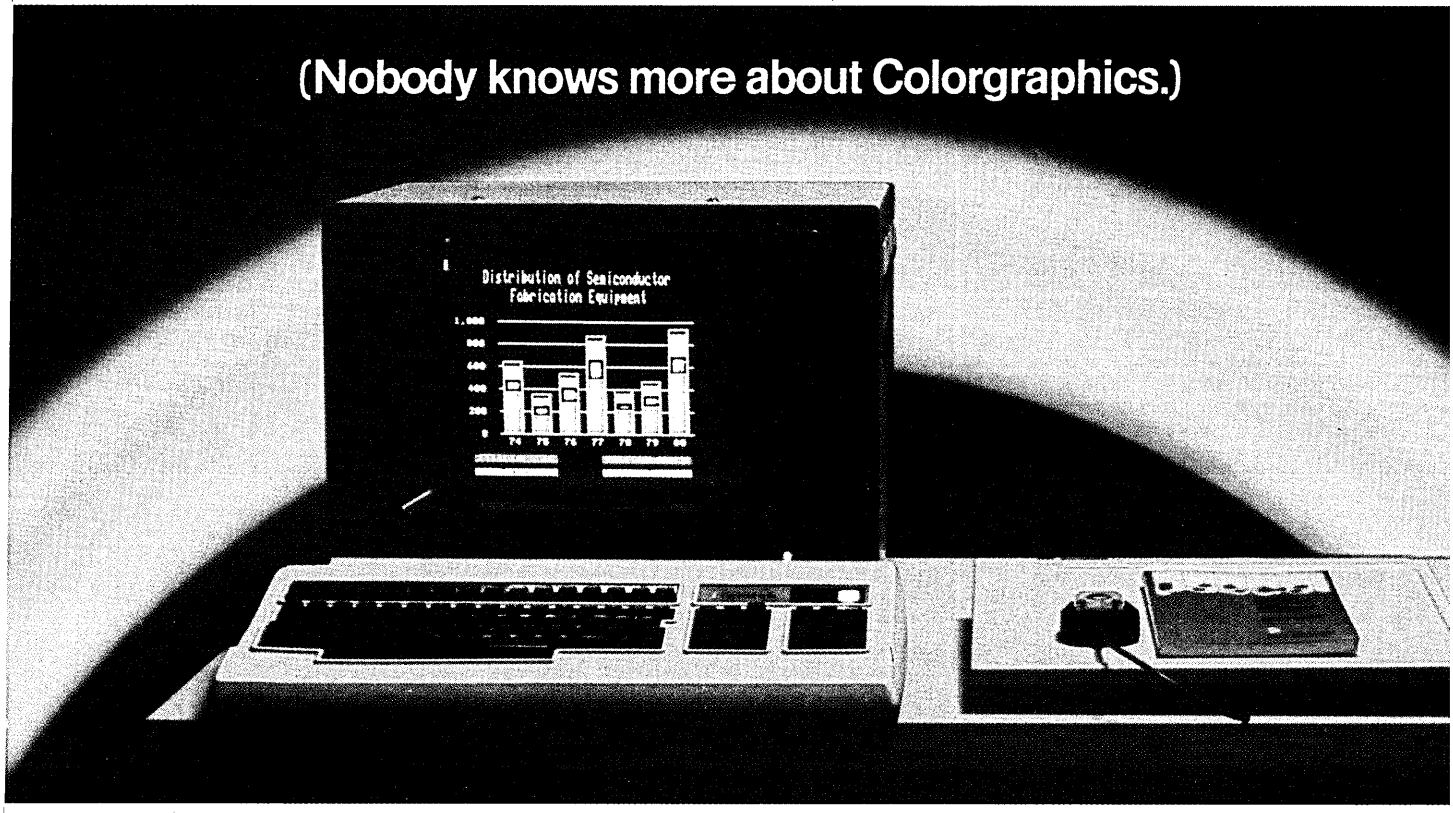
CIRCLE 73 ON READER CARD

Ask Ramtek.

(Nobody knows more about Colorgraphics.)



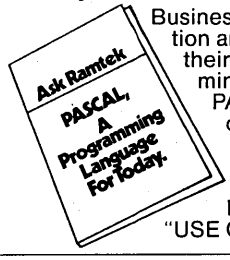
Isn't one clear, colorful picture worth a thousand lines of print-out?

Get the picture fast with Ramtek's 6114 Colorgraphic Computer. Operating alone or with your host computer, the 6114 not only provides you with state-of-the-art tools for graphically and colorfully displaying your data, it also gives you PASCAL, the modern, interactive computer language that speeds up manipulating and formatting that data.

The 6114 is just one of five color and black and white graphic computers that you can choose from in Ramtek's 6000 Series. Designed with the information management needs for business, education and industry in mind, the Ramtek 6000 Series is designed to make data retrieval faster and more effective. Hardware options permit you to choose the resolution and graphics manipulation features that fit your needs. One time-saving software option provides a basic package of graphics and text routines that simplify applications programming.

For complete information on the Ramtek 6114 Colorgraphic Computer and the entire Ramtek 6000 Series, write: Ramtek, 2211 Lawson Lane, Santa Clara, CA 95050. Or, call your nearest Ramtek office.

Why is PASCAL better for business?



Business, industry and education are turning to PASCAL for their interactive programming needs. To find out what PASCAL offers and how it can benefit you, request "PASCAL, A Programming Language For Today." It's Issue Number 1 of Ramtek's "USE OUR EXPERIENCE" series.

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CIRCLE 74 ON READER CARD

NOW CLEANING YOUR
COULD SAVE YOU A
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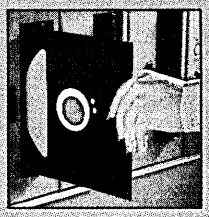
The recording heads on your diskette drives may be filthy—and that can cause you a lot of grief. There's the serviceman you have to call when the machine doesn't perform. (You know how much service calls cost these days!) There's machine down-time. Idle data entry clerks. All the other delays a cranky machine can cause.

And that service call might not even be necessary.

3M SOLVES THE PROBLEM IN SECONDS— AND LEAVES YOUR HEADS "COMPUTER ROOM CLEAN".

The new Scotch® 7400 head-cleaning diskette kit lets *you* clean the read-write heads on your 8″ or 5¼″ diskette drives. In just 30 seconds, without any disassembly, mess or bother, the heads can be completely



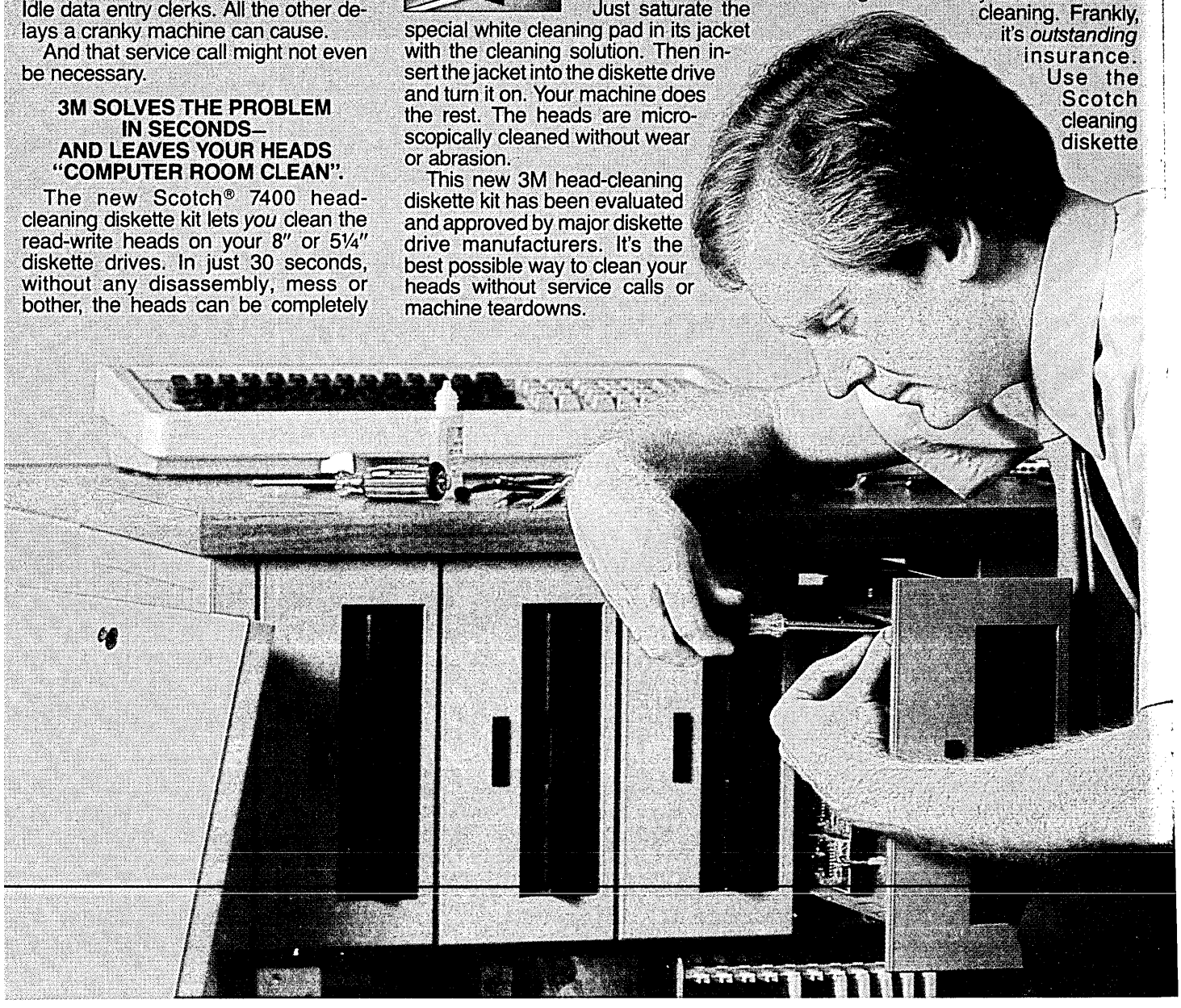
cleansed of dirt, dust, magnetic oxides—all the things that can get into your machines every day. And foul them up.

Just saturate the special white cleaning pad in its jacket with the cleaning solution. Then insert the jacket into the diskette drive and turn it on. Your machine does the rest. The heads are microscopically cleaned without wear or abrasion.

This new 3M head-cleaning diskette kit has been evaluated and approved by major diskette drive manufacturers. It's the best possible way to clean your heads without service calls or machine teardowns.

AT ONLY $1 PER CLEANING IT'S THE BEST INSURANCE YOU CAN GET.

This fast-cleaning new Scotch kit comes with everything you need (including special fluid, applicator tip, cleaning diskettes) to handle up to 30 cleanings. That's only about a dollar a cleaning. Frankly, it's *outstanding* insurance. Use the Scotch cleaning diskette



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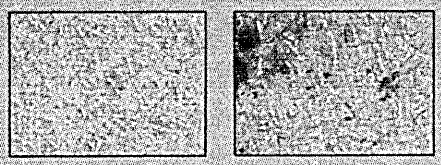
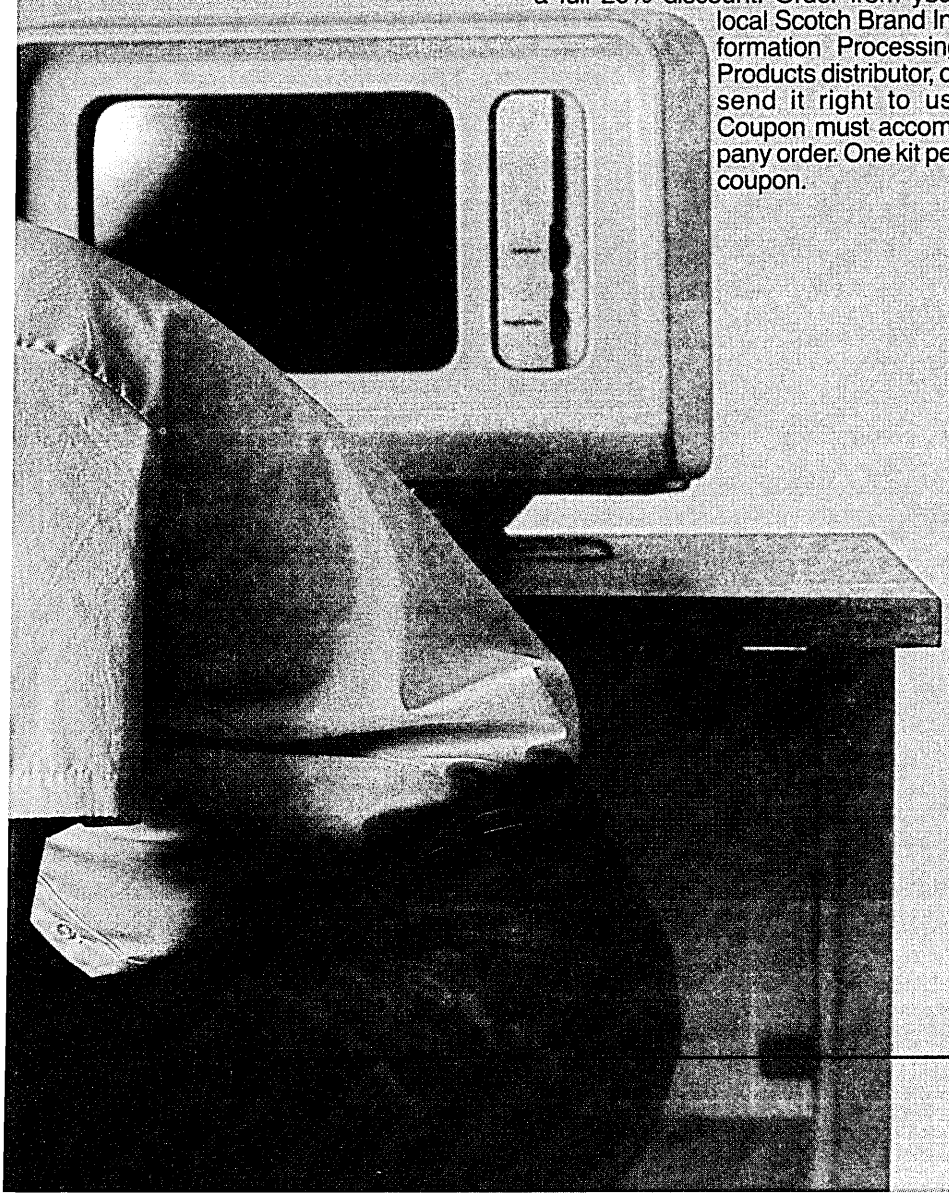


A Scotch cleaning diskette shown before and after 15 cleanings of recording heads.

frequently, to make sure your diskette heads are kept clean. And to help them perform at the level specified by the manufacturer.

You could save yourself a lot more than just a service call. So we want you to try this remarkable new kit now. Order before June 30 and get $6.00 off... a full 20% discount. Order from your local Scotch Brand Information Processing Products distributor, or send it right to us. Coupon must accompany order. One kit per coupon.



$6.00 OFF!

We'll take $6 off the list price when you order the 7400 Kit with this coupon and your check or money order. So send for this special offer today. (Send to: 3M, Dept. P, P.O. Box 33984, St. Paul, MN 55133.) D4

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Please send my new kit for $24. I enclose ☐ Check ☐ Money Order. Add state sales tax where applicable. Make check payable to 3M.

Diskette size: ☐ 5¼" ☐ 8" (Not yet available for Burroughs Mini-Disk II or Vydec drives.)

(Offer good in U.S. and Canada only. Void where prohibited by law. Expires June 30, 1980.) Offer valid only if coupon is completed.

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Four more reasons why AJ is a world leader in data communications.

We make acoustic data couplers and modems that get a communications job done for you, reliably and efficiently.

It doesn't matter whether you transmit at low speed or high speed. Over the switched network or leased lines.

These four AJ couplers and modems, for example, are specifically designed for low-speed use—up to 450 bps. All are Bell 103/113 compatible.

Reason One. Experts called our A 242 "the best coupler ever made." Users responded by buying 25,000! Now the advanced A 242A is even better, bringing new standards of performance to full or half duplex communications.

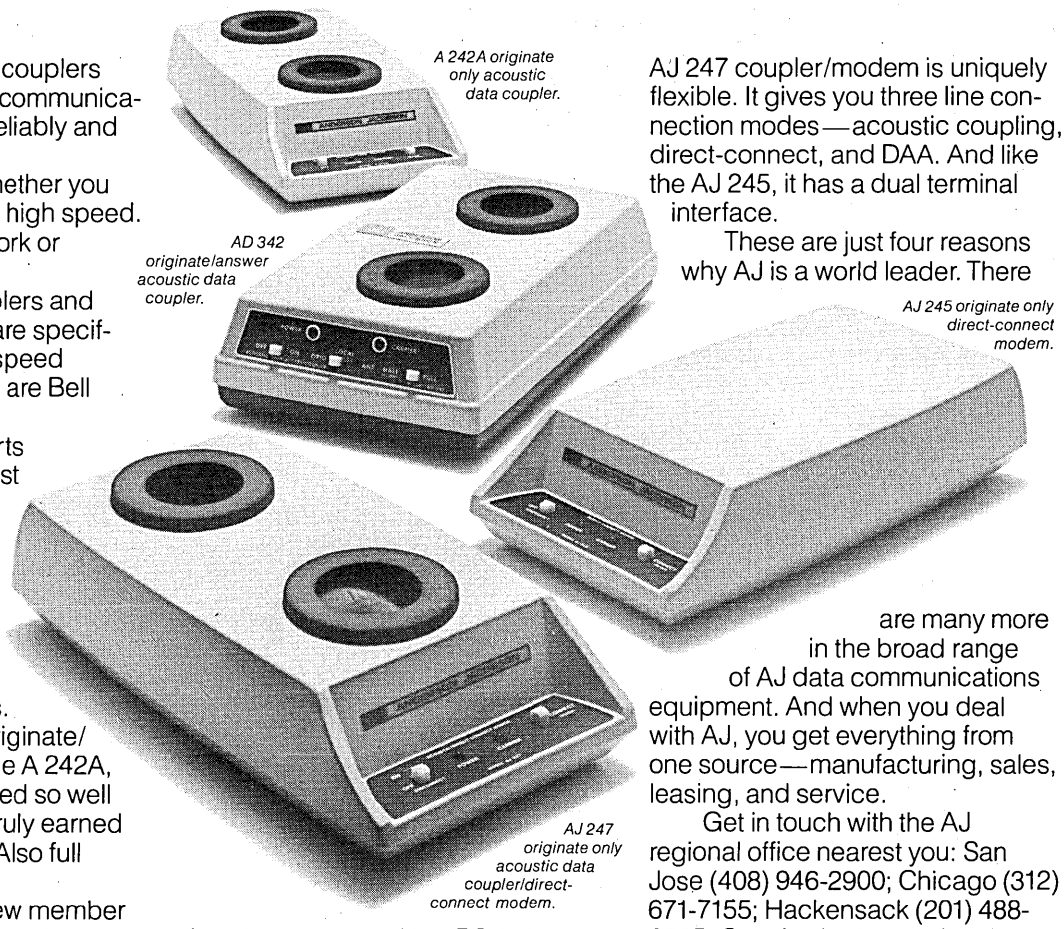
Reason Two. Our originate/answer companion to the A 242A, the AD 342 has performed so well for so many that is has truly earned the title, "Old Reliable." Also full or half duplex.

Reason Three. A new member of the family is our AJ 245 originate only modem. It's FCC-approved for direct connection to telephone lines via modular jack. And its dual interface lets you use either RS 232 or TTY-compatible terminals.

Reason Four. "The Cadillac of couplers," our new FCC-approved AJ 247 coupler/modem is uniquely flexible. It gives you three line connection modes—acoustic coupling, direct-connect, and DAA. And like the AJ 245, it has a dual terminal interface.

These are just four reasons why AJ is a world leader. There are many more in the broad range of AJ data communications equipment. And when you deal with AJ, you get everything from one source—manufacturing, sales, leasing, and service.

Get in touch with the AJ regional office nearest you: San Jose (408) 946-2900; Chicago (312) 671-7155; Hackensack (201) 488-2525. Or write Anderson Jacobson, Inc., 521 Charcot Avenue, San Jose, California 95131. (Available in U.S. and Canada only.)



A 242A originate only acoustic data coupler.

AD 342 originate/answer acoustic data coupler.

AJ 245 originate only direct-connect modem.

AJ 247 originate only acoustic data coupler/direct-connect modem.

ANDERSON JACOBSON

CIRCLE 76 ON READER CARD

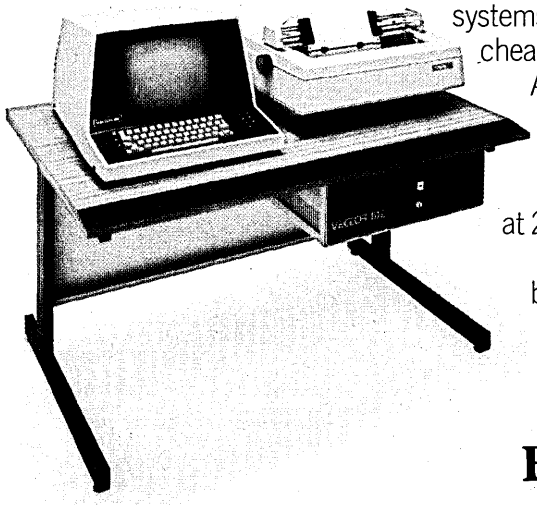
Greedy OEM's wanted.

There are only two ways for you to make more money in the OEM business.

Either you sell equivalent capability at a lower price than your competitors. Or you sell more capability at an equivalent price.

Take your choice. Vector can help you do either.

Because no matter if you're a software house or a systems house, no one can sell you capability cheaper than Vector.



And that includes everything from boards, terminals, and printers to complete Economy Sized Computer™ systems.

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CIRCLE 77 ON READER CARD

Abqaiq, Saudi Arabia

No baseball, no morning paper, no pizza, no autumn leaves.

But here's the great life that makes Aramco people stay on and on.

If you never considered working in Saudi Arabia because you think it's all sand and hardships, consider this.

3,900 Americans like you work for Aramco in Saudi Arabia now. Ask them why they stay and they'll tell you that, besides money, it's the casual lifestyle, American-style hometowns, top-notch schools, and vacation travel they used to only daydream about.

Where on earth is Abqaiq?
Located close to the world's largest oilfield (Ghawar), Abqaiq is the center of a giant oil-gathering and processing system that handles 60% of all the oil produced by Aramco, the world's largest producer.

Does Aramco's paycheck justify living in a desert kingdom?
Yes! You get a base salary competitive with top U.S. oil firms. We compensate you for overseas cost-of-living differences.

On top of that, Aramco pays an **incentive of up to 40%** for overseas employment, and you are reimbursed for any foreign or U.S. Federal income tax on the premium. So your premium is tax-protected.

Another benefit: employees overseas participate in Aramco's Retirement Income Plan on an **accelerated** basis.

With this financial package, no wonder 3,900 Americans like you work for Aramco in Saudi Arabia today.

What can you do with all that money stuck out in the desert?
Aramco people use 40-day paid vacations (every 12½ months) and 12 paid holidays (average) to visit fabulous places like the Pyramids, Greek Islands, Mt. Everest, the Serengeti Plain, Hong Kong.

Aramcons vacation in Asia, Africa, the Middle East and Europe

Doesn't a child's education suffer so far away?
No! Aramco has a modern American school system. Teachers are primarily American and more than 75% of them have master's degrees. The teacher-student ratio is 1 to 15 in grades 1 to 6; 1 to 20 in grades 7 to 9.

Where do you go if you get seriously ill, or need dental surgery?
Aramco's Dhahran Health Center is one of three hospital systems outside the U.S. accredited by the Joint Commission on Accreditation of Hospitals. The Dental Clinic is as fine as any in the States. Better than most.

Aramco recruiting ads mention "comfortable housing." Is that on the level?
At first, you'll live approximately 18 months in adequate but not terribly attractive off-camp temporary housing. Next, it's on to comfortable on-camp temporary housing. Then, based on a housing priority-point system using job level and length of service, you'll get your permanent residence. Many of these are like homes you'd want to live in, in the States.

What jobs are open today? Can a person advance?
Aramco's operations are so big that our job opportunities are probably unduplicated anywhere. Challenging jobs are open in administration, refineries, gas plants, support facilities, everywhere.

We need accountants, medical personnel, technicians, teachers, vocational trainers, communications specialists and materials forecasting specialists. And scores of engineers: in construction, project management, operations and maintenance—for operations in oil, gas, petrochemicals, EDP, computers, transportation, utilities, name it.

You'll have challenges, responsibilities, and management advancement opportunities.

Interested? Send your resume in confidence to: Aramco Services Company, Department DM040080GENA, 1100 Milam Building, Houston, Texas 77002.

CHALLENGE BY CHOICE

ARAMCO
SERVICES COMPANY

CIRCLE 78 ON READER CARD

DP Dialogue

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

Getting More Gas from Coal with Less Energy

The energy crisis has prompted new interest in coal gasification – the derivation of fuel gases from coal. At IBM's Scientific Center in Palo Alto, California, Dr. Louis Lopez is directing the development of a computer model of the "moving bed" gasification process. This treats coal with steam and air or oxygen, which react with the carbon to produce a mixture of combustible gases: primarily carbon monoxide, hydrogen and a small quantity of methane (CH_4).

The challenge, Lopez points out, is to design an economic process: one that yields enough gas for the energy it consumes. This would offer major advantages over burning the coal directly: gas-burning industrial processes would not have to convert, and a natural-gas distribution system already exists. Moreover, burning sulfur-bearing coal produces a sulfur-oxide pollution that is difficult to control. But burning the gas produces a pollutant that is mostly hydrogen sulfide, and is much easier to extract.

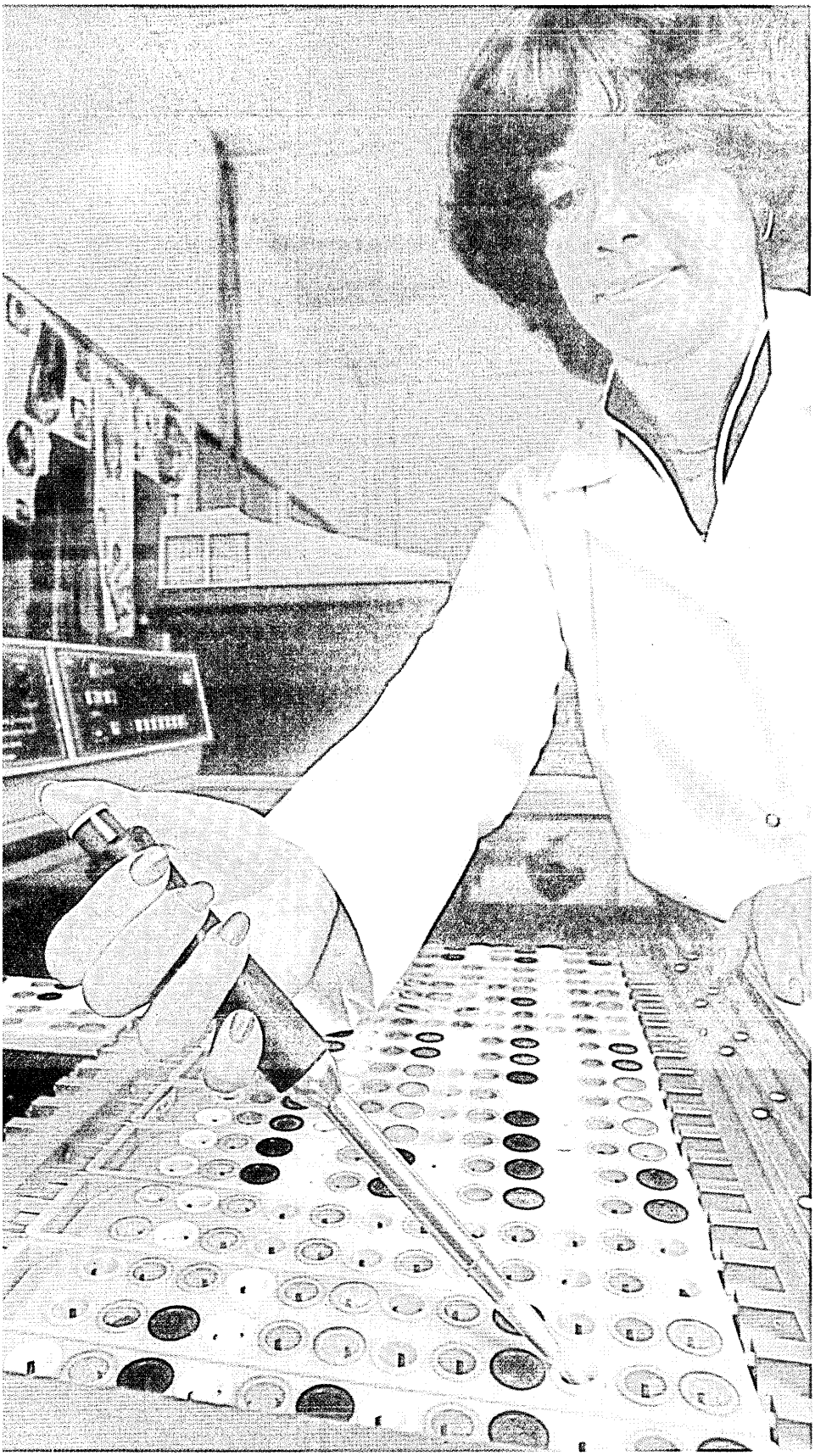
"Although simple in principle, the gasification process is extremely complex in physical detail," he says. "The yield is affected by the chemistry of the coal, the geometry of the moving bed and its velocity. The temperatures and volumes of steam and air or oxygen – among many other factors – are also significant.

Details are Important

"To be useful, the model must be quite detailed," he notes. "We start with equations for the general laws of the process. We end up with a mathematically complex model, for which a numerical solution is not easily found. If we make certain simplifying assumptions, many of the problems go away. But that's just what we don't want to do; these are important effects."

Today, scientists at the Palo Alto center have found methods to reach numerical solutions of such problems with reasonable amounts of computer time. "Once a process design with a good yield is found," Lopez adds, "there is a fresh set of complications: it won't scale up readily from a demonstration or pilot plant to a full-sized plant. The significant physical effects will all behave differently, and trial-and-error on an actual plant would be costly. Computer testing of tentative designs for a commercial plant should avoid millions of dollars worth of construction and operating trials."

ADRS Passes the Test at Roche Clinical Labs



Blood specimens are prepared for thyroid function test. Managers at RCL do their own planning and analysis, with the aid of IBM's A Departmental Reporting System (ADRS).

"Users are getting the answers they need – promptly," says Kim C. Frank of Roche Clinical Laboratories, Inc. "With ADRS, people throughout the company are solving their own problems without our help, and our programmers are free to concentrate on our primary business systems."

Frank is operations/technical support manager of the Raritan, New Jersey, subsidiary of Hoffmann-La Roche Inc. A leading clinical laboratory, RCL accepts blood and other specimens from physicians in many states and performs the tests they order. An IBM System/370 Model 148 collects the test results and transmits them via telephone links to IBM 3770 Communication Terminals in 24 regional offices.

Users from managers to secretaries at RCL have learned to work with A Departmental Reporting System (ADRS), an IBM program product that enables them to structure a wide variety of formatted reports and analyses. A data interface program lets them write ADRS programs that take advantage of existing computer files.

"With a small programming staff, we can't always respond to users' needs fast enough," Frank notes. "Now managers, professional people and secretaries invoke ADRS directly through 3277 Display Stations."

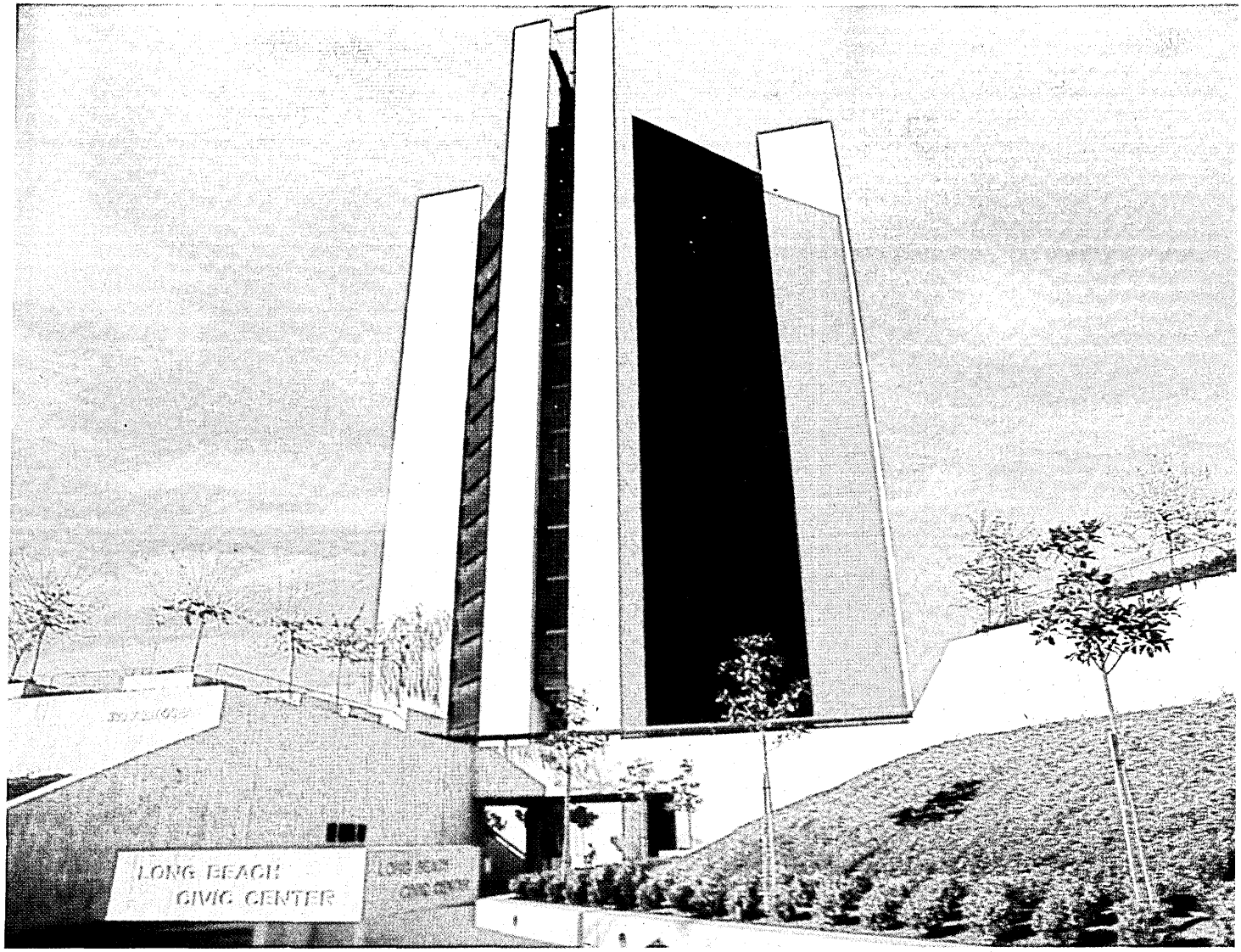
Among the personnel using ADRS is James P. Halligan. As director of distribution services, he is in charge of the field organization that collects the samples from local offices and then transports the finished reports from the regional facilities to the local offices. He uses ADRS to analyze route structures for a fleet of 225 vehicles.

Good Management Tool

"It's a tremendous management tool," he states. "We've improved gas utilization, done travel-time studies, prepared budgets, and tracked costs and revenues. The system stores anything I want – lists of drivers' names and addresses, vehicles, routes, and collection stations. And airline schedule data. We can shape the information as people need it. We invest less time and get better information."

In the purchasing and material control department, people use ADRS to track the consumption of supplies, analyze the materials costs of specific tests, and maintain purchasing and vendor files. Still other active users are found in the payroll, finance, security and maintenance departments.

"Some of these applications," Frank says, "would have taken months if developed conventionally, by system analysts and programmers."



The citizens of Long Beach, California, are proud of their sparkling new civic center. And they're pleased with their city's computer-based system for answers to questions and concerns about city services.

Answering the Concerned Citizen in Long Beach, California

In some cities and towns, the questions and concerns of citizens are to a degree like the weather. Everybody talks about them, but nobody does anything about them. Not in Long Beach, California, though. Thanks to a computer, residents need call only one telephone number to be connected to the right department and be guaranteed a response.

People who answer the phones use IBM computer terminals to display a list of information areas ranging from consumer protection and senior citizen services to animal regulation and sidewalk repair. After finding the right category, they can see a display of various kinds of questions and put the caller through to the responsible department.

Up to this point, a well-indexed directory might serve just as well. But from here on, an IBM System/370 Model 158 helps keep queries and concerns from becoming serious problems.

According to John Dever, City Manager of Long Beach: "The computer automatically prepares a letter to each caller, which is hand signed by a city official. The letters thank callers for their interest, tell them which department is handling their calls and provide a reference number if there is need for correspondence or an additional call. The system lets us track each inquiry as an open item until we've made a complete response. We get a statistical analysis of the kinds of complaints we receive and periodic reports for city management. The analysis helps us spot problems in their early stages and act to remedy them."

The Information Management System/Virtual Storage (IMS/VS), an IBM program product, is used with computer programs written by the city. The system is designed to update information quickly. Changes become immediately available at the terminals as soon as they are added to the computer data base.

"We publicized the system heavily and got 700 calls the first two days," says Dever. "We're running slightly below 100 calls a day since then. And we've received questions and expressions of interest from over 100 other cities, including some outside the U.S.A. Perhaps most important, citizens who have used the system tell us it's been needed for a long time."

DP Dialogue is designed to provide you with useful information about data processing applications, concepts and techniques. For more information about IBM products or services, contact your local IBM branch office, or write Editor, DP Dialogue, IBM Data Processing Division, White Plains, N.Y. 10604.

IBM®
Data Processing Division

While salaries are rising slowly, employers are making jobs more attractive by increasing fringe benefits.

1980 SALARY SURVEY

by Louise C. Shaw

"Salary plus bonuses for the nation's top business executives averaged $277,400 in 1979, up 12.9% from 1977." The New York Times, Dec. 18, 1979.

Data processing people have something to look forward to as they move up the salary ladder. We present our annual salary survey to help you find out where you are and how much closer you are to that top rung.

A glance back shows we've come through a year in which the emphasis has been on keeping people (see "That Old Bugaboo, Turnover," Oct., p. 96), the dearth of the experienced programmer, and the struggle to attract new employees. With that behind us, we weren't sure what kind of answers our questionnaire would bring—but when the returns were in, the dust settled. The nearly 400 dp employees queried gave rational reports—nobody scrawled messages of panic or defeat across the bottom of the page.

After doing the necessary calculations, the average salary hike dpers gained in 1979 was 8.7% compared to 7.9% in 1978. This year pay raises will average 9.1%.

Looking at the figures and listening to the people you find it's a little of this and a little of that. One manager at a large private college in the Northeast says the 10% pay hikes he is allowed to give this year still leave his people far below what private industry is offering. "I know we can't compete—still, I am attracting the caliber of people I want." How? "I can offer academic benefits, flexible hours, good retirement plans, and a desirable living setting." Add to that the fact his shop recently installed an IBM 4300. "So I can entice people with interesting and challenging things to work on. Right now I feel I can continue to be competitive . . . "

Overall, the greatest wage fluctuations continue to be in entry-level positions. Salaries here range from $10,000 to $17,000. The high end may seem a bit extravagant to those people who remember when $15,000 was the big time. One interesting comment from managers was that two-year college and technical school programmers are garnering the same entry-level salaries as their four-year counterparts. Many managers say they are impressed with how well the local programs are equipping graduates with computing basics.

Moving into the managerial level, salaries level off and things become more stationary. "These people tend to be the up-through-the ranks folks," a Midwest manager noted. Also, at this level the number of positions available diminishes. An exception is the junior management level, where job jumping has been a tradition and easier to justify. Again, an exception that reflects these times of economic uncertainty was noted by a Philadelphia executive, who said that he had noticed that even within the junior exec ranks the movement was way below what it had been in the past. "I see the greatest movement in larger businesses that are going sour, where people who aren't long term yet are quite willing to jump." For those on the way up, job jumping is one of the best ways to increase salary. "I had been told that before I got out of school but really didn't believe it. But they were right; it worked that way for me," noted one dp executive at a small consulting firm.

We also did comparisons between '80 figures and figures from the 1978 survey. When compared across the board, data appeared logical—steady increases. A corporate director of dp in retail sales who was making $40,000 in 1978, was earning $52,591 in 1980. A division director of dp could expect an average starting salary of $25,030 in light manufacturing two years ago. Today, it's $31,261. In 1978 a senior systems analyst in banking could expect an average starting salary of $18,500. Today it's $25,750.

TOP JOBS REDEFINED

What we did not expect to find but what became apparent is that there is something going on within the top management levels. A number of the top level positions, such as corporate director, were showing lower salary levels this year than two years ago. We are speculating that many companies may be redefining the top positions, for example, moving a corporate MIS director to vp-information systems, and replacing him with a younger, less costly person with, perhaps, a diluted title.

What about women in data processing? It's been said that in this industry salaries have been equal—you are paid for what you know and how well you know it. As good as that sounds, one dp manager noted, "We don't pay enough to hire males so 83% of our programmers are female . . . " This year, trying to determine what the situation was with women in dp, we asked on the questionnaire if the position being reported was for a male or female. The number of responses was insufficient to draw any conclusions. Women, especially in management positions, say there are discrepancies. As the head of the data processing and communications division for one of the country's larger banks said, "I know there's a gap, but I also know I like what I'm doing and the people I work for. I don't know what the answer is."

Looking at the male/female data that did come in, it was far easier to find women in the categories of data entry, librarians, and production control clerks than as senior systems analysts. Yet, female job applicants continue to be welcomed heartily when they come through the personnel department's door—those people are well aware of the government's guidelines.

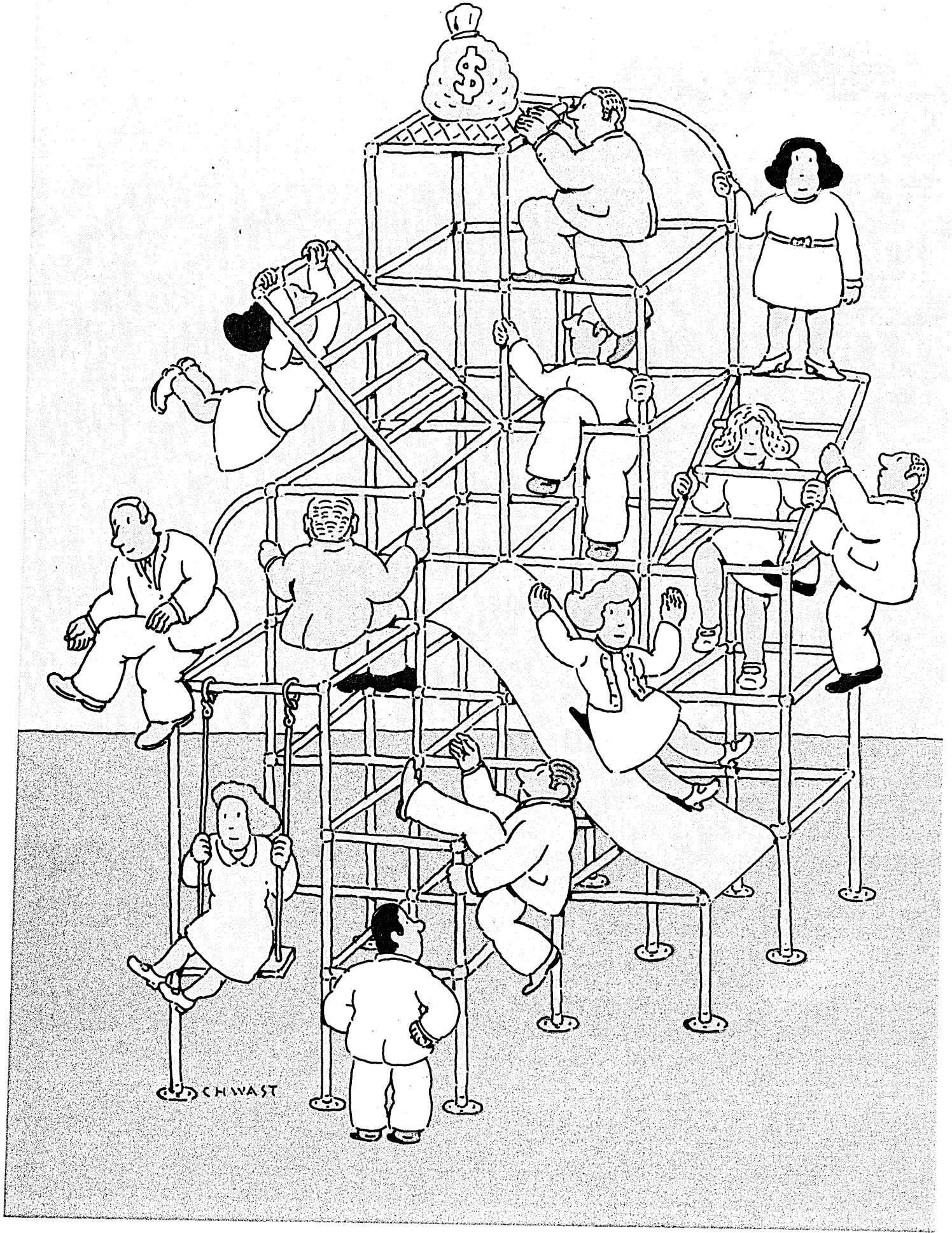
Other highly desired employes are system programmers with large mainframe experience. Programmers with data base or MIS knowledge also get quicker notice. One recruiter said knowing either one in New York City automatically places you in a higher salary bracket on the open market.

That brings us to the one fact about data processing that remains a constant: the industry continues to grow and to demand skilled people. One estimate projects an increase of 25% in jobs available for programmers in the '80s. As another recruiter put it, "The updating, the adding of new systems, programs, hardware, and so on does nothing but increase the need for people. Nowhere do I see any indication this will not continue."

Of course, what may change is how the people who hire and fire begin to react to the rising cost of keeping people on the payroll. More and more company people may be thinking along the lines of the manager of a public utility's small dp shop in the Northeast. "Right now we have stabilized our growth size, but should we decide to change I can go either of two ways: more people or more efficient hardware. Right now I am inclined to favor the hardware route."

One last observation: salary alone no longer guarantees a "Yes, I'll take it" from a prospective employee or "Yes, I'll stay" from someone already there. As several dp executive noted, people are looking at the bottom line. "They are looking at health insurance plans, dental plans, medical benefits, further schooling opportunities, etc." Employers are aware of that, and as one executive noted, "Just looking at my company, what we offer people now is far greater than five years ago."

ILLUSTRATION BY SEYMOUR CHWAST


CHWAST

JOB DESCRIPTION GUIDE

The following 55 job descriptions were used as the basis for our salary survey questionnaire. Dp managers were asked to asked to match their job categories as closely as possible.

1. *Corporate Director of Data Processing or MIS:* The top executive for all computer processing.
2. *Administrative Assistant:* Primarily concerned with money matters and sometimes with personnel administration.
3. *Technical Assistant:* A member of the corporate director's staff. Usually the head of advanced planning for the dp function.
4. *Services Coordinator/User Liaison:* Coordinates dp activities with those of other functions or departments.
5. *Division or Department Director of Dp or MIS*
6. *Administrative Assistant*
7. *Technical Assistant*
8. *Services Coordinator/User Liaison* 5-8 are in the division or department staff; they are directly parallel to 1-4 but their influence may be less.
9. *Manager of Systems Analysis:* Analyzes how dp is applied to user problems, designs effective and efficient dp solutions.
10. *Lead Systems Analyst:* Assists in planning, organizing, and controlling the activities of the systems analysis section.
11. *Senior Systems Analyst:* Confers with users to define dp projects, formulates problems, designs solutions.
12. *Systems Analyst:* Works with users to define dp projects or project segments or iron out details in specifications.
13. *Systems Analyst Trainee:* Usually has some dp experience. Expected to spend a good deal of time learning rather than producing.
14. *Manager of Applications Programming:* Responsible for the development of effective, efficient, well-documented programs.
15. *Lead Applications Programmer:* Assists in planning, organizing, and controlling section activities.
16. *Senior Applications Programmer:* Works with program designs or specifications.
17. *Applications Programmer:* Usually works on only one or a few applications.
18. *Applications Programmer Trainee:* Is learning to program. Usually works under direct supervision.
19. *Programming Team Librarian:* Keeps track of program revisions.
20. *Manager of Systems Analysis/ Programming*
21. *Lead Systems Analyst/ Programmer*
22. *Senior Systems Analyst/ Programmer*
23. *Systems Analyst/Programmer*
24. *Systems Analyst/Programmer Trainee*
20-24 positions cover both the analysis and programming functions.
25. *Manager of Systems Programming:* Plans and directs the activities of the OS programming section, assigns personnel to projects.
26. *Lead Systems Programmer:* Assists in planning,organizing and controlling the activities of the OS programming section.
27. *Senior Systems Programmer:* May specialize in the support, maintenance and use of one or more major operating systems. Is able to work at the highest levels of programming.
28. *Systems Programmer:* May specialize in the support of one or a few operating system components or sub-systems.
29. *Systems Programming Trainee:* Has a good background in dp and knows or is learning assembler language.
30. *Program Librarian:* Responsible for maintaining the on-line and off-line libraries of production programs in source and object form.
31. *Manager of Data Base Administration:* A still relatively new position which has the functions of planning, organizing, and scheduling the activities of the data base administration section.
32. *Data Base Administrator:* Analyzes the company's computerized information requirements, coordinates data collection and storage needs, organizes data.
33. *Data Communications/ Telecommunications Manager:* Responsible for design of data communications networks and installation and operation of data links.
34. *Data Communications Analyst:* Specializes in network design, traffic analysis, and data communications software.
35. *Technical Control Specialist:* Primarily concerned with hardware selection, operation, and maintenance.
36. *Manager of Computer Operations:* Responsible for the operation of computers including scheduling, assignment of operators and monitoring of efficiency.
37. *Manager of Data Processing Operations:* In charge of computer operations, data entry, production control, and post processing, but not of systems analysis or applications programming.
38. *Lead Computer Operator:* May be responsible for the operation of large-scale computers for the duration of an eight-hour shift or the operation of a remote site.
39. *Senior Computer Operator:* May be responsible for all operations on a medium-scale computer or for console operator of a large machine.
40. *Computer Operator:* Assists in running the computers and may operate the central console in the absence of the senior operator.
41. *Computer Operator Trainee:* Usually assigned to mounting magnetic media, loading printers, or working on a peripheral subsystem, always under direct supervision.
42. *Magnetic Media Librarian:* Maintains the library of magnetic tapes, disks and/or cartridges.
43. *Post Processing Clerk:* Operates forms bursting,decollating, and binding equipment. May also deal with microfilm and microfiche output.
44. *Production Control Supervisor:* Responsible for setting up and scheduling jobs for processing.
45. *Lead Production Control Clerk:* Responsible for the data control function for the duration of an eight-hour shift or the data control function of a single site in a multisite organization.
46. *Production Control Clerk:* Prepares jobs for processing, enters the appropriate job commands, gathers output for routing.
47. *Production Control Trainee:* Learning the production control function and works under direct supervision.
48. *Data Entry Supervisor:* Responsible for a staff which performs data entry and verification functions.
49. *Lead Data Entry Operator:* Responsible for data entry during an eight-hour shift or for data entry at one site in a multisite environment.
50. *Data Entry Operator:* Qualified to operate one or more data entry devices, requires only general supervision.
51. *Data Entry Operator:* Has not yet become fully qualified to operate one type of data entry device.
52. *Staff Consultant/Trainer:* Helps in debugging and in understanding system messages.
53. *Librarian:* Responsible for the library of technical documentation.
54. *Word Processing Supervisor:* Responsible for a staff that operates word processing equipment.
55. *Word Processing Operator:* Qualified to operate intelligent typewriters, wp systems, terminals for text editing/wp.

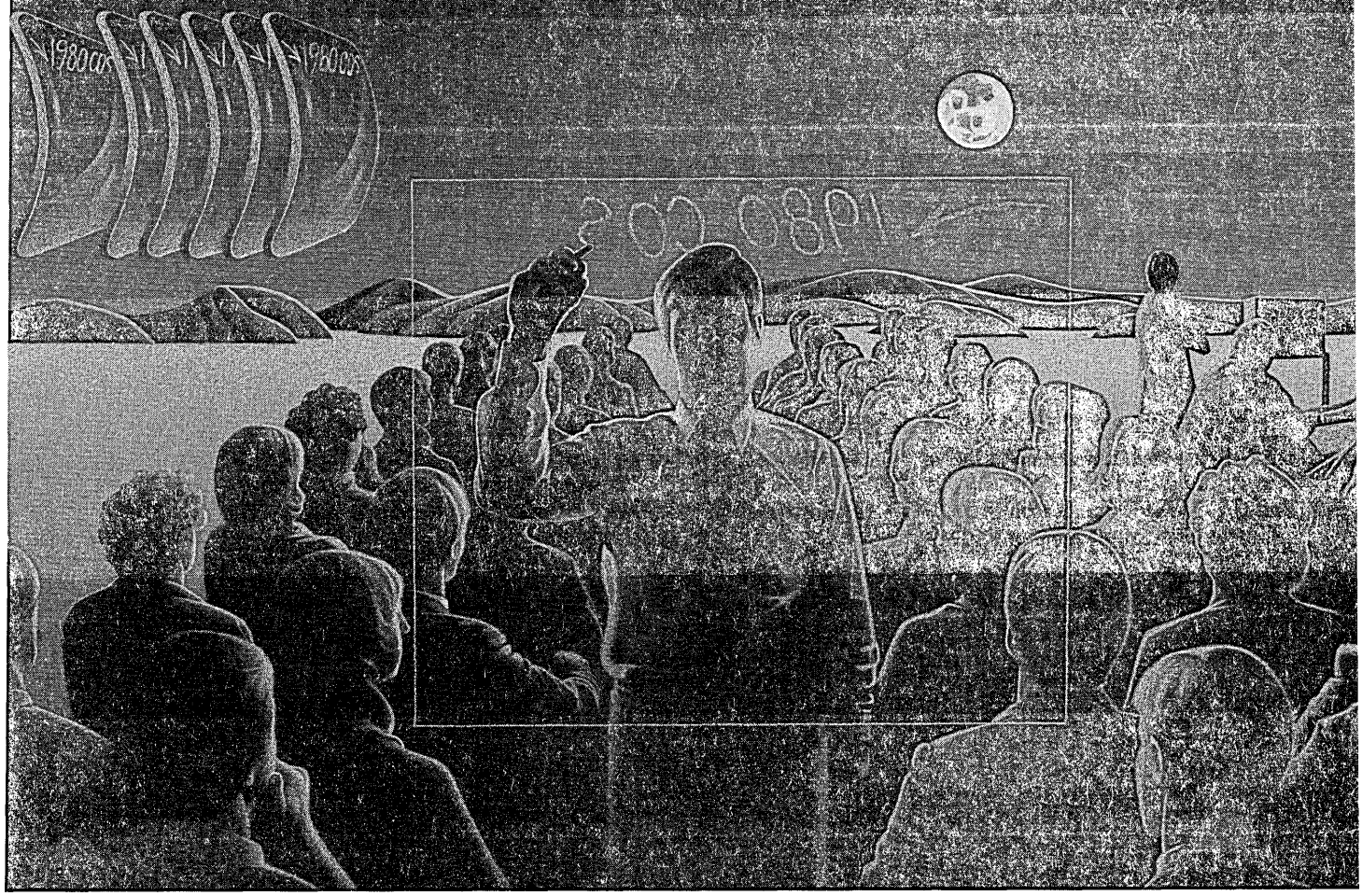
AVERAGE SALARIES BY INSTALLATION SIZE DETERMINED BY MONTHLY HARDWARE RENTAL

JOB TITLE								
CORPORATE STAFF								
1. Corp. Director of DP/MIS	34,095	31,147-37,225	24,656	23,525-25,767	30,096	28,410-31,694	35,020	31,758-38,881
2. Administrative Assistant	20,728	17,722-23,733	—	—	16,500	12,500-20,500	16,851	14,306-19,397
3. Technical Assistant	25,101	21,331-28,332	—	—	30,000	28,800-31,200	9,500	9,000-10,000
4. Services Coordinator	20,750	16,606-24,203	—	—	21,520	17,000-26,000	—	—
DIVISION OR DEPARTMENT STAFF								
5. Div. Director of DP/MIS	29,315	26,343-32,653	23,903	22,117-26,202	28,456	23,616-30,176	32,079	30,270-34,071
6. Administrative Assistant	18,997	17,308-23,400	15,048	13,742-16,604	20,725	16,500-25,000	12,879	11,414-14,426
7. Technical Assistant	21,485	17,478-25,493	12,125	10,500-13,750	22,250	15,000-29,500	20,800	15,400-26,000
8. Services Coordinator	24,164	21,190-27,470	15,500	12,200-19,000	18,000	16,975-27,000	22,500	20,000-25,000
SYSTEMS ANALYSIS								
9. Manager	29,323	25,979-31,736	27,952	22,468-29,662	29,500	26,075-35,500	28,250	26,750-31,500
10. Lead	28,147	26,419-29,075	22,550	20,650-24,967	28,163	23,325-33,000	20,000	17,000-23,000
11. Senior	24,311	20,797-26,761	25,000	24,000-26,000	22,840	19,900-25,960	19,318	16,500-22,700
12. Analyst	21,138	18,456-23,985	19,551	16,851-22,203	20,134	18,375-22,000	20,684	17,929-23,439
13. Trainee	17,094	15,668-18,260	19,000	18,000-20,000	14,500	13,000-16,000	17,662	17,200-18,325
APPLICATIONS PROGRAMMING								
14. Manager	25,975	24,014-27,936	20,500	20,000-21,000	27,960	24,000-31,920	30,227	29,307-30,841
15. Lead	22,370	20,097-24,643	15,750	15,000-16,500	19,320	17,320-21,340	22,053	19,981-24,125
16. Senior	19,735	17,547-22,069	16,416	16,350-16,833	18,493	16,215-21,530	19,870	18,531-21,209
17. Programmer	16,294	13,751-18,651	13,999	11,894-15,338	16,018	12,984-19,053	16,906	14,608-19,204
18. Trainee	13,024	11,445-14,662	11,964	10,625-13,303	11,111	10,041-12,763	12,287	10,799-13,775
19. Team Librarian	10,218	9,834-10,644	9,650	9,200-10,100	10,400	8,600-12,200	9,600	8,500-10,700
SYSTEMS ANALYSIS/ PROGRAMMING								
20. Manager	26,305	22,630-29,529	15,300	22,967-27,267	25,058	21,183-28,933	25,800	23,948-27,653
21. Lead	22,689	20,292-25,455	22,300	21,167-24,000	20,940	19,546-22,567	22,806	20,696-25,340
22. Senior	21,353	18,633-23,891	20,214	18,167-21,750	20,087	17,979-22,358	21,755	19,705-23,189
23. Analyst/Programmer	18,069	15,835-20,345	15,643	13,833-17,000	17,558	15,673-19,614	17,380	15,266-19,494
24. Trainee	13,951	12,387-15,459	13,325	10,313-15,583	13,415	11,956-14,630	12,450	11,932-12,968
OPERATING SYSTEMS PROGRAMMING								
25. Manager	28,317	24,493-31,069	—	—	24,757	22,968-25,652	39,918	34,713-45,123
26. Lead	26,773	24,998-28,675	—	—	18,500	16,500-20,500	33,781	29,375-38,186
27. Senior	23,165	20,630-26,870	27,500	20,000-35,000	22,425	20,850-24,000	21,389	17,983-24,795
28. Programmer	20,561	17,975-23,072	—	—	18,101	15,943-20,997	17,106	15,655-19,040
29. Trainee	16,713	14,461-19,097	—	—	15,700	14,100-17,300	16,500	16,000-17,000
30. Program Librarian	12,834	10,516-15,414	—	—	8,750	8,000- 9,500	7,825	7,100- 8,430
DATA BASE ADMINISTRATION								
31. Manager	27,844	23,374-32,341	—	—	—	—	28,062	24,688-31,593
32. DB Administrator	26,639	23,366-29,919	—	—	—	—	31,150	28,188-34,193
DATA COMMUNICATIONS/ TELECOMMUNICATIONS								
33. Manager	27,237	23,456-30,858	—	—	—	—	—	—
34. Analyst	24,639	21,033-28,240	—	—	—	—	—	—
35. Tech. Control Specialist	19,265	16,850-21,679	—	—	—	—	19,252	15,092-23,413
COMPUTER OPERATIONS								
36. Manager of Computer Operations	23,000	19,956-25,954	26,532	18,760-30,832	18,300	16,713-19,888	20,753	18,250-23,077
37. Manager of DP Operations	21,098	19,884-22,359	17,156	16,780-17,625	16,601	16,150-17,165	25,764	23,294-27,740
38. Lead	13,768	11,113-16,750	13,036	11,510-14,679	13,722	12,820-15,077	16,890	15,349-18,507
39. Senior	14,380	12,848-15,884	15,268	12,863-17,410	12,786	12,067-13,446	13,139	11,790-14,366
40. Operator	11,322	11,268-11,472	11,013	9,728-12,114	12,713	12,599-12,840	13,194	11,722-14,665
41. Trainee	10,653	9,732-11,574	15,618	14,831-16,090	8,857	8,575- 9,233	8,784	7,718- 9,584
42. Magnetic Media Librarian	11,311	9,843-12,892	8,500	7,500- 9,500	9,200	7,900-10,500	11,200	8,400-14,000
43. Postprocessing Clerk	11,109	9,869-12,349	8,567	7,900- 8,900	8,640	7,833- 9,850	9,600	9,000-10,800
PRODUCTION CONTROL								
44. Supervisor	16,590	15,075-18,465	17,000	14,000-20,000	12,750	11,417-14,750	22,157	20,969-23,049
45. Lead	12,904	11,721-14,195	11,722	10,769-12,676	11,445	10,510-12,691	13,155	11,275-15,035
46. Clerk	10,485	10,091-11,491	10,540	9,040-11,630	9,396	8,789-10,004	11,071	9,222-12,504
47. Trainee	10,688	9,475-11,994	13,175	11,350-15,000	10,000	9,000-11,000	8,450	8,000- 8,900
DATA ENTRY								
48. Supervisor	14,101	12,769-15,313	13,847	12,050-14,745	13,273	12,301-14,245	13,867	12,677-15,058
49. Lead	11,460	10,484-12,410	10,527	9,213-11,633	10,988	10,274-11,881	12,602	11,711-13,492
50. Operator	10,964	9,457-11,933	11,997	10,386-13,170	9,765	8,529-11,191	10,330	9,514-11,204
51. Trainee	8,986	8,299- 9,635	8,682	8,100- 9,167	8,368	7,930- 8,915	8,150	7,800- 8,500
OTHER POSITIONS								
52. Staff Consultant	20,476	16,466-21,969	—	—	16,500	14,500-18,500	13,500	10,250-20,000
53. Librarian	14,888	12,571-18,832	—	—	14,179	13,104-16,328	11,450	10,900-12,000
54. WP Supervisor	17,777	13,808-18,351	—	—	—	—	9,000	8,000-10,000
55. UP Operator	11,528	9,305-12,665	—	—	—	—	—	—

AVERAGE SALARIES BY INSTALLATION SIZE DETERMINED BY MONTHLY HARDWARE RENTAL

JOB TITLE	to $50,000 Salaries	to $50,000 Usual range	to $150,000 Salaries	to $150,000 Usual range	over $150,000 Salaries	over $150,000 Usual range	Job
CORPORATE STAFF							
1. Corp. Director of DP/MIS	39,200	34,195-44,563	44,997	39,710-50,945	36,496	32,555-41,752	1.
2. Administrative Assistant	24,128	19,075-29,181	23,394	21,292-25,496	25,265	21,438-29,193	2.
3. Technical Assistant	24,793	19,693-29,892	23,130	20,050-24,670	39,375	—	3.
4. Services Coordinator	16,128	12,970-18,233	23,064	19,092-27,036	29,241	21,000-37,482	4.
DIVISION OR DEPARTMENT STAFF							
5. Div. Director of DP/MIS	35,638	30,049-40,519	33,797	29,665-39,617	34,708	31,301-38,190	5.
6. Administrative Assistant	22,895	21,832-23,571	23,551	17,241-27,951	19,482	17,106-21,798	6.
7. Technical Assistant	33,500	29,000-38,000	23,722	18,994-28,450	26,000	23,000-29,000	7.
8. Services Coodinator	25,167	21,500-28,833	30,087	28,217-32,364	28,000	25,000-31,000	8.
SYSTEMS ANALYSIS							
9. Manager	31,833	28,550-33,750	27,280	25,486-31,036	30,815	27,456-34,174	9.
10. Lead	23,167	20,220-26,333	24,592	20,812-28,300	25,141	22,591-27,822	10.
11. Senior	25,733	22,239-28,922	24,242	20,230-26,860	22,211	19,817-24,423	11.
12. Analyst	21,188	18,637-26,683	21,959	19,230-24,689	19,798	18,233-23,342	12.
13. Trainee	17,250	16,500-18,000	16,097	15,247-16,962	18,127	14,685-27,570	13.
APPLICATIONS PROGRAMMING							
14. Manager	23,953	23,216-24,838	23,983	21,937-26,030	39,920	34,713-45,126	14.
15. Lead	21,411	20,201-22,923	23,005	20,085-25,509	28,216	24,635-31,797	15.
16. Senior	18,733	17,110-20,762	19,936	16,856-22,631	27,875	24,311-31,439	16.
17. Programmer	16,272	13,782-18,762	17,675	15,075-20,038	17,534	14,887-20,180	17.
18. Trainee	14,243	12,739-15,998	14,367	12,575-15,861	14,653	11,992-17,314	18.
19. Team Librarian	12,085	11,047-14,162	11,665	9,852-12,571	10,350	9,500-11,200	19.
SYSTEMS ANALYSIS/ PROGRAMMING							
20. Manager	25,445	21,770-29,404	27,803	23,643-32,558	29,333	25,000-31,500	20.
21. Lead	23,741	20,696-26,786	21,935	18,333-27,338	24,750	21,500-28,000	21.
22. Senior	21,833	18,492-25,174	22,587	19,392-25,782	24,073	18,850-29,566	22.
23. Analyst/Programmer	19,748	16,743-22,986	19,302	17,034-21,570	18,925	16,706-23,364	23.
24. Trainee	15,634	13,581-17,981	13,736	12,164-15,308	17,610	15,060-20,160	24.
OPERATING SYSTEMS PRORAMMING							
25. Manager	25,921	21,616-30,226	25,299	22,644-27,954	33,282	30,429-35,422	25.
26. Lead	22,575	19,300-25,850	26,703	21,878-26,058	31,960	27,856-36,023	26.
27. Senior	27,350	18,100-24,600	21,450	20,033-23,221	29,420	26,056-31,944	27.
28. Programmer	21,019	18,168-24,345	18,406	16,616-20,196	25,323	22,545-28,100	28.
29. Trainee	20,950	18,900-23,000	15,120	11,320-18,680	15,902	13,636-19,800	29.
30. Program Librarian	13,745	10,600-15,715	15,880	11,200-19,300	18,643	14,200-21,300	30.
DATA BASE ADMINISTRATION							
31. Manager	32,400	26,400-38,400	26,442	22,244-30,470	31,750	24,500-39,000	31.
32. DB Administrator	25,817	22,733-28,767	25,962	22,375-29,724	24,515	21,478-27,765	32.
DATA COMMUNICATIONS/ TELECOMMUNICATIONS							
33. Manager	27,964	23,871-32,057	27,005	23,331-30,679	26,000	23,000-29,000	33.
34. Analyst	21,500	17,000-26,000	27,018	23,002-31,034	23,800	21,080-26,566	34.
35. Tech. Control Specialist	18,000	16,000-20,000	26,000	24,500-27,500	13,806	11,808-15,804	35.
COMPUTER OPERATIONS							
36. Manager of Computer Operations	23,504	20,468-26,700	23,786	20,235-27,337	28,796	26,429-30,689	36.
37. Manager of DP Operations	18,250	13,000-20,000	21,800	21,443-22,258	26,098	24,342-27,416	37.
38. Lead	14,603	12,841-16,512	15,248	13,718-16,779	21,885	18,983-24,787	38.
39. Senior	14,511	12,791-16,375	13,988	12,601-15,515	23,132	20,363-25,902	39.
40. Operator	12,460	10,542-14,378	12,244	11,042-13,446	12,272	10,868-13,675	40.
41. Trainee	9,486	8,284-11,288	9,992	9,981-10,010	11,712	10,287-13,138	41.
42. Magnetic Media Librarian	11,628	9,130-14,125	11,797	11,273-12,453	12,098	10,555-13,641	42.
43. Postprocessing Clerk	7,500	6,000- 9,000	13,018	11,766-13,853	22,194	19,760-24,627	43.
PRODUCTION CONTROL							
44. Supervisor	14,002	13,172-15,188	18,121	16,652-20,178	17,755	14,961-19,618	44.
45. Lead	13,728	12,730-14,925	13,353	12,209-14,689	13,208	11,292-14,166	45.
46. Clerk	10,308	9,138-11,565	12,037	10,633-13,616	11,045	10,275-11,623	46.
47. Trainee	8,960	8,024- 9,896	11,655	10,134-11,014	11,014	9,818-12,209	47.
DATA ENTRY							
48. Supervisor	14,121	12,296-15,764	14,195	12,995-15,394	16,863	15,760-17,691	48.
49. Lead	11,186	11,711-13,492	12,469	11,577-13,271	11,890	11,111-12,410	49.
50. Operator	10,351	9,160-11,543	10,575	9,416-11,579	10,455	9,738-11,029	50.
51. Trainee	12,000	11,000-12,000	9,431	8,569-10,079	9,344	8,211-10,477	51.
OTHER POSITIONS							
52. Staff Consultant	2,397	18,098-21,128	15,784	10,913-16,369	18,158	16,148-21,439	52.
53. Librarian	12,950	11,154-14,662	12,761	10,844-14,736	20,880	16,880-24,814	53.
54. WP Supervisor	40,000	35,000-45,000	12,371	10,616-14,168	10,000	8,000-12,600	54.
55. WP Operator	11,982	10,692-13,272	10,311	8,944-11,684	12,250	9,000-15,500	55.

TO EXPAND HORIZONS, EXPAND YOUR CLASSROOM BEYOND THE HORIZON.



To expand his or her horizon, the student goes to school. With an electronic classroom, your school goes to the student.

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AVERAGE SALARY BY SELECTED INDUSTRY

JOB TITLE	Average for Canada	Banking	Education	Fed Gov't	State Local Gov't	Heavy Mfg	Light Mfg	Retail Sales	Dp Vendors
1. Corp. Director of DP/MIS	34,333	33,944	27,969	40,552	31,105	29,163	37,218	45,591	36,019
2. Administrative Assistant	26,400	29,700	14,233	23,702	24,750	28,000	21,230	38,400	29,979
3. Technical Assistant	22,700	—	19,910	23,500	23,500	—	—	35,000	—
4. Services Coordinator	—	—	26,500	23,200	24,000	—	—	—	23,064
DIVISION OR DEPARTMENT STAFF									
5. Div. Director of DP/MIS	24,600	24,470	25,009	32,898	26,727	30,513	31,261	25,350	38,315
6. Administrative Assistant	18,300	13,144	11,196	34,000	15,474	—	28,202	24,343	29,720
7. Technical Assistant	—	13,000	11,500	33,000	26,000	—	25,619	23,698	25,200
8. Services Coordinator	—	14,000	25,583	32,000	25,988	22,500	10,900	28,000	28,100
SYSTEMS ANALYSIS									
9. Manager	31,200	24,667	24,700	39,500	26,960	29,029	31,400	26,000	24,000
10. Lead	27,850	22,700	22,425	33,500	25,207	26,667	22,564	22,000	23,064
11. Senior	22,600	25,750	17,711	34,000	21,445	22,376	26,054	19,875	22,536
12. Analyst	21,400	19,200	18,700	23,000	20,095	22,850	21,540	22,500	22,832
13. Trainee	19,700	11,900	13,000	13,000	16,668	17,750	18,000	—	17,500
APPLICATIONS PROGRAMMING									
14. Manager	—	21,667	22,700	39,918	21,278	22,540	26,569	26,400	31,492
15. Lead	19,500	21,000	22,450	33,781	19,896	20,754	21,812	22,200	31,228
16. Senior	—	18,300	16,254	27,600	18,624	18,078	19,706	20,136	29,803
17. Programmer	—	15,000	15,781	28,411	15,918	15,855	16,128	14,690	16,876
18. Trainee	15,500	12,200	14,905	12,500	11,884	13,395	13,902	11,886	14,562
19. Team Librarian	—	—	10,716	13,700	14,670	13,027	—	10,130	12,432
SYSTEMS ANALYSIS/ PROGRAMMING									
20. Manager	27,200	27,623	23,033	29,317	23,361	27,005	28,804	24,823	29,400
21. Lead	25,000	22,723	23,357	26,120	21,123	22,108	22,471	22,111	23,700
22. Senior	24,100	21,612	20,258	25,600	22,952	20,642	22,871	19,693	19,200
23. Analyst/Programmer	20,350	17,377	17,458	21,575	18,475	18,582	18,457	18,093	16,500
24. Trainee	16,300	12,624	13,903	14,000	14,517	—	19,560	13,777	12,470
OPERATING SYSTEMS PROGRAMMING									
25. Manager	26,130	26,568	28,900	39,918	25,214	29,138	26,590	26,818	34,736
26. Lead	23,270	21,630	24,130	33,961	20,736	27,650	23,084	21,750	39,919
27. Senior	22,480	20,340	20,667	28,411	21,390	28,967	22,439	20,100	—
28. Programmer	18,400	16,685	17,267	21,600	20,706	19,435	19,429	23,500	—
29. Trainnee	17,800	14,500	14,000	11,420	16,377	18,900	17,924	—	—
30. Program Librarian	11,350	—	12,800	15,750	13,350	—	—	—	—
DATA BASE ADMINISTRATION									
31. Manager	19,500	31,000	22,500	33,781	22,156	32,400	30,582	31,250	23,064
32. DB Administrator	18,780	28,600	22,000	—	22,504	28,200	27,233	27,500	22,536
DATA COMMUNICATIONS/ TELECOMMUNICATIONS									
33. Manager	—	—	25,300	40,000	26,000	30,280	15,928	31,633	23,064
34. Analyst	19,340	—	23,000	28,000	23,646	26,500	21,500	31,500	22,536
35. Tech. Control Specialist	—	—	15,600	20,000	16,529	24,800	—	22,000	—
COMPUTER OPERATIONS									
36. Manager of Computer Operations	30,240	21,593	18,871	29,574	21,939	21,474	22,025	20,760	35,914
37. Manager of DP Operations	20,650	19,000	14,297	23,781	19,587	26,210	22,366	18,350	33,781
38. Lead	16,720	13,296	13,190	28,411	13,935	15,059	14,660	13,704	23,601
39. Senior	14,390	12,727	13,580	14,092	13,830	14,136	13,877	12,375	26,860
40. Operator	12,350	12,215	11,384	12,928	13,166	12,498	11,624	10,874	12,000
41. Trainee	11,625	10,054	12,017	14,500	10,504	—	9,345	8,848	8,850
42. Magnetic Media Librarian	11,350	10,861	9,467	11,875	12,259	13,000	10,500	9,544	—
43. Postprocessing Clerk	—	9,850	10,300	10,200	15,870	10,100	8,750	8,067	—
PRODUCTION CONTROL									
44. Supervisor	20,310	—	15,025	23,780	15,428	21,391	17,738	—	16,300
45. Lead	17,450	—	12,767	16,014	12,480	15,079	12,752	—	13,674
46. Clerk	12,230	10,795	9,511	11,556	10,282	12,022	10,792	10,108	11,555
47. Trainee	10,400	7,714	10,746	—	10,358	11,300	11,740	9,760	8,900
DATA ENTRY									
48. Supervisor	18,200	16,100	12,317	13,320	14,173	14,969	13,637	14,212	12,900
49. Lead	12,400	13,117	10,038	11,600	10,696	12,173	12,631	10,899	—
50. Operator	12,333	10,447	9,727	10,500	11,072	9,593	10,291	9,628	—
51. Trainee	9,450	10,000	5,500	8,700	9,344	10,520	8,787	8,770	—
OTHER POSITIONS									
52. Staff Consultant	10,000	12,210	14,067	—	—	20,267	16,404	18,000	27,255
53. Librarian	11,620	8,600	15,108	—	16,986	13,200	10,390	14,376	14,124
54. WP Supervisor	—	—	10,300	—	10,182	—	12,870	—	—
55. WP Operator	—	—	11,982	—	9,240	—	11,580	—	10,122

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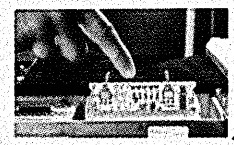

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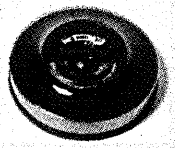

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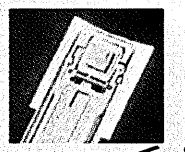

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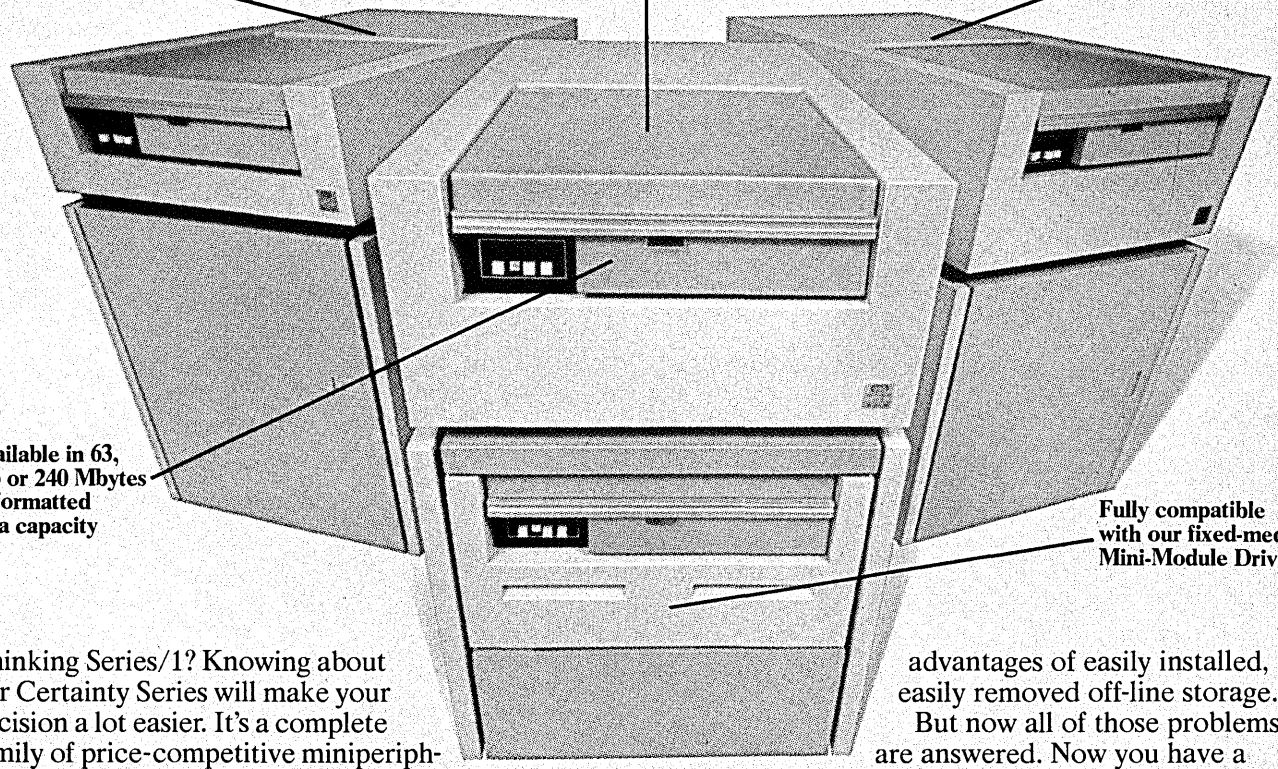

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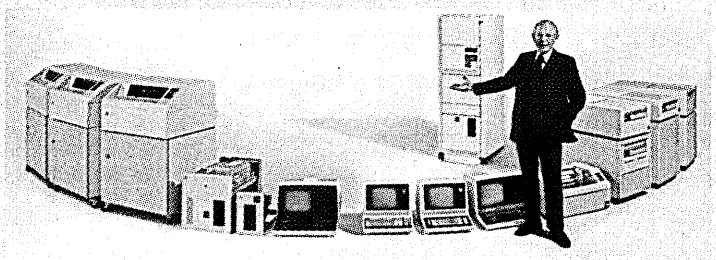

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JOB TITLE	New York	Chicago	Los Angeles	San Francisco	Miami	Boston	Phila.	Atlanta	Dallas	Denver	Seattle
1. Corp. Director, DP/MIS	31,667	34,667	32,389	—	25,850	21,680	26,450	34,566	25,710	24,382	20,040
2. Administrative Assistant	22,500	21,784	22,850	—	—	20,640	21,300	—	—	—	—
3. Technical Assistant	27,950	—	29,900	—	—	—	—	25,000	—	—	—
4. Services Coordinator	19,400	—	—	—	—	—	—	—	—	18,700	—
DIVISION OR DEPARTMENT STAFF											
5. Div. Director of DP/MIS	30,100	32,709	33,200	27,320	35,100	29,700	27,100	20,911	26,200	29,250	16,000
6. Administrative Asst.	19,250	21,360	20,200	18,470	—	19,125	17,400	—	—	—	—
7. Technical Assistant	20,320	20,850	19,620	—	—	18,410	—	—	—	17,600	—
8. Services Coordinator	27,311	25,410	21,319	19,267	—	19,310	18,600	28,000	17,480	16,525	14,860
SYSTEMS ANALYSIS											
9. Manager	30,684	29,457	27,455	23,215	20,717	25,100	25,780	20,600	—	24,300	—
10. Lead	27,293	25,319	27,312	20,316	18,410	23,000	24,810	20,350	—	22,650	—
11. Senior	26,400	27,241	25,750	18,400	17,000	22,200	—	19,200	—	21,777	—
12. Analyst	24,310	21,750	20,319	—	—	18,600	—	17,000	—	20,685	—
13. Trainee	19,270	18,400	20,100	16,420	—	17,300	—	16,000	—	19,000	—
APPLIC. PROGRAMMING											
14. Manager	27,300	22,741	24,318	22,450	21,300	23,364	20,800	—	—	21,640	20,500
15. Lead	24,612	20,414	22,500	—	19,180	22,615	21,750	—	—	19,830	—
16. Senior	21,326	18,094	18,580	17,930	—	19,210	—	20,000	19,060	—	—
17. Programmer	18,435	11,061	16,469	—	15,250	—	—	14,386	13,000	19,000	—
18. Trainee	15,350	15,625	15,560	—	—	—	—	12,000	—	—	—
19. Team Librarian	14,200	13,700	—	—	—	—	—	—	—	—	—
SYSTEMS ANALYSIS/ PROGRAMMING											
20. Manager	24,900	23,200	28,000	—	28,000	23,700	21,000	26,000	18,500	31,235	17,400
21. Lead	20,000	22,170	24,960	—	—	18,450	19,400	24,000	19,100	28,152	16,820
22. Senior	20,000	—	22,830	—	—	17,330	—	18,781	—	24,369	—
23. Analyst/Programmer	19,470	—	21,591	—	—	—	—	21,000	14,500	22,488	—
24. Trainee	—	—	13,500	—	—	—	—	—	—	19,560	—
OPERATING SYSTEMS PROGRAMMING											
25. Manager	31,420	27,241	29,300	21,740	19,450	25,600	26,500	30,000	24,000	25,624	—
26. Lead	28,500	24,685	27,212	21,325	18,700	23,240	24,000	25,750	23,000	24,930	—
27. Senior	25,310	21,520	21,425	22,430	17,000	—	22,610	23,210	—	23,200	—
28. Programmer	13,500	14,200	—	—	—	—	—	12,500	—	12,000	—
29. Trainee	15,680	15,850	14,460	—	—	—	—	—	14,000	—	—
30. Program Librarian	—	—	—	10,600	—	11,000	—	—	—	—	—
DATA BASE ADMIN.											
31. Manager	29,300	25,650	—	24,333	—	—	—	27,200	—	25,000	—
32. DB Administrator	—	—	24,500	—	—	—	—	—	—	22,740	—
DATA COMMUNICATIONS/ TELECOMMUNICATIONS											
33. Manager	31,464	15,928	29,310	31,100	21,314	18,611	18,800	24,200	—	23,400	20,300
34. Analyst	23,230	22,611	24,600	—	—	18,450	—	—	—	20,715	—
35. Tech. Control Specialist	21,320	18,413	19,485	—	—	17,000	—	18,000	—	—	—
COMPUTER OPERATIONS											
36. Manager of Computer Operations	27,100	23,364	21,464	20,000	21,210	22,300	19,460	24,500	18,400	25,250	18,780
37. Mgr., DP Operations	23,000	22,430	16,660	14,700	22,000	20,200	18,742	16,980	15,430	22,360	17,600
38. Lead	18,470	14,544	16,145	14,000	16,050	14,300	15,000	14,000	12,100	18,200	16,000
39. Senior	16,300	11,673	14,912	12,000	14,500	15,225	14,750	11,000	—	17,900	—
40. Operator	12,622	13,716	14,354	11,225	13,500	14,600	—	9,923	10,250	14,500	—
41. Trainee	11,540	12,000	10,000	9,875	9,300	10,400	9,100	9,500	8,200	10,000	7,000
42. Magnetic Media Librarian	11,850	11,100	8,800	10,400	—	—	—	10,500	—	10,000	—
43. Postprocessing Clerk	11,500	10,980	8,200	9,000	10,000	10,100	8,000	9,700	—	8,600	—
PRODUCTION CONTROL											
44. Supervisor	19,319	18,400	17,116	16,550	15,000	17,400	17,611	13,500	13,650	16,310	15,500
45. Lead	13,500	11,226	13,667	12,000	—	12,275	—	7,807	10,400	15,550	14,000
46. Clerk	—	10,554	11,253	9,200	11,000	11,667	9,500	10,000	—	14,000	—
47. Trainee	11,340	—	10,373	—	—	—	—	—	—	13,560	—
DATA ENTRY											
48. Supervisor	12,000	12,700	19,125	14,600	19,500	12,300	13,225	13,500	14,250	22,488	14,000
49. Lead	10,700	11,775	13,746	12,000	11,950	—	11,200	10,000	11,000	13,985	11,200
50. Operator	10,420	11,294	10,982	—	10,800	9,800	—	—	—	10,459	—
51. Trainee	9,000	10,250	6,656	—	7,000	—	8,400	—	7,300	—	—
OTHER POSITIONS											
52. Staff Consultant	23,000	16,308	24,000	—	—	22,723	21,485	17,300	19,000	19,500	16,300
53. Librarian	17,850	14,500	13,940	—	12,950	18,560	17,000	15,000	—	14,600	—
54. WP Supervisor	19,300	15,200	—	—	—	17,491	15,600	—	—	—	—
55. WP Operator	13,200	—	11,982	—	—	12,284	11,390	—	—	10,000	8,200

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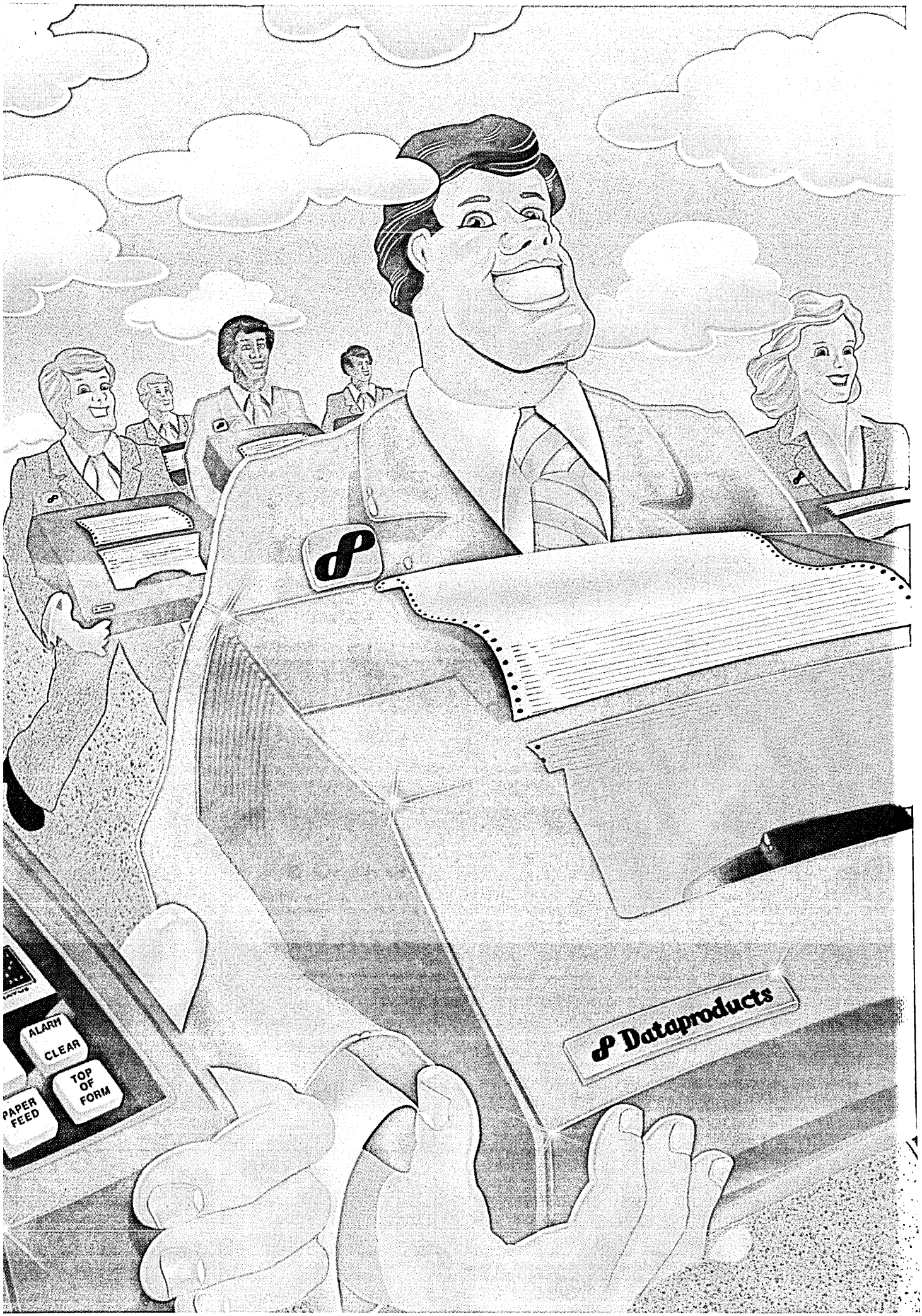
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CIRCLE 82 ON READER CARD

To keep their skilled dp people, companies must reassess their personnel evaluation systems and reward top priority skills.

GROW YOUR OWN

by Robert M. Alloway

Simply stated, the demand for skilled dp personnel is greater than the supply; competition in hiring skilled people has driven up salaries, and has left most dp departments without enough skilled people. Consequently, more and more dp departments are revitalizing their skill development programs and are reassessing their personnel evaluation procedures.

Unfortunately, our research results reveal a hidden crisis. Skill development programs omit major, relevant topics, and do not reward systems analysts for developing skills. Personnel evaluation systems are driving systems analysts out of some firms with obsolete standards, and are not rewarding analysts for the skills the head of the dp department rates as most important.

Success requires practical planning for the diagnosis and improvement of current problems. Data processing management must identify the relevant skills for an SA, modify the evaluation system to reward these skills, communicate these priorities effectively, and assure at least the existence of a skill development program in top priority skills.

These necessities for success may seem obvious, but, according to our research, they have not been practiced in even the better companies. In order to examine these issues we at the Center for Information Systems Research surveyed systems analysts and heads of dp departments about skill priorities and evaluation systems for systems analysts.

Our research began with identification of a list of relevant skills for systems analysts. We designed the list to be short but representative of the broad range of skills. If this skill list had been drawn up for a particular company, it would have been longer and more specific.

The 16 skills used in our survey and referenced throughout this article are listed in Table I. They were randomly sequenced on a questionnaire, and respondents rated each on the seven-point scale shown, where 1 represents a completely irrelevant skill, 3 a necessary prerequisite, 5 very important, and 7 the single most important skill.

The chief information officers (CIO) in companies V,W,X,Y, and Z rated the priority of each skill. (CIO is our term for the head of the dp department; typically, this is the director or vp of dp, MIS, or information services.) The order in which the 16 skills are numbered in Table I is the average value of each skill on the seven-point scale of the CIO's priority rating.[1]

We do not contend the CIOs surveyed are right in their priority assignments, and the proper priorities of the skills do, of course, vary by company. However, our data do show a basic agreement among these five CIOs on their priority assignments of systems analysts' skills.

The bottom six priorities (rated not as irrelevant, but as necessary prerequisites) are dominated by the traditional technical skills, whereas the top six all relate to a strong user orientation. The CIO's emphasis[2] is on managerial and organizational issues at the front end of the system's development life cycle.

It seems likely that the current priorities of these CIOs have evolved only recently. However, changes in priorities should be effectively communicated to the analysts involved and reflected in modified evaluation standards.

SA, CIO VIEWS COMPARED

To investigate the extent to which the CIO's priorities have been reflected in his department, we compared the skill priorities of the CIO in company Z with the priorities of one of his SAs for each skill listed in Table I. These two people form one of the pairs of CIO-SA studied. Their level of agreement on skill priorities is shown in Fig. 1.

If their agreement had been perfect, both colored bars would be the same height for all skills 1-16. It is easy to see the extent of disagreement for this pair and consider the implications for productivity and successful software development.

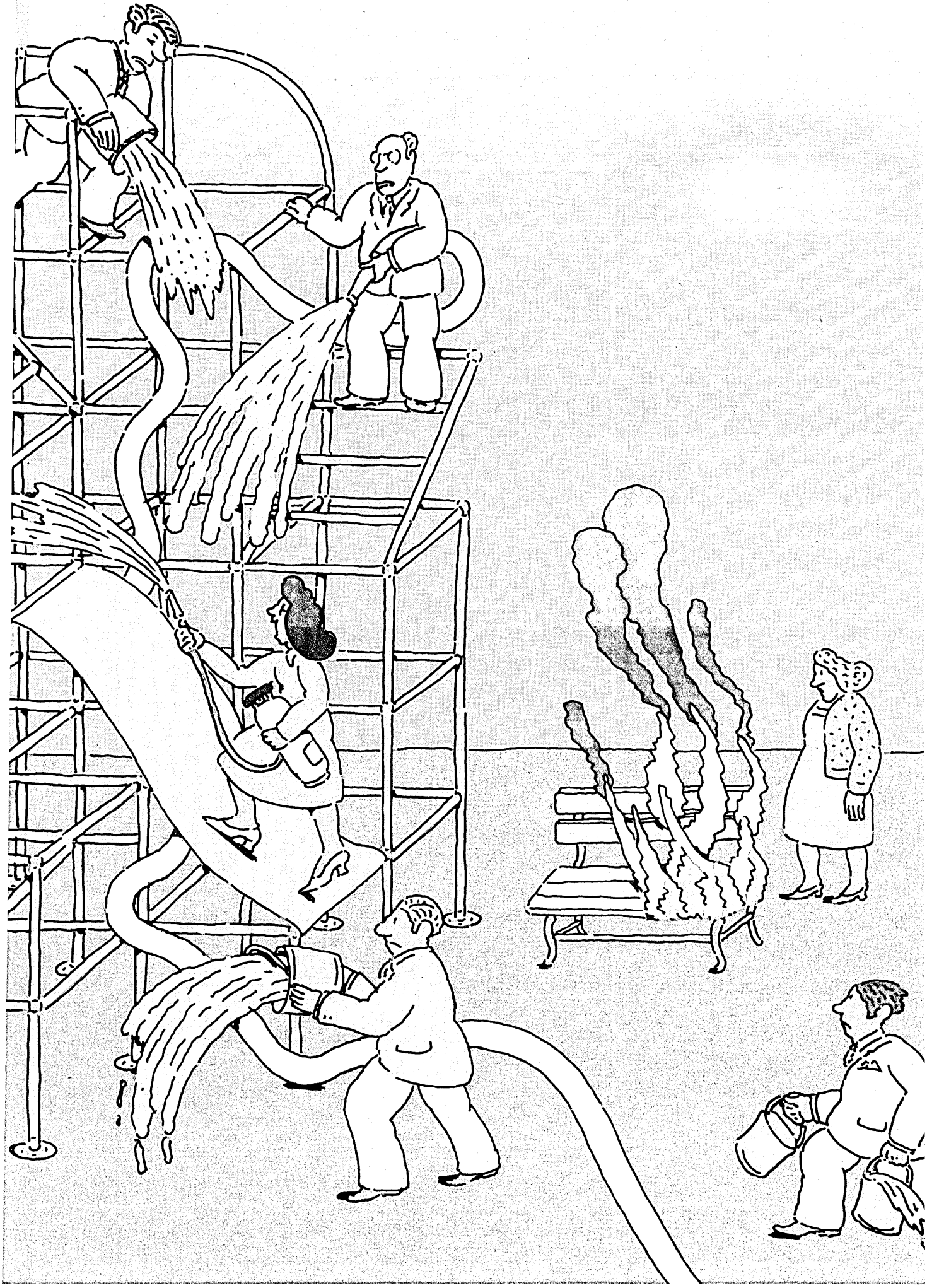
For example, the CIO rates implementation planning, education, motivation, and training of users skills (9) as very important, whereas this SA considers it irrelevant. Conversely, this SA rates technical skills (16) as very important, while his CIO considers it only a necessary prerequisite. To the extent that a CIO-SA pair disagree on skill priorities, considerable efforts may be misallocated or allocated at cross-purposes, or important issues may be unintentionally ignored. This is because an SA's skill priorities indicate what aspects of the systems development process he would emphasize—in this example, technical considerations over implementation planning.

For each of the CIO-SA pairs studied, a Fig. 1 can be prepared. To compare all CIO-SA pairs studied, we needed a composite index for level of agreement on the skills 1-16. We used a correlation coefficient which ranges in value from +1 for perfect agreement to -1 for perfect disagreement. Fig. 1 has a correlation

ILLUSTRATION BY SEYMOUR CHWAST

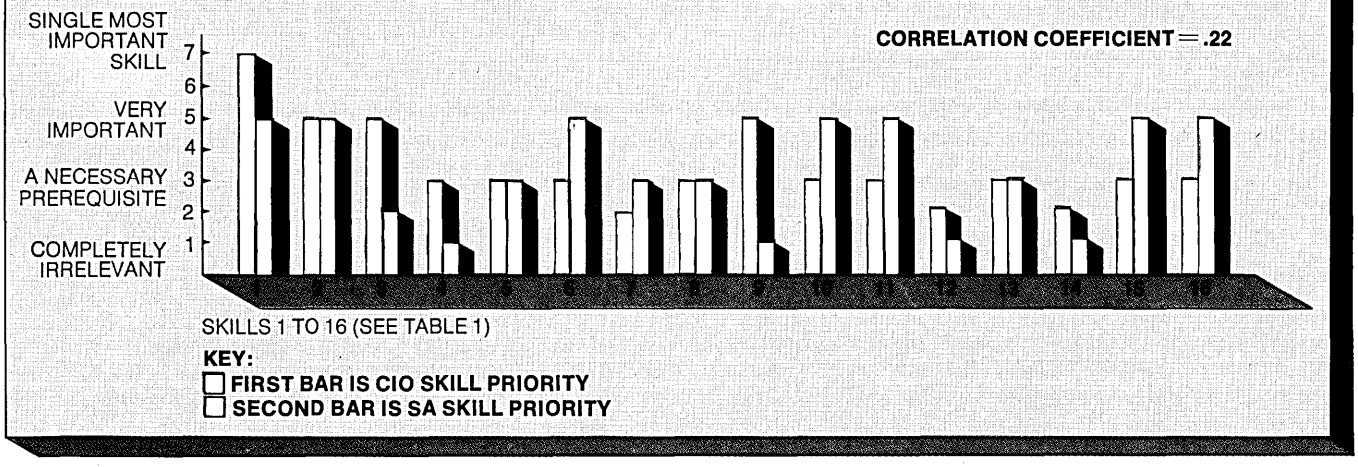
1. The Pearson R correlation coefficients of each CIO's ratings to average CIO ratings are .68, .69, .83, and .72.

2. For the 16 skills and variance in ratings assigned by SAs and CIOs, a Pearson R correlation coefficient of .50 or greater is statistically significant at the .05 level. Statistical significance indicates that there is a relationship between priorities (5% chance there is no relationship); however, it does not indicate the strength of agreement. A correlation coefficient of .80 is strong agreement and is statistically significant. A correlation coefficient of .50 is statistically significant but indicates only weak agreement. Any lower correlation coefficient, for example, .30, indicates no agreement, i.e., only a random relationship.



More effective communication and discussion of skill priorities for systems analysts is necessary.

FIG. 1
SKILL PRIORITY AGREEMENT FOR ONE CIO-SA PAIR FROM COMPANY Z



coefficient of .22 but is not statistically significant.

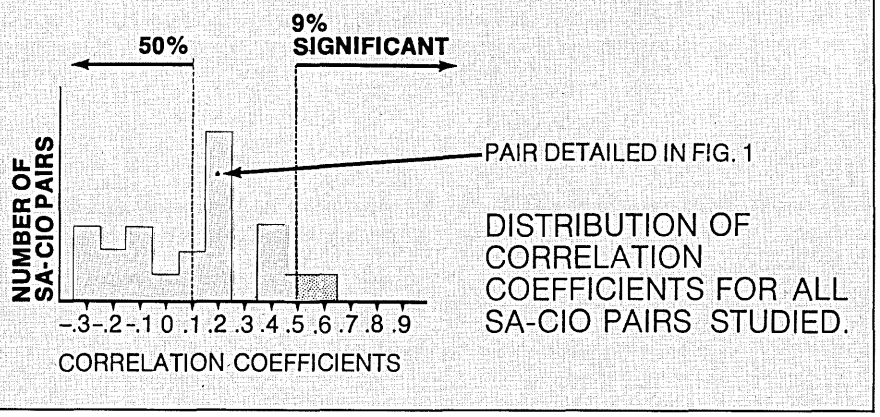
Company averages for the level of skill priority agreement by CIO-SA pair were: .11, .11, -.19, .10, and .22. The highest company average correlation coefficient is .22. coincidentally the same as the pair in Fig. 1, and simply managerially unacceptable.

To look at all the CIO-SA pairs studied we prepared the histogram in Fig. 2. The correlation coefficient for skill priority agreement is the horizontal axis, and the height of the bars indicates the relative number of pairs with that level of agreement.

The particular pair in Fig. 1, with a correlation coefficient of .22, is now seen to be typical and above average for all pairs. The pairs with reasonable agreement, the 9% with positive and statistically significant correlations, are few and far between. The level of agreement on skill priorities for the other 91% of the CIO-SA pairs is random. *Random*. Think about *that* for a minute.

Clearly, more effective communication and discussion of skill priorities for SAs is necessary. Productivity includes doing the right thing as well as doing something efficiently. Motivation relates to doing something personally considered important. It is hard enough to lead when everyone agrees on the direction. With our survey results, it is easy to see why both leaders and followers in dp departments feel frustrated.

FIG. 2
SA SKILL PRIORITIES VS. CIO SKILL PRIORITIES:



SKILLS REWARD RATING

Each systems analyst also rated the 16 skills for perceived evaluation standards for positive feedback, raises, and promotions. We have compared these ratings with CIO skill priorities to see if important skills are being rewarded.

The perceived evaluation standards are reality for a systems analyst. It is possible that an SA may have a poor perception of the actual evaluation standards in his dp department. More likely, however, dp management has been too busy fulfilling users needs to revise its own obsolete evaluation standards. Even with revised standards, the evaluation system must be well implemented to send clear, consistent signals to SAs. It is the perception of what is rewarded that influences behavior.

Selecting the same CIO-SA pair from company Z, we have displayed the level of agreement between CIO skill priorities and SA perceived evaluation standards in Fig. 3. If agreement were perfect, the bars would be the same height for all 16 skills. The disagreements evident in Fig. 3 indicate the CIO is being actively subverted by his own department's evaluation system. Moreover, this SA is being encouraged to develop skills the CIO considers virtually irrelevant.

The CIO considers implementation planning (skill 9) to be very important. Unfortunately, this skill is not being effectively rewarded. The SA perceives skills in implementation planning to be virtually ignored by the evaluation system and will behave accordingly.

Conversely, the SA perceives skills 3 and 14 to be equally important. Unfortunately, the CIO considers skill 14 (estimating and rigid adherence to project costs and schedules) virtually irrelevant and skill 3 (organizational design and assessing system impacts on user departments) very important and will behave accordingly.

The result is the SA finds the evaluation system, and his CIO, to be arbitrary and capricious, while the CIO finds the evaluation

FIG. 3

CIO SKILL PRIORITY AGREEMENT WITH SA PERCEIVED EVALUATION STANDARDS

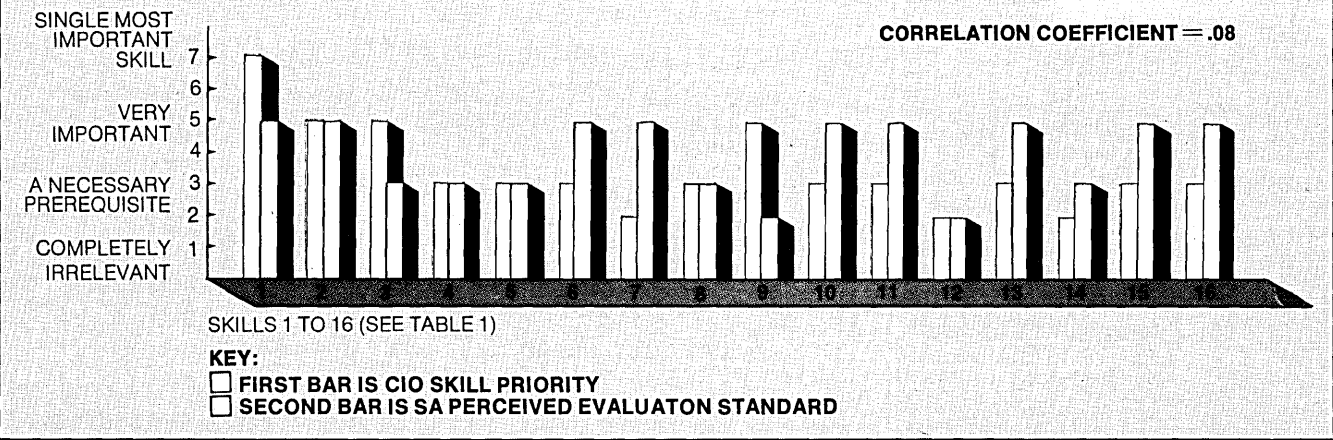
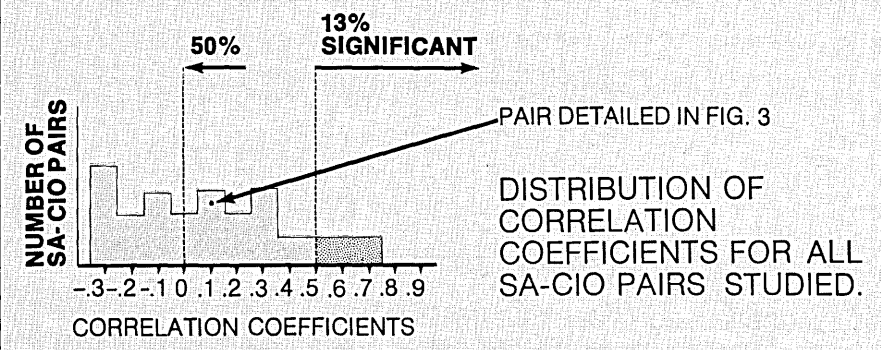


FIG. 4

SA PERCEIVED EVALUATION VS. CIO SKILL PRIORITIES



system, and his SA, to be ineffective in improving or changing skills or behavior.

The level of agreement in Fig. 3 expressed as a correlation coefficient is .08. The average correlation coefficient for all CIO-SA pairs in each company are: -.02, .20, -.14, .13, and .14. These results are unacceptable for all five companies. It is clearly necessary for these CIOs to devote some portion of their schedules to a revision of the evaluation system, its implementation, and effective communication.

The skill priorities of the CIOs have precious little effect on what gets rewarded in their own departments. Fig. 4 makes this point dramatically by summarizing the level of agreement for all CIO-SA pairs studied. Only 13% of these pairs have a statistically significant correlation between CIO skill priorities and SA perceived evaluation standards. The rest, 87%, are random, and more than 50% of all the pairs are worse than the pair detailed in Fig. 3.

We could have selected CIO skill priorities with a random number generator and had an equal chance of comparable agreements for 87% of the CIO-SA pairs. When perceived evaluation standards do not agree with intended priorities, the effect is to both stimulate and reinforce undesired behavior, generating the cross-purposes and frustrations discussed for Fig. 3 on a massive scale.

When an individual's perceived evaluation standards do not agree with his own skill priorities, considerable frustration is generated. This frustration is manifested in lower job satisfaction, motivation and productivity, and a higher propensity to quit.

We don't really know what level of agreement between an SA's skill priorities and perceived evaluation standards is adequate to prevent frustration. For example, Fig. 5 dis-

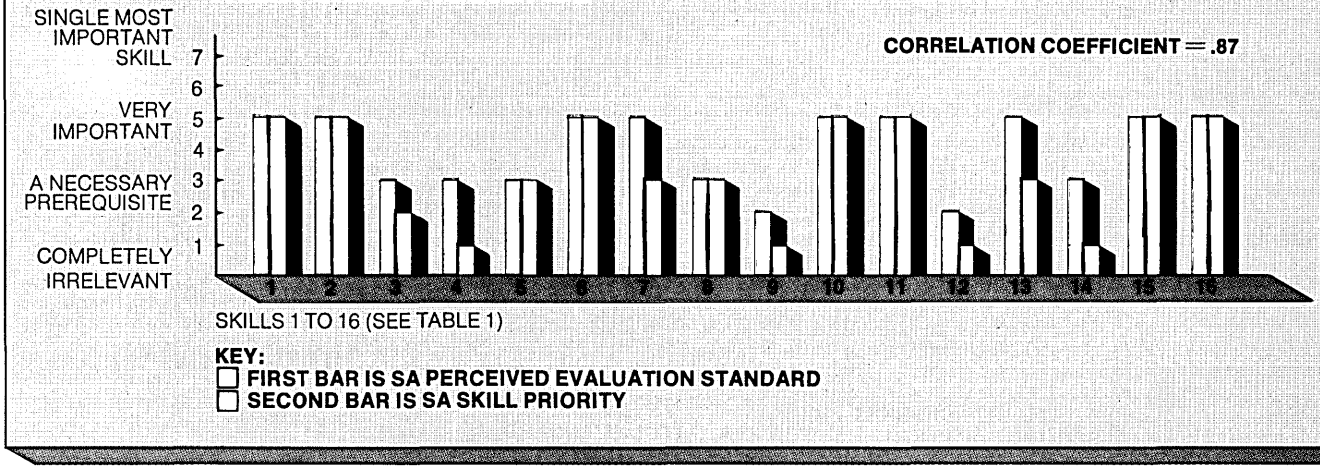
Table I

SYSTEMS ANALYSTS' SKILLS

1. Strong user orientation, delivering systems users like
2. Ability to work with ill-defined objectives and resolve conflict productively
3. Skills in organizational design and assessing system impacts on user departments
4. Behavioral sensitivity to impacts of systems on individuals
5. Project management skills (planning and control)
6. Broad view of company goals and operations, senior management orientation
7. In-depth knowledge of user departments' operations
8. Dedication, hard work, hustle
9. Implementation planning, education, motivation, and training of users
10. Cost consciousness, hardware and operational efficiency
11. Expertise in system design of monitor and exception systems
12. Leadership ability, administrative experience, political sensitivity
13. Ability to work intimately with senior user managers
14. Estimating and rigid adherence to project costs and schedules
15. Expertise in system design of inquiry and analysis systems
16. Technical skills (programming, data base design, telecommunications, etc.)

Dp management must identify relevant skills, modify the evaluation system to reward these skills, and assure the existence of a skill development program.

FIG. 5
SA PERCEIVED EVALUATION STANDARDS AS COMPARED WITH THEIR SKILL PRIORITIES

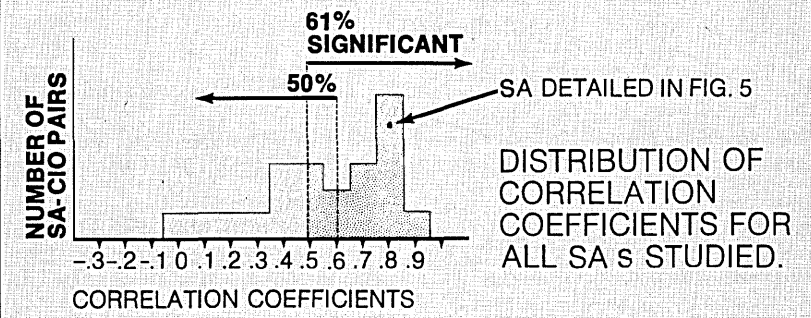


plays the effect of perceived evaluation standards on skill priorities for our favorite SA from company Z. There are regular but reasonable differences on the 16 skills. Only skills 7 and 13 are out of balance and this doesn't appear to be sufficient to cause a real problem.

Fig. 5 has a very high and statistically significant correlation coefficient of .87. The company averages are generally good: .52, .60, .29, .65, and .67. Even without knowing the exact threshold level of disagreement for frustration, it is easy to see why some companies experience higher SA turnover than others. Company X, with a .29 average, is definitely driving SAs out of their dp department. When SAs are hearing the abandon-ship alarm it is not the time to rearrange the deck chairs.

There is a very strong relationship between an SA's perception of evaluation standards and his or her own skill priorities. Fig. 6 summarizes the correlation coefficients for all SAs studied. About 61% of the relationships are statistically significant.

FIG. 6
SA SKILL PRIORITIES VS. SA PERCEIVED EVALUATION



REWARD SYSTEMS WORK

These are encouraging results. There is no doubt that evaluation/reward systems are effective. Revision of the evaluation standards, implementation, and effective communication are managerially feasible and will affect SAs' perceptions, skill priorities, motivation, productivity, skill development, and turnover. However, there are three aspects of this strong relationship between perceived evaluation standards and skill priorities which must be considered very carefully in planning.

First, some people leave an organization rather than modify their behavior in accordance with evaluation standards with which they strongly disagree. Consequently, we do not know what proportion of this strong relationship is due to self-selection. More importantly, we do not know what proportion of the current SAs would choose to leave if they perceived a major change in evaluation standards.

Secondly, as Fig. 6 demonstrates, evaluation standards are quite influential. The evaluation/reward system not only influences overt behavior but, over time, influences deep-seated personal opinions like skill priorities. Conversely, changing personal opinions requires equivalent influence over time. A quick, light fix would be ineffectual.

Thirdly, this strong relationship is not necessarily good. In fact, for these five companies it is making matters worse. We have already demonstrated that the perceived evaluation standards are wrong—they disagree with the skill priorities defined as desirable by the CIO. Remember, Fig. 3 revealed a basically random relationship between SA perceived evaluation standards and CIO skill priorities.

The evaluation/reward system does work. But, being obsolete, it is driving SAs away from their CIO's evolving priorities. It is sending the wrong signals throughout the department, emasculating the skill development program, rewarding the wrong skills, misdirecting emphasis in systems development, and driving the wrong SAs out of the dp department. In this situation, the longer the delay in modifying the evaluation/reward system, the worse the problem.

These results are so strong and nearly uniform across the five companies that they can probably be generalized to a larger number of dp departments. Managerial actions to improve this situation can and should be taken.

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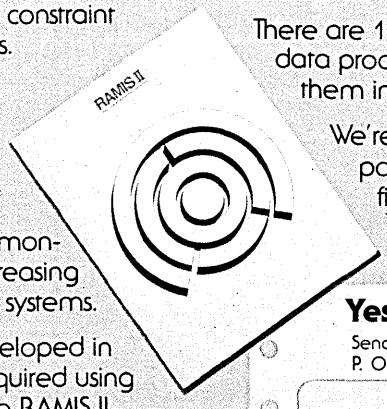

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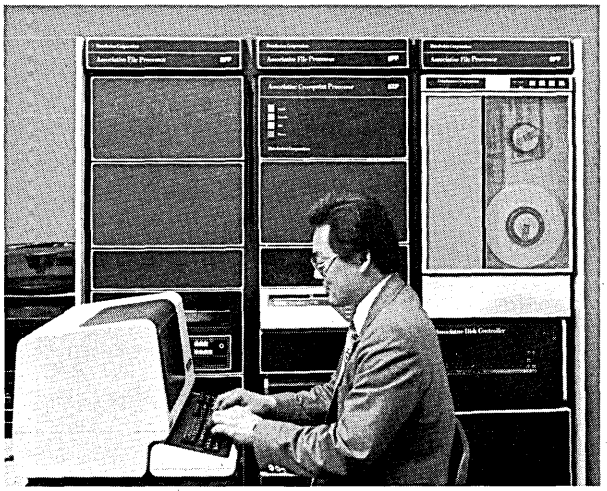

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The CIO and his dp management team must conscientiously and explicitly identify and prioritize skills for SAs. To the extent that the CIO's priorities are uncertain or evolving over time, a continuous and effective communication and discussion process must be established.

The current situation in dp must be diagnosed. An enhanced version of the straightfoward methods used in our research could be used for an internal diagnostic and discussion vehicle.

The longer the delay, the more obsolete evaluation standards influence SAs away from the CIO's priorities. Moreover, the duplicity of the situation, the CIO's espoused priorities versus perceived evaluation standards, understandably frustrates SAs. The result is misallocated and cross-purpose efforts, lower productivity and motivation, and higher turnover.

The evaluation standards must be revised to agree with the desired priorities. This entails revision of the evaluation/reward system, effective communication of the new evaluation standards, and clear, consistent signals from its implementation. During this process, SAs will experience pressure for change. Your plan should anticipate disbelief with the new priorities and evaluation standards until actual practice has demonstrated real implementation.

If the current skill development program is both irrelevant to organizational rewards and SAs' skill priorities, its impact on SAs' skills, irrespective of level of expenditure, is quite predictable.

The CIO's skill priorities should drive the emphasis and offerings in the skill development program. Most skill development programs concentrate on the traditional technical skills found in the bottom six priorities in Table I. These are indeed "necessary prerequisite" skills. However, the skill development program should not stop there; rather, a concerted effort to identify program elements (courses and task assignments) for the development of higher priority skills is required. The revised evaluation system will stimulate SAs' interest in top priority skills and their development. ❋

ROBERT M. ALLOWAY

Dr. Alloway is assistant professor of management science at the Sloan School of Management, MIT, where he is concerned with organizational and management issues at the school's Center for Information Systems Research. Previously he spent five years as special projects manager for major corporations. He has a doctorate in the management of technology from Harvard Business School.

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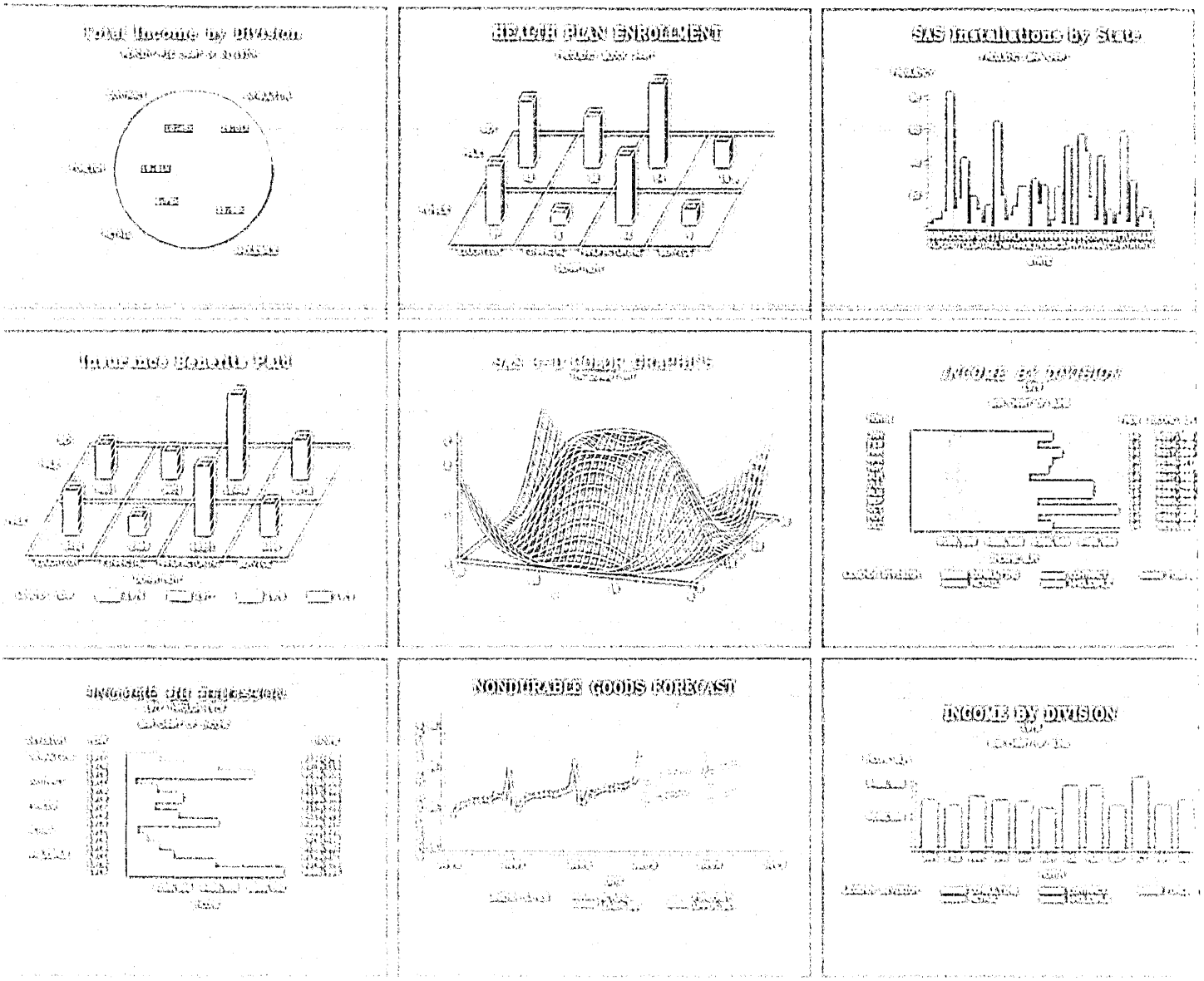

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Options for women in business are different, but instead of creating limitations, the differences sometimes provide greater advantages.

WOMEN IN MANAGEMENT: A CONVERSATION

PHOTOGRAPHS BY ROBIN PLATZER

Women in business are a minority, and are so included in federal affirmative action regulations. Women in management are even more a minority. Why? Are there substantive differences in the way women and men perform on the job? Are men and women differently qualified? Can the imbalance be traced to corporate attitudes? Or to the attitudes of women?

To answer these questions, and more specifically to follow the career paths of several women successful in management positions in the data processing industry, DATAMATION conducted an informal round table discussion with five participants: Chris Millen, Nancy Jordan, Mary Lynn McCaffery, Susan Fleishhacker, and Molly Nemhouser.

Our discussion did not attempt to address the issue of sex-role stereotyping. The social and psychological issues involved entail fields of study. But because there does exist gender-related public policy, and because of the widespread belief that attitudes are changing, our panel addressed the circumstances rather than the well-worn issues.

And what did we discover? That, for whatever reasons, the options for women in business *are* different. Instead of creating limitations, however, the differences sometimes provide greater advantages.

SUSAN FLEISCHHACKER recently joined American Can Co. as a senior systems analyst in field facilities planning. Prior to that she worked as a systems engineer with Bell Helicopter's International Division in Tehran, Iran. At American Can she is responsible for the acquisition of hardware for 90 field facilities. In this capacity, she manages performance proposals, equipment strategies, and operational and applications reviews. She holds a BA from Harvard in Public Health Administration.

NANCY R. JORDAN is vice president and group project manager with Chase Manhattan Bank in New York City. She is presently responsible for the development and ongoing support of all domestic money transfer data processing applications. In 1978, she was put in charge of developing Chase's message switching system to automate the Telegraphic Services department. Before joining Chase in 1973, Jordan served as systems consultant for the New York Off-Track Betting System, the mutual funds system for First Jersey National Bank, and N.V. Philips Electrologica in Holland. In the mid-'60s she was an IBM senior programmer with the Mercury and Gemini projects. Her background includes a BA in mathematics from Wellesley College, and membership on the Fedwire Committee of the New York Federal Re-

FLEISCHHACKER: "People know the computer industry is a lucrative field and open to women more than other industries are."

serve Bank, and of FOCUS.

MARY LYNN MCCAFFERY is a manager in Citibank's International Services Division, where she is responsible for the development of investment and MIS systems. She has designed and developed an International Portfolio Management System linking New York and major European cities. She joined Citibank in 1968 as a programmer with the National Division before moving into the computer software services area as project manager. While serving as a consultant with the bank's investment management group, she developed financial tracking systems for international branches.

CHRISTINE M. MILLEN is senior manager for Management Advisory Services, Price Waterhouse & Co., New York City. She joined Price Waterhouse in 1969 as a consultant and since has handled a wide variety of clients' business and financial problems including systems analysis and the implementation of data processing systems. She has also designed and implemented PW's Law Firm Management System, which provides management information to legal firms. In addition, she is in charge of developing and teaching dp classes for both client and Price Waterhouse personnel. Past projects have included the design of an information and accounting system for a large port authority in the United Kingdom.

With a BA degree in Latin from the University of London, Millen moved into the data processing field as a senior analyst and sales representative with International Computers, Ltd., in Northern Ireland following a stint as a customer representative in London. Since then she has directed the implementation of a financial reporting system for a large multinational company, designed a financial management system for a major U.S. shipping firm, and worked on the implementation of a claims processing system for a major retail chain.

MOLLY NEMHOUSER, a senior systems analyst for the advanced systems planning department of Mocatta Metals Corp., was formerly a project coordinator for Bradford Securities Processing Services, Inc. She is responsible for the long-range planning of the company's dp department, including the evaluation of hardware requirements for internal data processing and customer accounts. Her projects have included the development and implementation of a batch-oriented network to handle accounting services for municipal bond dealers in four major U.S. cities. She has also developed user and operations manuals and system security in network interfacing. She was previously with Olivetti Corp. of America as a systems analyst/programmer, and later joined Four Phase Systems as a systems engineer. Her financial expertise was acquired with Allen & Co. and as a sales assistant to the commodities brokers of Merrill Lynch, Pierce, Fenner & Smith.

What were your early attitudes toward education and careers?

Nemhouser: I never went to college, and I never planned on a career. When I graduated from high school, I had been the manager of a dry cleaning store, but I had no other experience.

Millen: I grew up in England. I always assumed I would be completely educated, that I would go to college. There was never any question of an applied degree course; in England, you have a completely academic background. I went to London University and read Latin and Greek, and I never thought of what I was going to do next.

Jordan: Goals were set for me: get good grades in high school so you can go to college so you can get a good job and one that you enjoy.

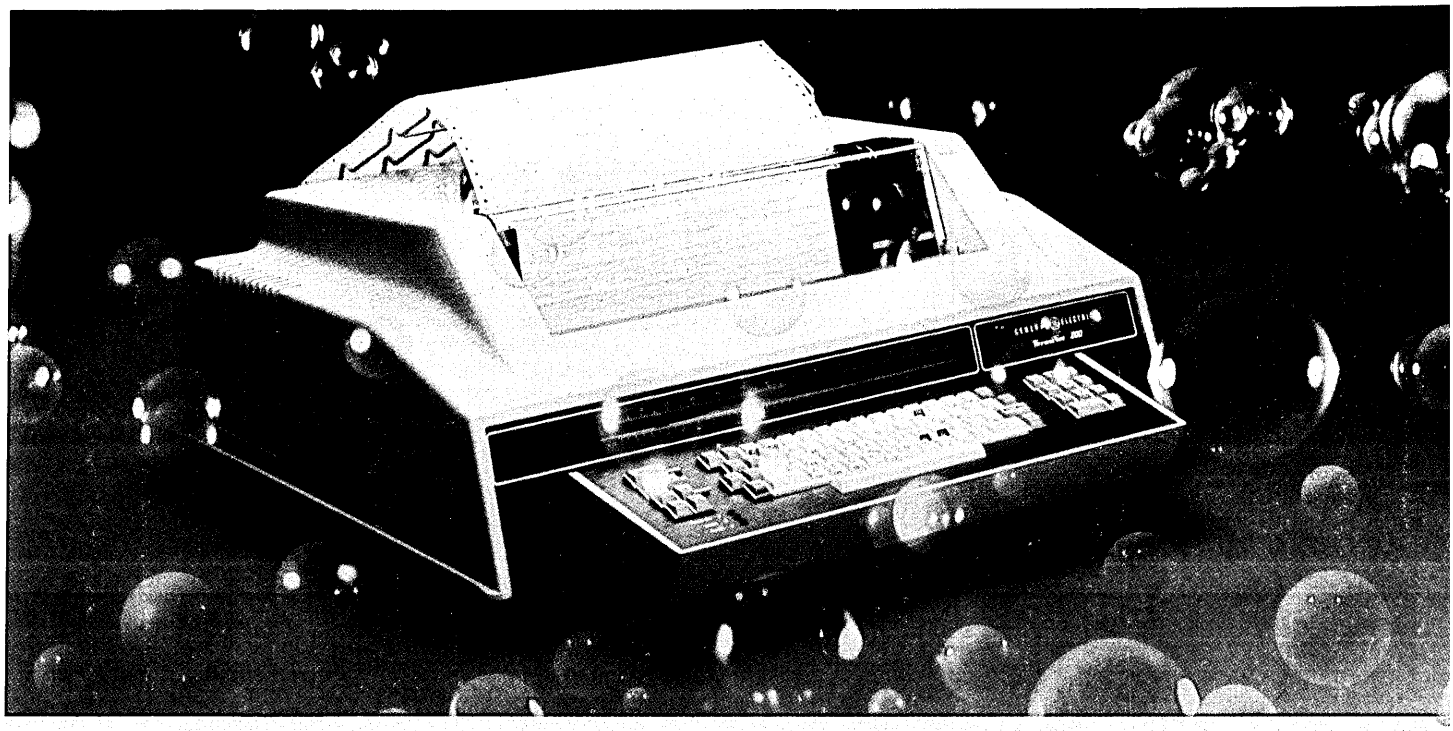
McCaffery: I'm the youngest of a large family. My mother is an amazing person. She never put any pressure on us, never set any real goals; she just had patience. She thought we were bright and capable, and therefore we believed we were bright and capable, and we all did very well in school. She has worked since I was two, and she loves her job. Growing up, I always felt I'd have a job, and that it would be an important part of my life, too.

Fleischhacker: My mother started her own business. She didn't finish college, but she bought a book on how to make a million in real estate. It's still on the market, in its 85th printing because she's bought every copy. We all followed her into the business as cheap labor. I learned to put up walls and strip floors and put in plumbing. While I was growing up, it was assumed I would take over her business.

How did you manage to avoid that and get into data processing?

Fleischhacker: Well, during college, I was first a part-time secretary and finally an office director for two doctors' offices. I realigned the books and the schedules, redesigned the offices for more efficient flow, fired some staff and hired new staff. After the offices began doing very well, other doctors came to visit and asked if I would reorganize their offices and set up their books, and I said sure. So, still in college, I started my own consulting business; eventually, I had accounts in eight states. Because of this experience, I got an offer from Electronic Data Systems' medical insurance group when I graduated. I had a heavy medical insurance background, but I knew nothing about computers.

How about the rest of you?



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JORDAN: "I was stereotyped as a technician, but was always interested in management as a career goal.

McCaffery: When the international investment project first came up I encountered the same type of situation. I was in London finishing up on another project when I was asked to get some preliminary information on a new system under consideration. I got involved just as a matter of circumstance. I realized that this was going to be a challenging project and I was excited by the prospect of working on it. But I also was apprehensive about the demands of traveling back and forth to London, especially since I was already committed to the Columbia program. After much soul-searching I decided I didn't want to pass up this opportunity, so I asked to be given responsibility for the new system. I think most people underestimate their own capabilities.

Millen: When I graduated, there were many corporations interviewing, and it wasn't necessary to have any special skills; the attitude was "we'll take brains and train them." I went for an interview with ICL, the British computer manufacturer, and was offered a job. That sounded OK, and I went through the standard training program. We learned about EAM equipment, debits and credits, and the sales process, and I joined one of the sales offices. ICL had just introduced the 1900 series, and I worked with the sales offices in installing some of the first computers in my area. I also worked with the client and with the head office on major software problems. I continued to work there without any real thoughts of a career.

Nemhouser: I went to work as a secretary for a computer vendor—Olivetti. At Olivetti I was unhappy and was going to leave unless I was transferred to a math-related job. The company asked if I'd like to be a programmer, and the salary was a $30 per week increase, so I learned how to program. I then learned all the different languages and about the machines; I learned about presales, finding out the needs of a customer, designing a system, and programming, documenting and, in general, designing a system from scratch. It was a great education; it was like going to college.

McCaffery: Since I had taken all academic courses in high school, when I went to look for a job I had no skills to offer. I started work at Citibank as a page. Later, through a training program, I became a secretary in a department that was involved in developing time-sharing programs as a new product for correspondent banks. I found secretarial work frustrating and I kept pestering everyone for more to do. My boss suggested I try programming, so I borrowed a FORTRAN manual and started programming and found I really enjoyed it. I was fortunate to be working for people who were willing to take a chance on me. I was able to become involved not only in developing programs but also selling them—running sales seminars, customers' training sessions, etc. It was a satisfying experience.

Then none of you had any definite plans for a career in the computer industry?

Nemhouser: I was just thinking of working, making money, and having something interesting to do.

Jordan: Well, I had wanted to go to architectural school; then I found out that to get a degree would require four years beyond the bachelor's degree. So, after wavering between art history and math, I chose math because it would be easier to get a good job.

Millen: I had always thought, as a child, I was going to teach. By the time I was through a couple of years of my degree, there was only one thing I *didn't* want to do—teach.

McCaffery: By the time I graduated from an all-girl Catholic high school, all I wanted to do was go out and work. And that's what I did.

Fleischhacker: As a kid, I'd been a Candy Striper at Kennedy Memorial Hospital, and I was determined to be a doctor. I majored in public health administration, hoping some millionaire would support me through medical school. It didn't happen.

Mary Lynn and Christine, was having children during the course of your career a difficult decision? Did it involve trade-offs?

McCaffery: I knew I wanted to spend time with my children and not work full time while they were young. I worked out an arrangement with the bank under which I worked at home for the first two years. I had a terminal at home and went in only once a month.

I just worked on whatever projects they had. It wasn't very satisfying, because it was programming—I really had had enough of programming, and before I left I had been a project manager. So that was a sacrifice, but on the other hand it was certainly financially rewarding.

After that two-year arrangement I did some free-lance consulting, and working on a variety of jobs was interesting, but I did find that most of the applications were pretty much mundane, payroll or cash flow applications.

Then I worked in White Plains for Citibank in MIS on a part-time basis. I went in about three days a week, and I had flexible hours. That was a great job to have with young children. But again I ran into the problem of there being no advancement. I was no further than I had been six years earlier when I stopped working full time, so I was getting really frustrated.

I found that when I said I wanted to be full time, the jobs they offered me were not at the level I thought I should be. But because I felt I didn't have any credentials, I accepted a job as the lowest level of officer, which is assistant manager but basically is not management responsibility.

After three or four months of that, my boss was transferred to Zurich. I thought I could handle his job and said I would like to be considered for it. They decided to give me

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Yes, but not directly. First, we selected a competing vendor's newly announced system. But as we started to plan, we began to see problems ahead. No tape drive. Perhaps no COBOL. Perhaps no match-up with our sales terminals. And all we could get from the supplier were vague assurances that the problems would somehow disappear. So we switched to NCR. Very fortunately, as it turned out, because our NCR system is up and running. While the other vendor is still not delivering the other system.

NCR's SWEENEY:
We are not only delivering, our operating software is fully tested.

DEE:
We had a shirtsleeve session with the NCR software people that was refreshing. They told us exactly where they stood. What we could expect and when. And that's the way it's turning out. They gave us the hard answers.

Joseph A. Dee (left) is president and chairman of Brooks Cameras, Inc. in San Francisco. Jim Sweeney is his NCR Account Manager.

NCR's SWEENEY:
You liked Migration Path Engineering, too.

DEE:
Our requirements are too unique for us to expect off-the-shelf application software from any supplier. We have every kind of sales transaction. We accept all the regular charge cards as well as our own. We have rentals, repairs and layaways. And our own special promotions. So once we made the investment in our own specialized programs, we wanted to protect it. Even when our growth forces us to move to a larger system. With Migration Path Engineering, NCR can give us that protection.

NCR's SWEENEY:
And finally, you wanted one supplier who would assume responsibility for the entire system from A to Z — including the terminals.

DEE:
You're absolutely right, Jim.

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MCCAFFERY: "One of the most important things is to pick good people to work for; support is essential."

a try. Well, because I had two young children there were many projects or responsibilities for which I was not considered. My managers were being very protective. I made it known that I didn't think that was fair, that taking on responsibilities should be my decision. I was outspoken enough that they did listen to me, but that's what it took. But I learned that one of the most important things is to pick good people to work for, that support is essential. Who you work for is the most critical decision you make.

Millen: That's exactly what I have found. When I was pregnant with Jenny I was working on a long, arduous job and we reached the stage where most of the specs were in and the programming was starting. Since I was going to get much more heavily involved during the testing, which was a ways off, I felt this was a good time to take off. Well, I found out many years later that the manager on the job had taken a lot of guff from the client on the basis of that leave—I was away four weeks. "What are you going to do when Christine doesn't come back?" was the client's attitude. And my boss just said, "She says she's coming back so she'll come back; there will be no problems." He supported me through that absence period.

I was promoted to manager, in fact, in my hospital bed!

McCaffery: I lost out on a promotion when I was pregnant, which was unfair. They were laying off half the people in the software services department and there was some outplacement. Since I knew I was not going to work full time, I decided to tell them in case they wanted to save one of those people's jobs. Well that was a terrible mistake, because even though I was scheduled for a promotion they held it back when I told them I was pregnant, saying, "Why should we promote you, you're leaving."

And when I said to the division head that's not fair, I may want to come back to the bank, he said to me, "You're going to be staying home in the country having children; you'll never come back to the bank. Why are you worrying your pretty little head about all this nonsense?"

What events forged your path into management?

Millen: I began to realize other people were moving faster than I was, and although I had already made the significant promotion to manager, I felt my career was flat. Other people were getting the high risk assignments. It's not always necessary to succeed on a high risk assignment, but it's important to be trusted with one. And I wasn't getting the assignments. There was a job in Holland, and I made it very clear I would be willing to go on the job, even though it required me to be away from home for several weeks at a time. I think that in saying, "You don't have to worry about my home life, I'll worry about that—and I'm prepared to go abroad, I'm prepared to make the extra energetic efforts on behalf of the company"—that was a very successful step.

Are you now in a position that may eventually lead to promotion to partner?

Millen: Yes.

Nancy, what was your experience?

Jordan: During my early career at Chase, I was stereotyped as a technician, but was always interested in management as a career goal. When a position as a unit manager became available, my manager recommended me for the promotion. The unit manager position was an entry-level management job having primary responsibilities for staff development and project staffing. After serving for six months as a unit manager, I was offered a promotion to project manager in the data communications planning area, and thus my management career began.

Nemhouser: When I started thinking about going into management, people said, "What does she want, 'he' isn't even there yet." I wasn't being judged on what I had done for the company, or what I could do. I kept hearing, "You must be patient." But I had designed and implemented a major project and I wanted a tangible reward.

Molly, it is interesting that despite the level of success you and Mary Lynn have reached, both of you have felt the need to return to school and complete your education.

Nemhouser: When I worked at Four Phase, I read technical manuals until one in the morning. It was probably worth a computer science degree. But now I believe I should go back to school, and I have decided on a good business school I can afford—most companies will not pay for a college education, although they'll pay for courses related to the job. So the only problem is financial.

McCaffery: Look upon it as an investment.

Nemhouser: Right. But this year, I've finally become somewhat secure financially, and I started to do some *real* investing . . . I hate to take all the money I finally have and give it to some school!

Fleischhacker: Can't you take your education expenses as a tax deduction?

Millen: It has to be directly related to your job.

McCaffery: Most people I work with just assume that I have a college degree because of the level job I have. My staff all have graduate level degrees in computer science, math or business, so getting an undergraduate degree at this point would not be productive. I have always been uncomfortable about my lack of credentials and I felt that this would work against me in being considered for promotion, so I looked around for graduate programs in business that would be willing to accept me without an undergraduate degree. Also, because I have children, and because

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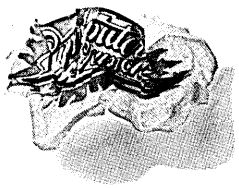

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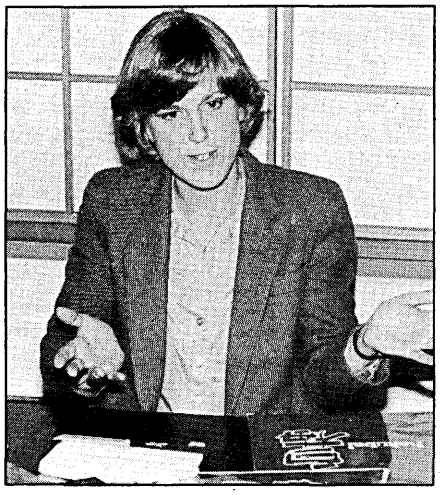
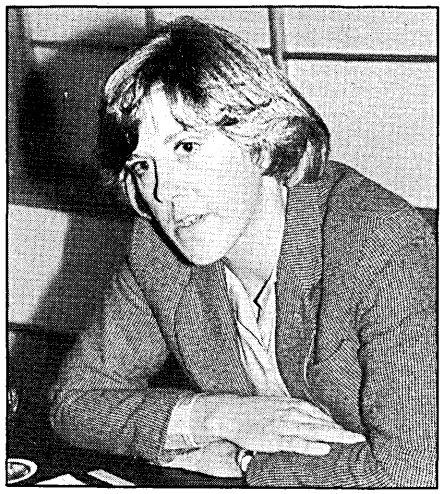
MILLEN: "It's not always necessary to succeed on a high risk assignment, but it's important to be trusted with one."





the job is demanding, I certainly don't have the time to go back to school at night. I talked to a number of universities, and Columbia said that if Citibank was willing to sponsor me and if I scored well on the GMATs, it would consider my application for its master degree program.

How much time away from work does this require?

McCaffery: Two weeks at the beginning of each semester and every Friday.

The course leads to an MBA?

McCaffery: Yes. In two years.

What has been your management's attitude?

McCaffery: I talked to my boss about it, and he said, "You're crazy. You have enough things to do. You have two children, and a new home; you can't handle it." I believed that was my decision. He went to our division head, who had exactly the same reaction. "You're overcommitting yourself, there's no need to do this, why do you have to prove it, it doesn't matter at this point," etc. And I said that for my own personal satisfaction, I want to do this, and it *does* matter. Both men have been very supportive, in spite of their initial resistance.

Two traits you all seem to have in common are a high degree of confidence and a strong sense of competition.

Nemhouser: I was never a competitive person; it's been hard to change my style and go after what I want. That's one of the reasons I've started playing tennis. Competing, understanding the interaction, understanding why someone is going to want me on their team. It's been a rough start, but a great experience, and I feel I'm a welcome member of the team now. It feels great.

McCaffery: One of the problems I had in the past was a lack of confidence. I believed I was capable and intelligent, but did not feel equal to many of the people I worked with; they had far different backgrounds than I did, and I was uncomfortable with my lack of credentials.

Millen: When you grow up English, you grow up very confident. At least when I was growing up—we still had the Empire, and my father was in the Royal Navy, and that accentuated it. And I also played all the team sports . . . out in the mud and driving rain playing field hockey.

Jordan: So did I.

Millen: What position did you play?

Jordan: Left wing.

Millen: So did I!

What have your experiences been with salaries?

Millen: Maybe I was paid a thousand or so less than a man at times, but there was never any substantial differential as far as I could determine.

McCaffery: The only reason I have any complaint about my present salary is that I asked for too little when I came in. Because of bank policy, it takes a while to catch up. I don't think it's because I'm a woman.

Jordan: My situation is similar. I've been promoted up through the ranks, and salary guidelines don't give you what your job is worth when you're promoted into it. It's happened to men who have reached their positions the same way I have.

Millen: No large corporation can afford to discriminate.

Nemhouser: If you find out.

Millen: But in large corporations, you *do* find out.

Nemhouser: Contrarily, I've worked for smaller companies; information like that has been more secret, more protected. When I found out I wasn't making an equal salary, I asked for more money. And I got it, no problems, no questions asked.

McCaffery: One problem is that I've always asked for too little and have underestimated what the job was worth. I felt I was lucky to get the job.

Nemhouser: We'll learn how to promote ourselves like men do, and to demand more, and to bargain.

What about relocation? Have you all been willing to go after or accept transfers?

Jordan: I wasn't really serious about my first move. I was visiting a friend in Washington and applied for some jobs to see if I could find one. One agency sent me on an interview to IBM and before I arrived back at my friend's home the agency had called with a job offer from IBM.

I moved to Washington and for the next three years worked for IBM on the space projects at NASA. The group I was with saw the Gemini project through to its completion, and then we worked on another unmanned space flight. After the third year my particular group was moving to Houston. I wanted to stay in Washington and I also wanted a change of work, to get into business programming, something I had never done.

I landed a job with Computer Sciences Corporation after being told by my interviewer that I'd be working on business projects. Not only did I wind up back at NASA and other space projects but the programming was still highly scientific. At about the same time Computer Sciences had just formed Computer Sciences International and several opportunities had opened up on foreign projects. I saw an opportunity to get away from the kind of work I had been doing and went on an interview to work on operating systems. This particular job involved working for Philips in Apeldorn, Holland, which at that time was doing its first series of computers.

NEMHOUSER: "Soon we're going to understand political strategies, and we won't settle. We'll start taking jobs because we want them and can do them well."

I hadn't the background for that type of work but I felt I could bluff my way through the interview, and my boss said he'd support me because I had done so well. The interviewer kept trying to discourage me about a single person working in Apeldorn but I thought the whole thing was exciting, just working in Europe.

As it turned out, they accepted me for the position, and for the next year and a half the work was fascinating. I wrote basic disk sort packages and caught on very quickly. However, the interviewer had been right about a single person living in Apeldorn and I decided to move back to the United States.

I wanted a different life-style than I had had in Holland but I didn't want to go back to Washington. I figured if I went to New York I could stay with Computer Sciences and work in a place that was a big contrast to Apeldorn. Computer Sciences put me in the New York office working in the commercial division, which by then had become a full-scale operation, and I finally got involved with business programming.

McCaffery: When the international investment project first came up I encountered the same type of situation. I was in London finishing up on another project when I was asked to get some preliminary information on a new system under consideration. I got involved just as a matter of circumstance. I realized that this was going to be a challenging project and I was excited by the prospect of working on it. But I also was apprehensive about the demands of traveling back and forth to London, especially since I was already committed to the Columbia program. After much soul-searching I decided I didn't want to pass up this opportunity, so I asked to be given responsibility for the new system. I think most people underestimate their own capabilities.

Do you think it's easier for women to progress rapidly in this industry than it was when you were starting out?

Millen: Ten years ago, the field was more open than it is now. From what I can gather, if I were to start now, I would not have the same opportunities.

McCaffery: There are so many more people in the industry . . .

Fleishhacker: Also, it's being pushed in the universities. People know it's a lucrative field, and that it's open to women more than other industries are.

Jordan: It used to be that anyone who graduated from college was guaranteed a good job. That's not true anymore. I'm glad I'm not in the job market right now, just starting out.

Millen: In the chief programmer team concept, the entry-level position was supposed to be the librarian. That was a great idea, but it's not working out in practice.

McCaffery: No. There used to be a lot of opportunities for people who didn't have a systems background. I wonder what percentage of them performed well in terms of a good return for the company.

Millen: It probably depends on how much the company invested in training to begin with.

Nemhouser: The education you get with a vendor is fantastic. At Four Phase, I learned about making presentations in front of the board of directors, I learned about data bases, communications, hardware architecture . . .

Jordan: I don't think enough women are striving to get into management.

McCaffery: The women who work for me definitely want to be managers. There's no doubt about it.

Perhaps the reason many women are not interested in rising to management positions is that they are not aware that script is available to them. If they knew how much money there was, and how much better the job was, they'd be interested if for no other reasons than pure economic ones.

Nemhouser: Right. There are many women who don't believe they have a choice. It's the same for men—people have all these options now: women can move into management, men don't have to. Over the next few years, everything will level out, and people will start doing what they really want to do.

McCaffery: As people begin to focus on what they want to do and understand what they need to do to get there, I don't think there will be any sex-related disparities.

Nemhouser: The college women who are coming into the business world now are the first large group of serious-minded women who have some career goal orientation. Soon, we're going to understand political strategies, and we won't settle. We'll start taking jobs because we want them and can do them well.

Do you ever feel a bit of resentment toward the women who are just getting out of college and—because of public awareness and government regulations—don't have to face the barriers some of us had 10 or 15 years ago?

Millen: I feel rather sorry for them. We had the chance to break ground . . .

Nemhouser: My mother is 67; she's not goal-oriented, but she feels the momentum of women. She likes working, and always pushes ahead any woman she works for or with.

McCaffery: My mother is 63; she's worked all her life, and never had the benefit and support of the new social climate. Then, when she was in her 50s, she was finally promoted to management, and she has had the exhilaration of success happening for the first time. It's a good feeling no matter when it happens.

Nemhouser: I think we're all feeling the momentum. I always used to think what I really wanted was to go back to the 1800s, wear a big gingham dress, and be a pioneer. Then one day I realized that I *am* a pioneer—the dream has come true. ✻

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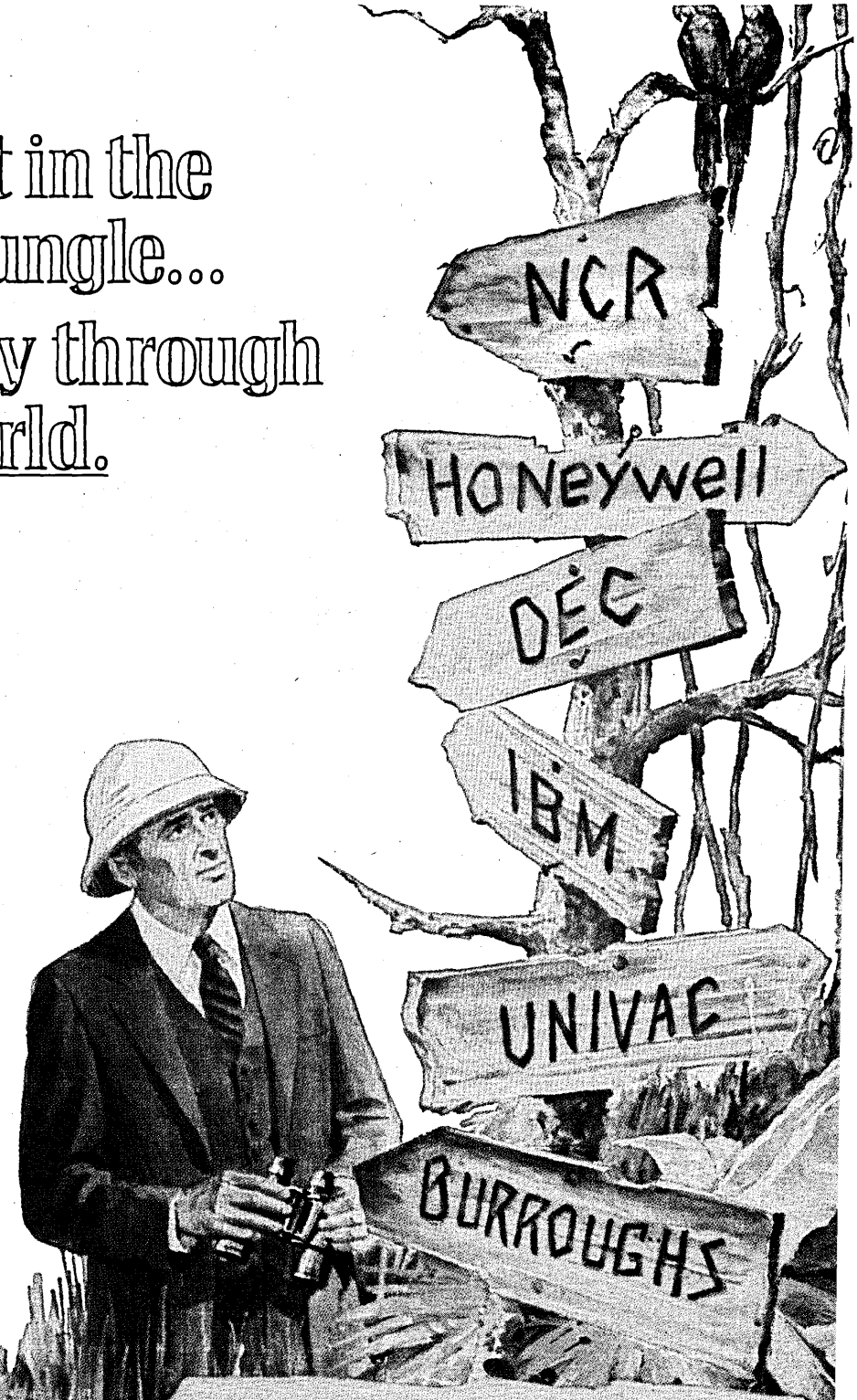

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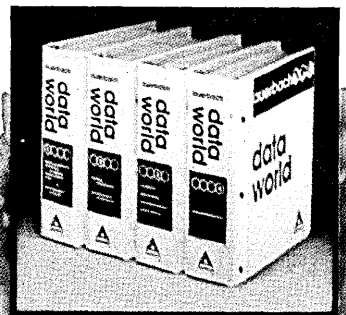

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A structured human resource management system can help solve the people problem.

SOLVING THE TURNOVER PROBLEM

by Charles D. LaBelle, Kimball Shaw, and Leslie J. Hellenack

When you come right down to it, the dp industry could well do with an old-time miracle—one that would give all dp managers enough human resources to satisfy the demand that exists for systems and programming people. However, since we're probably going to have to settle instead for hard work and common sense, we'd like to suggest that there are solutions to the problems of attracting, motivating, and retaining superior computer talent. Some of these solutions have been tested and are working. Others, still in the embryo stage, merit consideration.

The focus of the major solution is project planning and implementation. Systems life cycles, steering committees, and project variance reporting are all part and parcel of everyday dp life—and yet, the key ingredient of projects, people, has been left out in the cold. Precious little has been done for the care and feeding of the dp professional. And so he or she becomes a nomad, moving to where the action and money are.

If the dp wanderers could state their cases collectively, they would probably include such comments as: "The politics in that place were too much" . . . "I couldn't believe it—they brought in consultants for that new development project and left me doing maintenance" . . . "They're not interested in my job development—the project's the thing" . . . "If only they'd fire a nonperformer so that I would know they cared about me" . . . and so on.

In most cases, what triggers a good performer to consider leaving is something other than money. And when when the interest dies, it's almost impossible to rekindle it; alternate opportunities abound.

Consider some of the characteristics of the dp professional's utopia: a place where politics are at a minimum, where good opportunities and challenges go to deserving employees, where there is a conscious and systematic development of each person's skills. It would be a place where performance is evaluated on an objective basis, where equitable rewards are distributed, and where educational opportunities are available and attainable.

At Manufacturer's Hanover Trust, over the last eight years we have developed a structured human resource management system. We have found that there are some very tangible actions that can be taken to solve the people problem, and we have been successful. For example, we have met corporate goals through the implementation of major on-line systems for retail, wholesale, trust, corporate, and international divisions; we have seen a dramatic surge in user requirements as a result: we have had an uninterrupted string of management stability for seven years, including the ability to fill management positions almost totally from within for the last three years; and we have had definitively positive results on a detailed attitude survey of all dp personnel conducted by an independent firm. These results put MHT above the norm for dp organizations in practically every category

STEPS TO BUILD A SYSTEM

The first step in building a structured human resource management system is the creation of a foundation analogous to a project life cycle—one that portrays details and descriptions of each job and the interrelationships of all jobs so that the dp person has a career road map (Fig. 1).

The plan should also define the skills that can be attained by working in the installation. This definition, a skills glossary, should be detailed by further defining the various levels of proficiency within a skill. Additionally, the levels of proficiency for each skill should be correlated to the job descriptions so that a standard is formed (Fig. 2). A person then knows not only what is required in the job but also the skills that can and should be acquired along the way.

At Manufacturer's Hanover Trust, this process has been applied to both systems and programming people, and people in computer operations in our 1,000 person data center. The standard of skills is then stored as a data base so that each individual's status can be recorded, updated, and reported (Fig. 3).

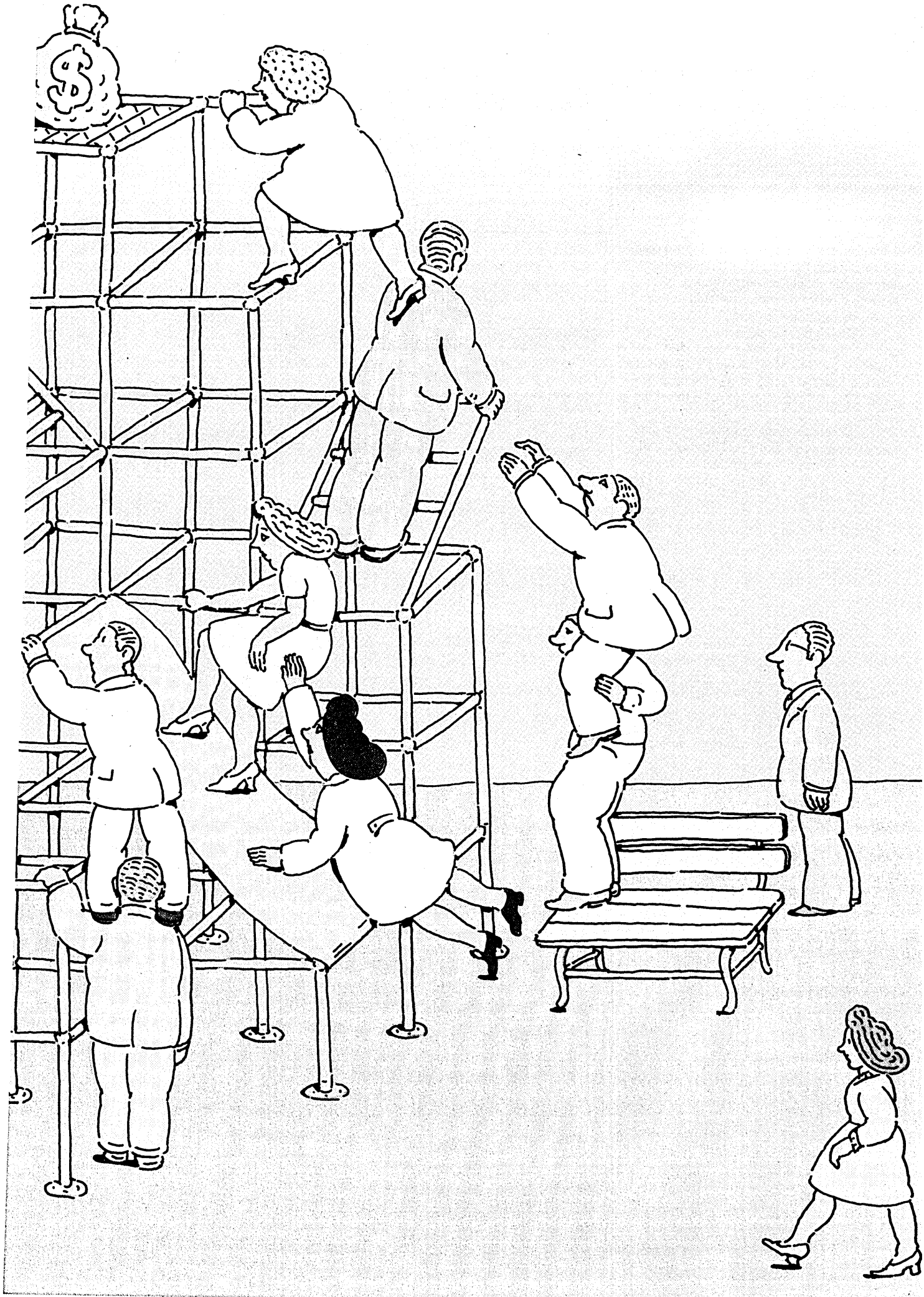
In addition, the ranges of educational opportunities available are correlated to the various levels of skills proficiency. The Skills Profile Report can also suggest educational courses available to acquire needed skills. Performance ratings of each person are also important, and are included with the skills information.

Another ingredient is a strong human resource department that reports to management high enough in the hierarchy to be independent and effective. This department should consist of informed, humanistic people who are able to understand and communicate with the line organization. The department's function should include hiring, mobility, use of contract programming, performance appraisal, career development administration, education, and personnel administration.

Search firms lure away dp professionals by somehow knowing the good ones, and either contacting someone who is unhappy in a present job, or selling an individual on a "better" opportunity.

Why not set up a similar system with-

ILLUSTRATION BY SEYMOUR CHWAST



In most cases, what triggers a good performer to consider leaving a job is something other than money.

in the organization? An internal search firm can seek out deserving employees and offer them the choice of other opportunities within the company if they so desire. What we are proposing is an aggressive, ongoing process designed only for deserving employees. A cardinal rule should be: only completely adequate or superior performers should have access to the mobility system.

The procedural setting of this mobility system has been tested and improved upon by Manufacturer's Hanover over the last six years. It starts with a job requisition that details the job and the skills needed.

A search is then performed on the data base of employee's skills. Qualifying candidates are reviewed for performance criteria, and dossiers are compiled on deserving candidates and given to the requesting manager.

At this point, the managers of these candidates are not aware that their persons may be drafted.

The manager with the requirement lists the candidates in order of preference, and the draft takes place. The "search firm" meets with the candidate's manager, and the manager may say yes or no to the draft. If it is a no, a reason is requested. If it is because of a critical assignment, the manager has one refusal right. Six months hence, he cannot refuse a draft for that individual, the assumption being that no one is indispensable for an indeterminate time, and managers must plan for succession.

If the manager allows the draft to proceed, the employee is told of the job and has the choice of accepting or rejecting the position. If the position is rejected, the next candidate is selected.

This internal mobility process has had a positive influence on the working environment at MHT because an individual knows that if he performs he will have access to the mobility process. When this process was initiated, most individuals would accept the draft. Now we have an equal number who elect to stay in their present positions, largely because their managers are doing a much better job of planning futures within their own departments.

PLANNING CAREER GROWTH

With the foundation we described above, managers have a better set of tools with which to plan each individual's career growth. Formalized career counseling sessions can not only elicit and document short- and long-term employee goals but can also use the detailed job descriptions and skills profile reports to plan specifically for job experiences and skills development. Since education has been tied to the skills, a manager and an employee can agree

FIG. 1

MHT CAREER LADDER

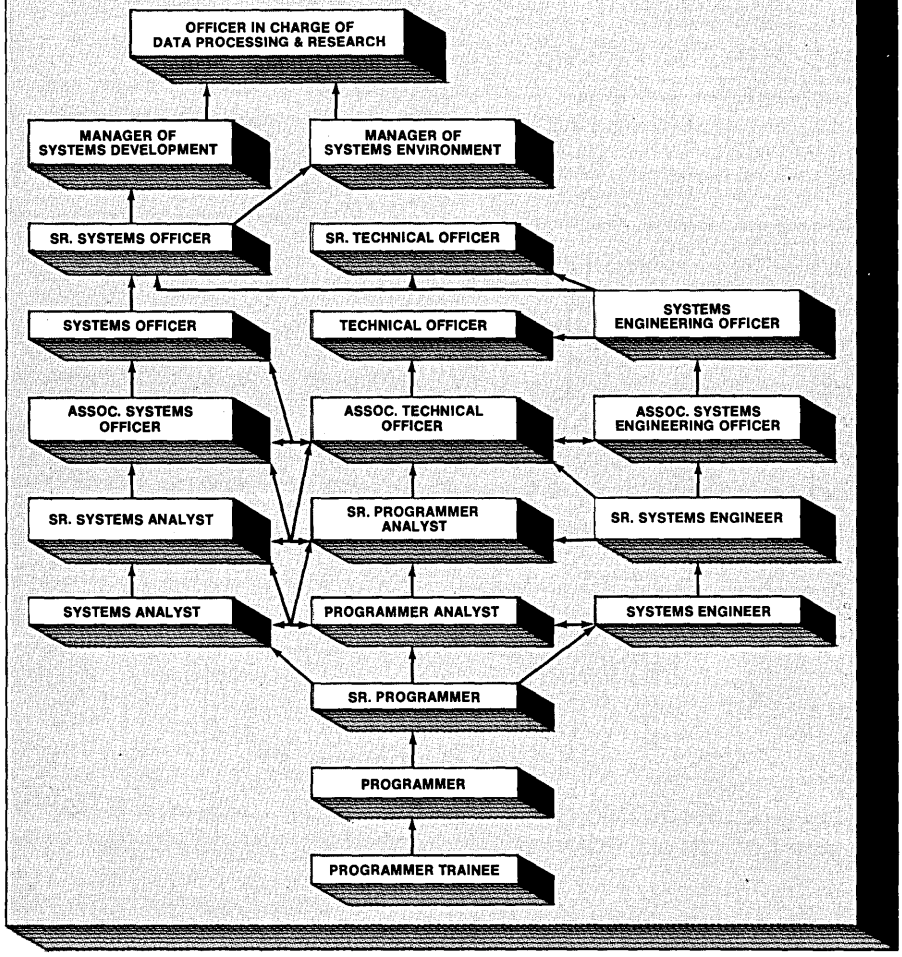


FIG. 2

SKILLS MATRIX

LANGUAGES	ASSOC. PROG.	PROG.	SR. PROG.	SYS. ANALYST	SR. SYS. ANALYST	ASO	PROG. ANALYST	SR. PROG. ANALYST
CORE								
COBOL	1	2	3	3	3	3	4	4
IBM ASSEMBLER	1	2	3	3	3	3	4	4

CHARTS BY CYNTHIA STODDARD

FIG. 3

SYSTEMS AND PLANNING
CURRENT POSITION SKILLS PROFILE

NAME: GEORGE WASHINGTON

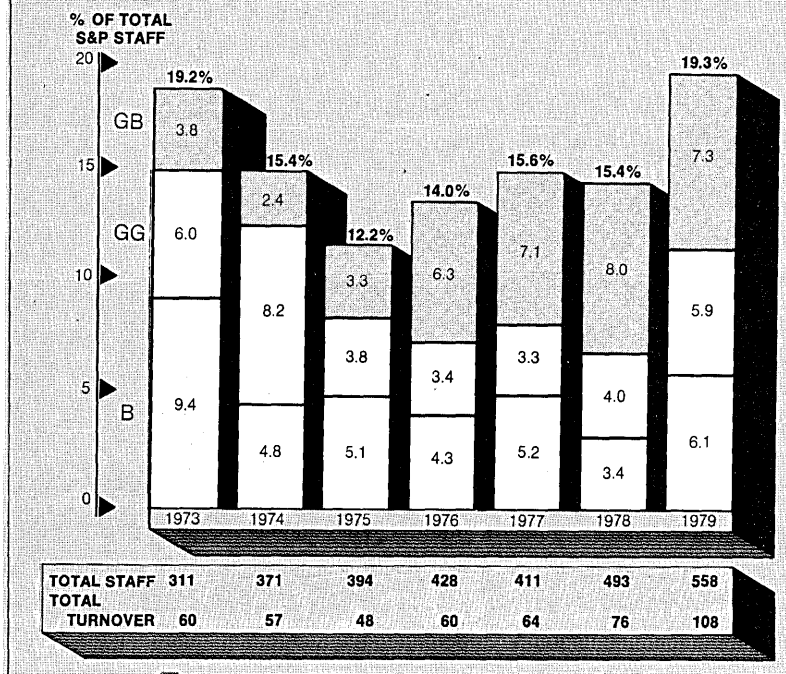
SOCIAL SECURITY NO.	CURRENT POSITION TITLE	MANAGER'S NAME	LAST UPDATE DATE	RUN DATE
987-65-4321	SYSTEMS ANALYST	BEN FRANKLIN		07/13/76

GROUP NAME: LANGUAGES

CORE SKILLS	INDIVIDUAL SKILL LEVEL	RECOMMENDED SKILL LEVEL	SKILL DEFICIENCY	RECOMMENDED EDUCATION
COBOL	1	3	2	3-IIIII
IBM ASSEMBLER	0	3	3	3-XYZLS

FIG. 4

QUALITY OF TURNOVER OF SYSTEMS AND PROGRAMMING PERSONNEL 1973 TO 1979



on an individualized education plan.

The plans are then submitted to the education department and monitored. This is the beginning of a pact between employer and employee on detailed career development. Variance reporting reveals those managers who are best fulfilling employee development plans.

The timetable for this process has thus far best been executed by appraising performance and setting objectives on an employee's anniversary. A career counseling session with revised objectives is held six months later. The human resource department administers this process and performs a quality control check on the results.

The name of the game is to minimize turnover and maximize hiring. There is little dispute as to the enormity of this job. With these processes MHT has experienced a better control of turnover and an increased capacity to hire (Figs. 4 & 5).

However, it is critical that the game outside the company be played aggressively. Current employees must see that qualified people are being hired and are being given appropriate positions and salaries. This can better be done by instituting a controlled procedure of interviewing by technical people from the line organization. By developing questions tied to levels of skills proficiency, the process becomes more standardized. Candidates are required to complete abbreviated skills analyses forms and are questioned

An internal search firm can be set up to seek out deserving employees and offer them other opportunities with the organization.

on their perception of their skills.

These interviews produce a document that pinpoints the job and skills assessment of the candidate. This document is passed on to the appropriate management for further screening.

Peer evaluation is the key to hiring from the outside. It is likely, however, you still will not be able to fill requirements with enough experienced people. Hiring entry level personnel and training them is an excellent strategy—provided they can be retained (Fig. 6 shows MHT'S experience since 1973). We have found three sources of people who are particularly appreciative of the opportunity and have a greater tendency to remain with the organization.

First are qualifying individuals from within the company. Particularly desired is a career path from computer operations.

From the outside, a program at MHT for training handicapped people (including the blind) has resulted in 20 programmers, and in five years, only one has left for another company.

A final source for meeting your requirements is the contract programming firm. Judicious use of this source can yield positive results if your employees understand the purpose of the firm's presence. Some simple rules:

1) Deserving employees must have access to challenging opportunities before outsiders.

2) In systems and programming, legitimate uses of contract programmers should include assignments that are nonchallenging, such as maintenance and conversions, assignments for temporary use until a permanent resource can be found, and assignments of hard-to-find skills until your own people can be prepared.

3) All bidding for jobs by outside organizations should be competitive, and technical interviews should be given to their staff. Rate negotiation should be administered by the human resource department and line management, and choices made on a best price/performance basis.

4) Managers should not be allowed to rely too heavily on contract programming firms. Excesses occur where turnover is high, hiring is low and/or the manager is not motivated to develop people but is interested primarily in the project.

SOME NEW CONCEPTS

Finally, here are the embryonic concepts to which we alluded in the beginning of this discussion.

Setting Up a Consulting Subsidiary. Recognizing the profound changes that have occurred in people's thinking over recent years, companies will have to rethink human resource strategies . . . and of prime impor-

FIG. 5

HIRING BY GRADE OF SYSTEMS AND PROGRAMMING PERSONNEL 1973 TO 1979

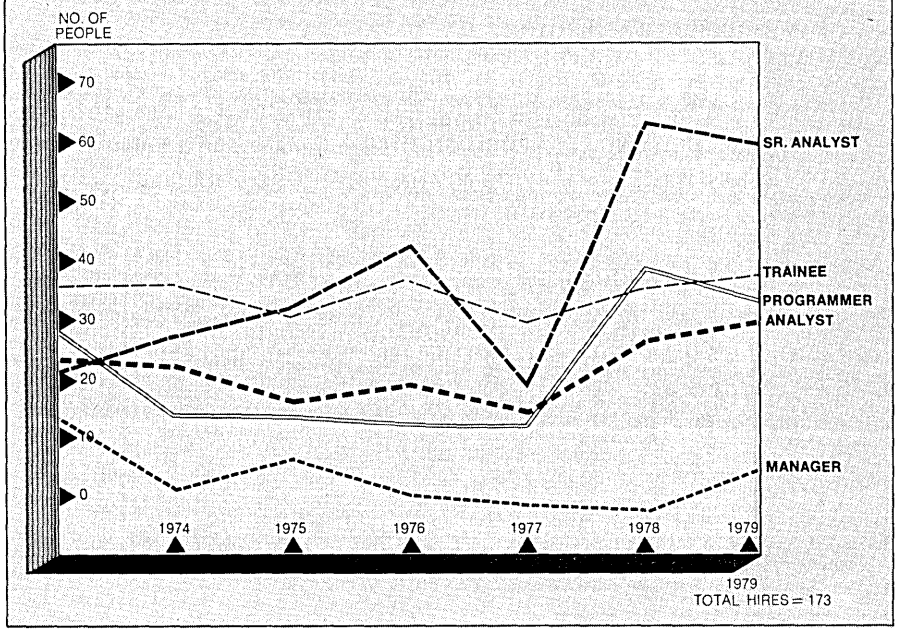
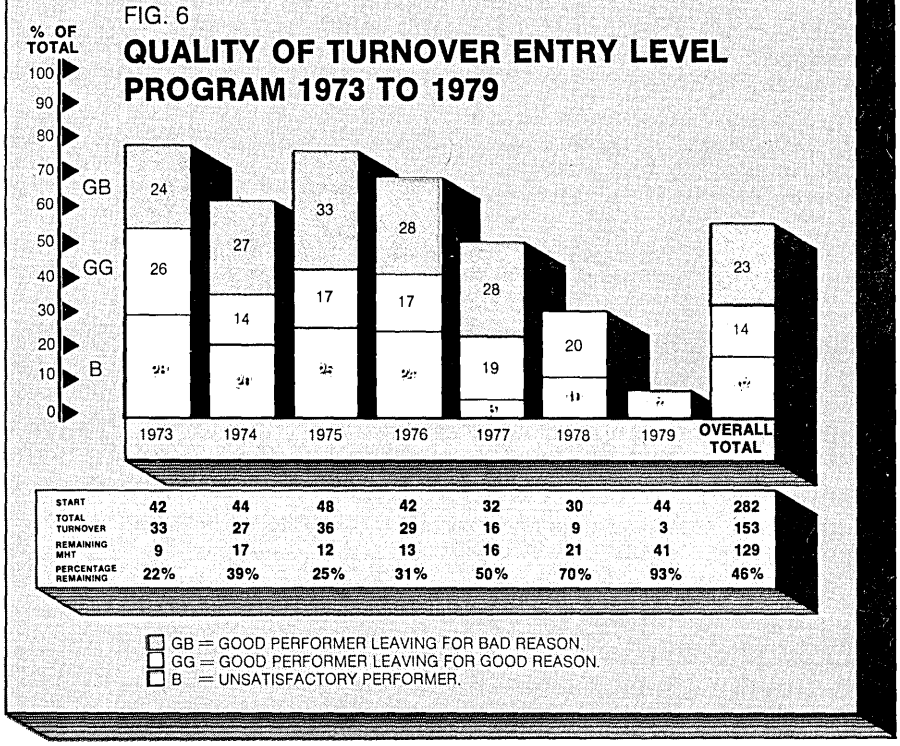


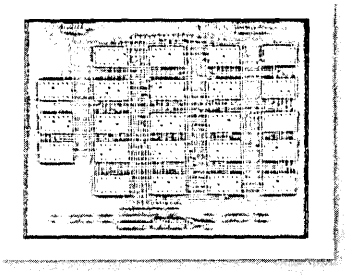
FIG. 6

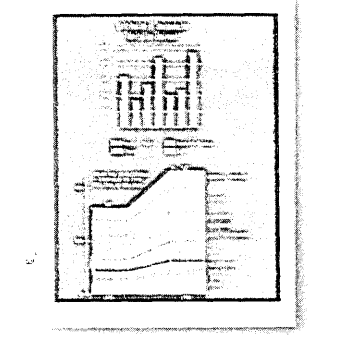
QUALITY OF TURNOVER ENTRY LEVEL PROGRAM 1973 TO 1979

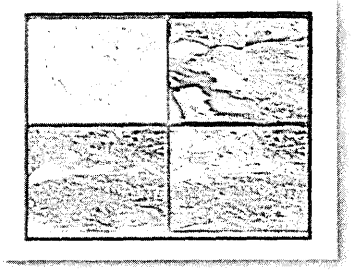


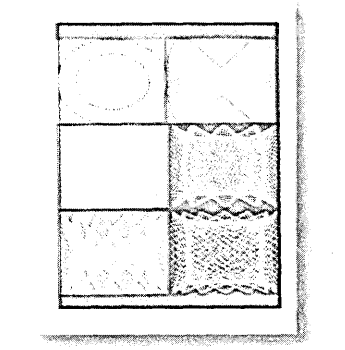
	1973	1974	1975	1976	1977	1978	1979	OVERALL TOTAL
START	42	44	48	42	32	30	44	282
TOTAL TURNOVER	33	27	36	29	16	9	3	153
REMAINING MHT	9	17	12	13	16	21	41	129
PERCENTAGE REMAINING	22%	39%	25%	31%	50%	70%	93%	46%

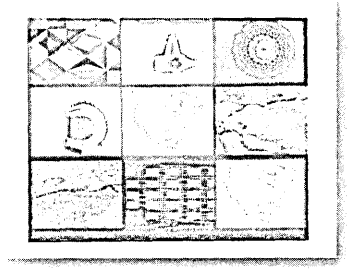
☐ GB = GOOD PERFORMER LEAVING FOR BAD REASON.
☐ GG = GOOD PERFORMER LEAVING FOR GOOD REASON.
☐ B = UNSATISFACTORY PERFORMER.

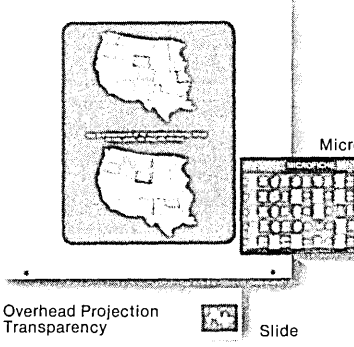












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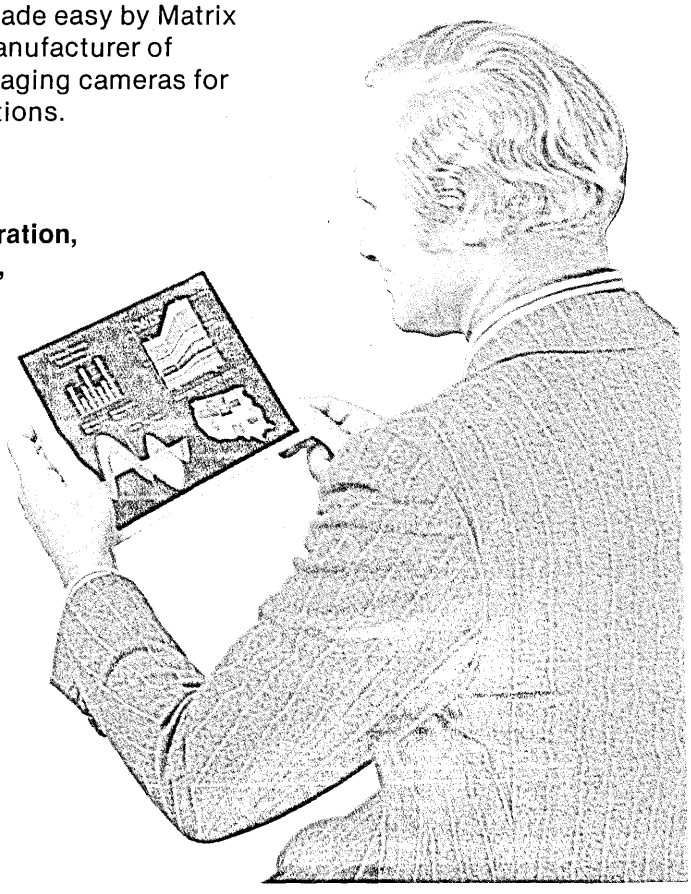

MATRIX INSTRUMENTS

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Multiple images recorded on a single sheet of film.
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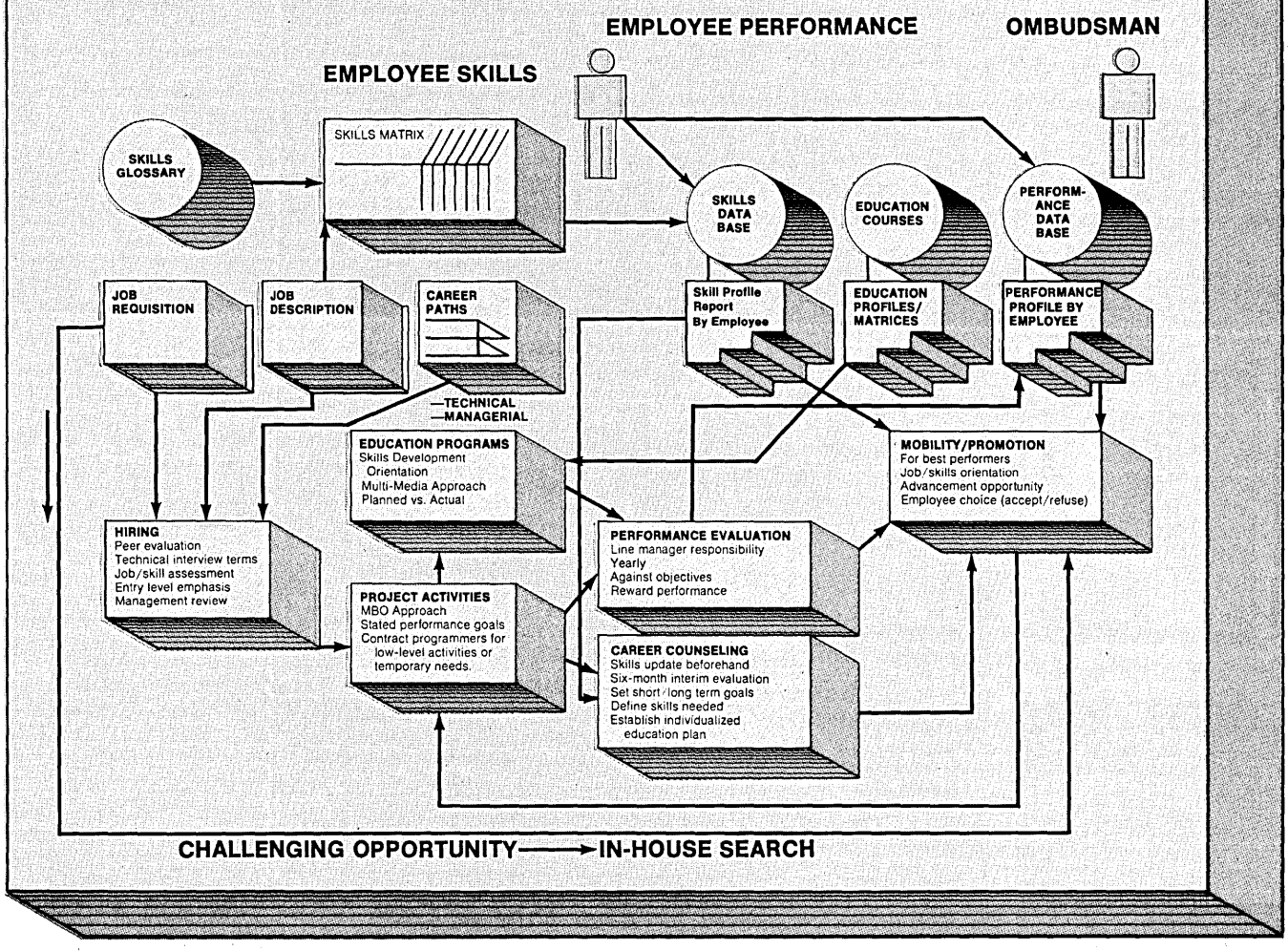
Peer evaluation is the key to hiring from the outside.

FIG. 7

STRUCTURED HUMAN RESOURCE MANAGEMENT SYSTEM

INDEPENDENT HUMAN RESOURCE GROUP REPORTING TO TOP EDP EXECUTIVE, CHARGED WITH MOBILITY, HIRING, USE OF CONSULTANTS, CAREER PLANNING, EDUCATION, PERSONNEL ADMINISTRATION AND ACTING AS OMBUDSMAN (EMPLOYEE ADVOCATE).



tance are salaries and benefits. More flexible arrangements in these areas will be needed in the computer business because of the pressure exerted by consulting companies. More and more, salaries are escalating. Subcontracting has become more popular as individuals realize they can get a bigger slice of the pie without a high risk. Companies may be able to moderate this impact by creating a dp consulting subsidiary to service the parent company. In this subsidiary, the salary-benefit ratio could be modified. Rather than benefits being, say, 30% of the salary total, certain benefits could be eliminated, and the difference transferred to the salary base. Later, the employee could be transferred to the parent company and the missing benefits could be substituted for an increase in salary.

Human Resource Accounting. By portraying the salaries and benefits of a company's human resources as an asset at the beginning of an accounting period and by adding plus factors while subtracting reductions (Table I), one can determine how much the value has increased or decreased. Likewise, an expense statement can be constructed that reflects the costs incurred (Table II).

By so doing and by applying on departmental levels, management can get a better handle on how managerial performance in human resources correlates with project and production results. Points of high turnover and low educational development tend to yield less satisfactory results.

Strategic Planning. While many people would argue that human resource planning exists in a number of firms, it is our experience that very few organizations include medium- to long-range (two to 10 years) human resource planning in the corporate planning process. Thus, large amounts of development and training investment are wasted. In fact, intelligent investment of these funds is impossible without strategic planning. Companies that do not place new and concentrated emphasis on the human resource considerations of their organization will be candidates dependent on consulting

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Companies that develop successful human resource systems will be better able to cope with dp challenges in the years ahead.

and facilities management firms; companies that develop successful systems for human resource management will be better able to cope with the dp challenges in the years ahead, and will retain strong dp capabilities. The choice is clear. ❋

CHARLES D. LABELLE

Mr. LaBelle is vice president of human resources for Manufacturers Hanover Trust Co. data center in NYC. His duties include directing the activities of hiring, education, career development, mobility, use of consultants, and personnel administration. Primarily responsible for the design and implementation of the system described in this article, Mr. LaBelle has held systems and programming managerial positions with IBM and CBS.

KIMBALL SHAW

Mr. Shaw is a labor specialist with Arthur D. Little, Inc. He is a principal in many of that firm's client assignments where project objectives are increased and improved labor utilization. His major current consulting activities are based on the human resources management system developed at Manufacturers Hanover Trust Co.

LESLIE J. HELLENACK

Mr. Hellenack is data processing specialist and a principal with Peat, Marwick, Mitchell and Co. He is currently involved in the management of the firm's internal data processing department and additionally is responsible for consulting in human resources.

TABLE I
XYZ CORPORATION
CHANGE IN HUMAN RESOURCE VALUES
YEAR ENDED DECEMBER 21, 19X1

	No. of Employees	Annual Salary	Accum. Education Costs	Service Premium	Performance Premium
STATUS: JANUARY 1	X	$ X	$ X	$ X	$ X
ADDITIONS TO STAFF:					
NEW HIRES	X	X			
TRANSFERS IN	X	X			
TRANSFERS OUT	(X)	(X)			
SALARY INCREMENTS		X			
NEW EDUCATION COSTS			X		
SERVICE PREMIUM				X	
PERFORMANCE PREMIUM					X
(A) GROSS ADDITIONS	X	X	X	X	X
LESS TERMINATION OF:					
GOOD PERFORMERS/ BAD REASONS	X	X	X	X	X
GOOD PERFORMERS/ GOOD REASONS	X	X	X	X	X
BAD PERFORMERS	X	X	X	X	X
(B) GROSS TERMINATIONS	X	X	X	X	X
STATUS: DECEMBER 31 (A)-(B)	X	X	X	X	X
AVERAGE STATUS:					
BEGINNING OF YEAR	X	X	X	X	X
END OF YEAR	X	X	X	X	X
CHANGE	X	X	X	X	X

TABLE II
XYZ CORPORATION
HUMAN RESOURCE COSTS AND STATISTICS
YEAR ENDED DECEMBER 31, 19X1

	19X1	19X1
DIRECT COSTS:		
RECRUITMENT	$ X	$ X
FAMILIARIZATION AND TRAINING	X	X
SEPARATION COSTS	X	X
	X	X
ADMINISTRATIVE COSTS:		
CAREER DEVELOPMENT	X	X
MOBILITY	X	X
ETC.	X	X
	X	X
PREMIUM FOR USE OF CONSULTANTS	X	X
ESTIMATED COST OF POOR PERFORMERS	X	X
TOTAL COSTS	X	X
STAFF STATISTICS:		
TOTAL STAFF JANUARY 1	X	X
NEW HIRES	X	X
TERMINATIONS	(X)	(X)
TOTAL STAFF DECEMBER 31	X	X

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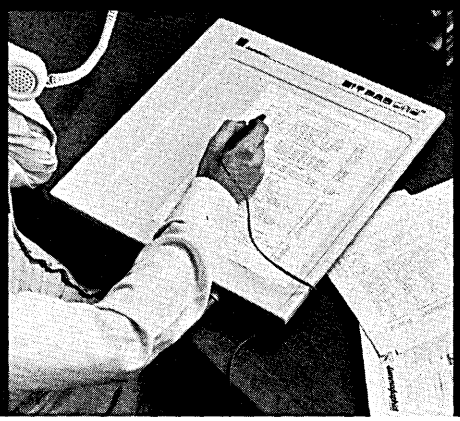
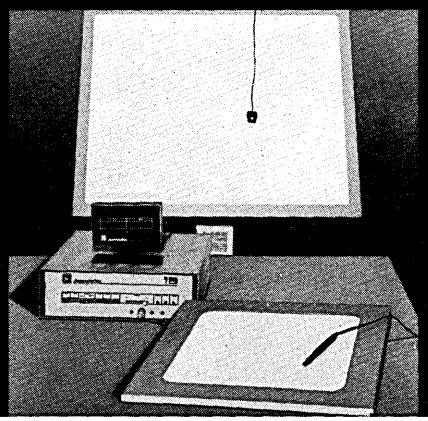


Bit-Pad One



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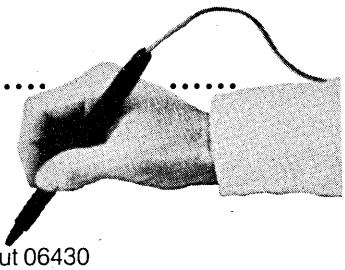

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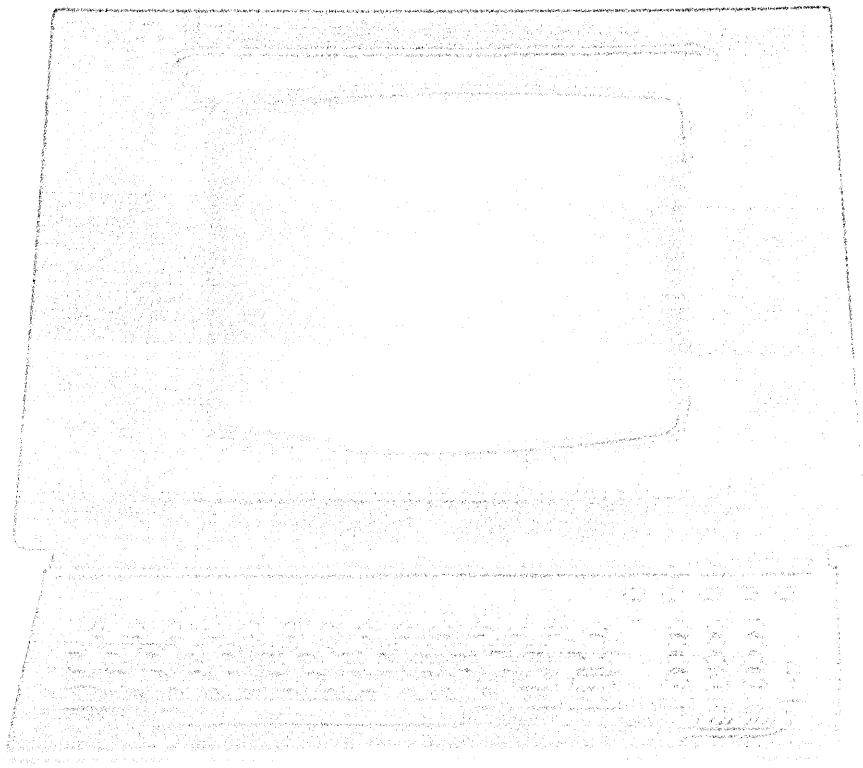

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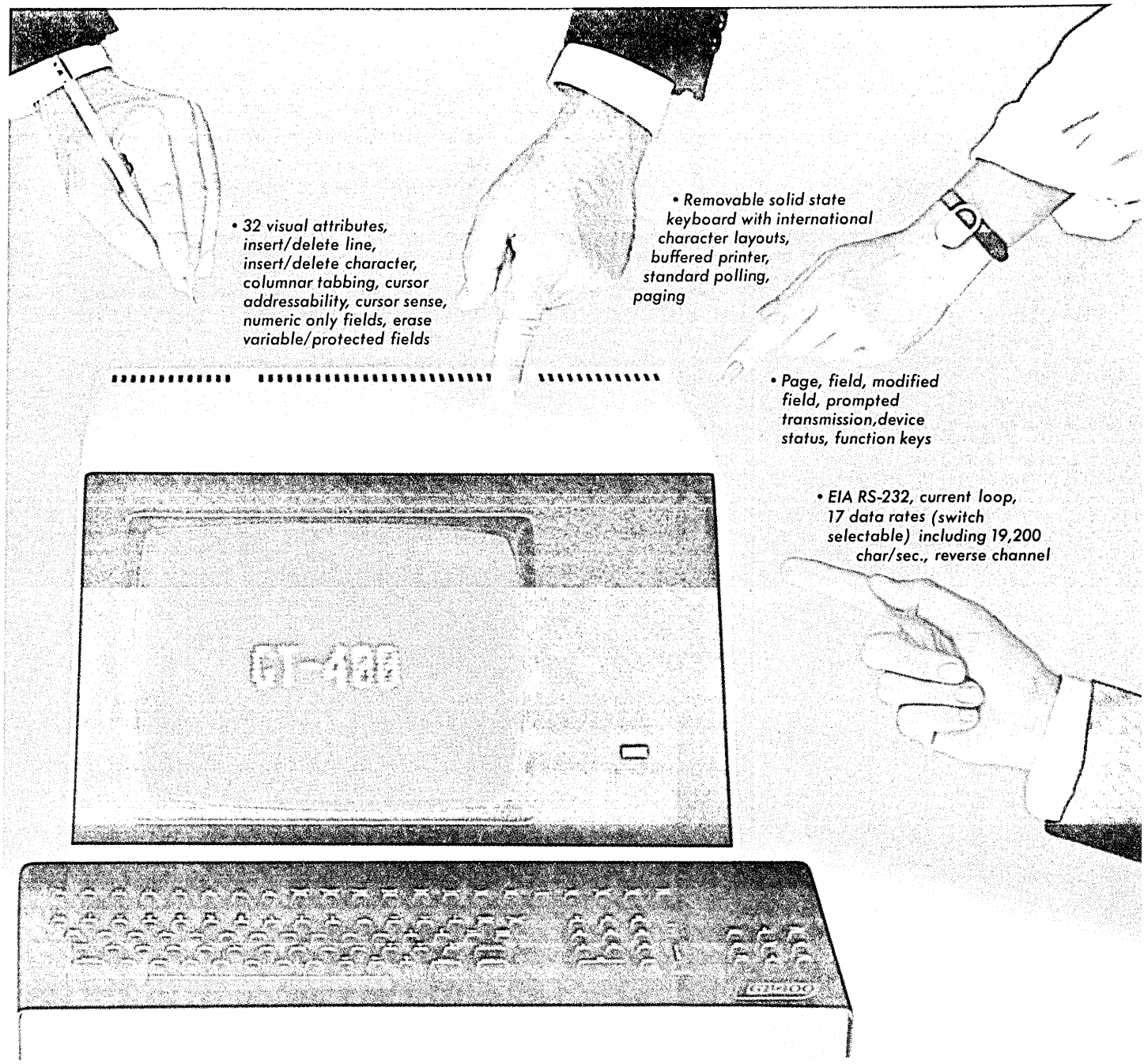

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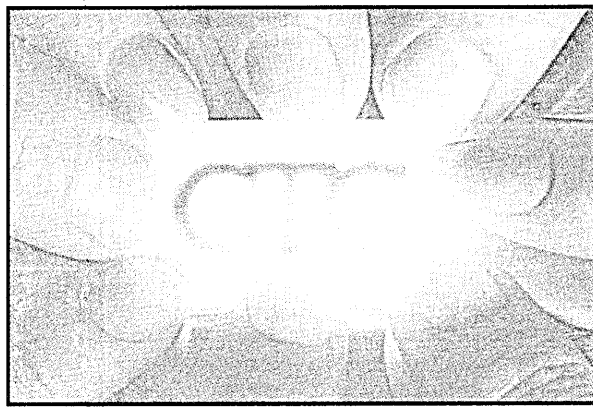

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CIRCLE 96 ON READER CARD

Economics and organization are important reasons for bringing some of the dp power and data base to the user department

SOURCE DATA PROCESSING

by W. Harry Vickers

There has been a great deal of discussion in the industry about dispersed processing, distributive and distributed processing, computer networks, etc. I prefer the term "source data processing" when we talk about the data processing functions—the data collection, some of the dp power, and a portion of the data base—to the source of the data, the user department. Whereas the word "distributed" reflects the view from a centralized perspective—it sounds as if computers are being scattered to the winds—"source" implies that computers

are being brought back home to the people who need them.

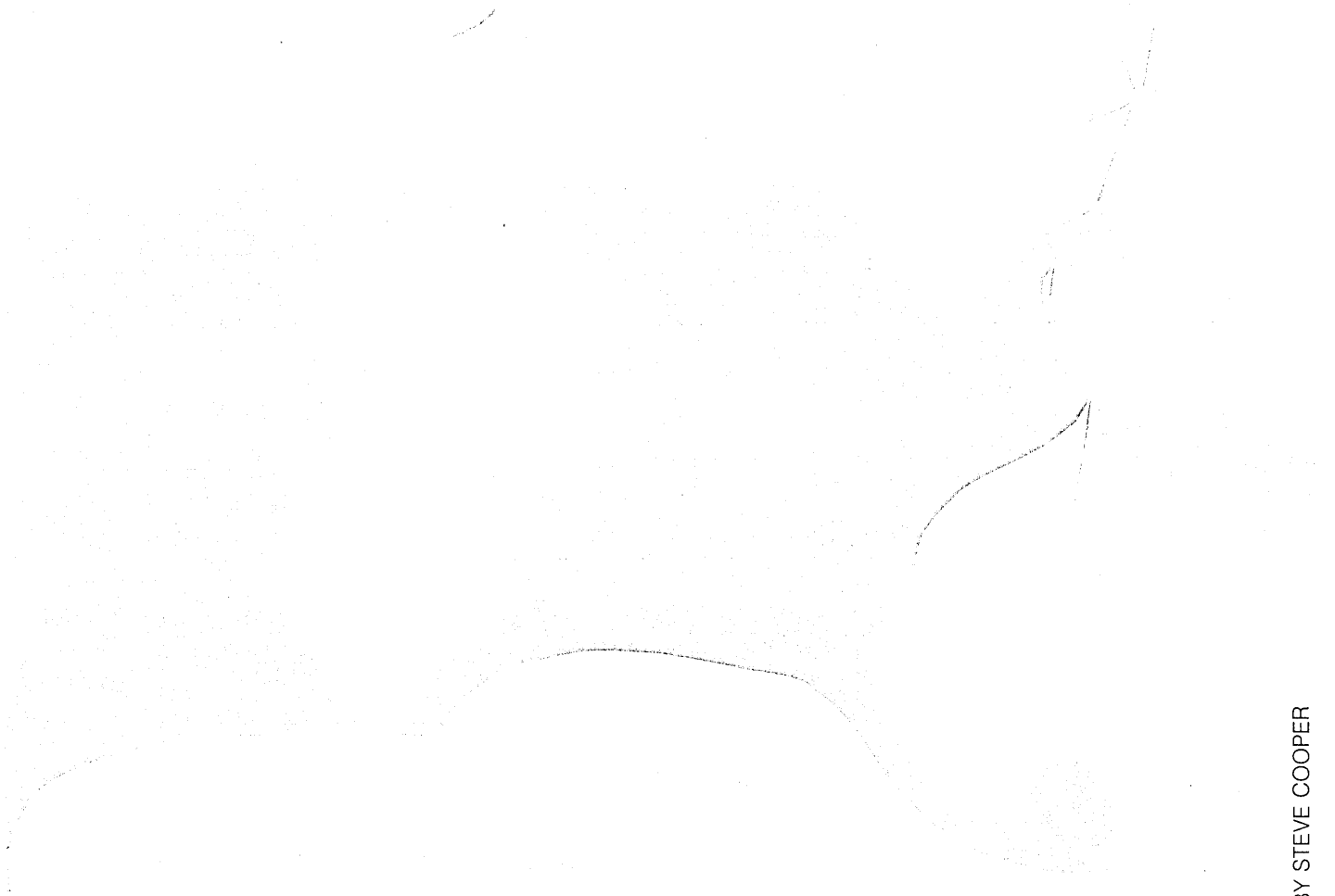
Now, why would someone want to push data processing out to the user departments? I have heard it said that line managers want it (even that line managers are doing it anyway, which is frightening on two), that the mainframe is bogged down, that the mainframe programming group is not responsive to the needs of the user departments, that the mainframe has become unsupportable, that companies wish to put responsibility and authority back together, apparently firing of the endless bickering between line departments and dp.

Those are all valid reasons for wanting source data processing, but there are two more fundamental reasons: economics and organization.

Economics refers to the total economics of running a business, and particularly the economics of collecting and using data. Factors in the economic equation are equipment and communications costs, implementation costs (programmers and systems analysts), the cost of clerks in the user department who prepare the data, costs of correcting invalid data, costs of late or obsolete data. The cost of decisions made with wrong data can be incalculable, but the cost of centrally collecting and processing 100% of the data needed for all decisions is mind-blowing.

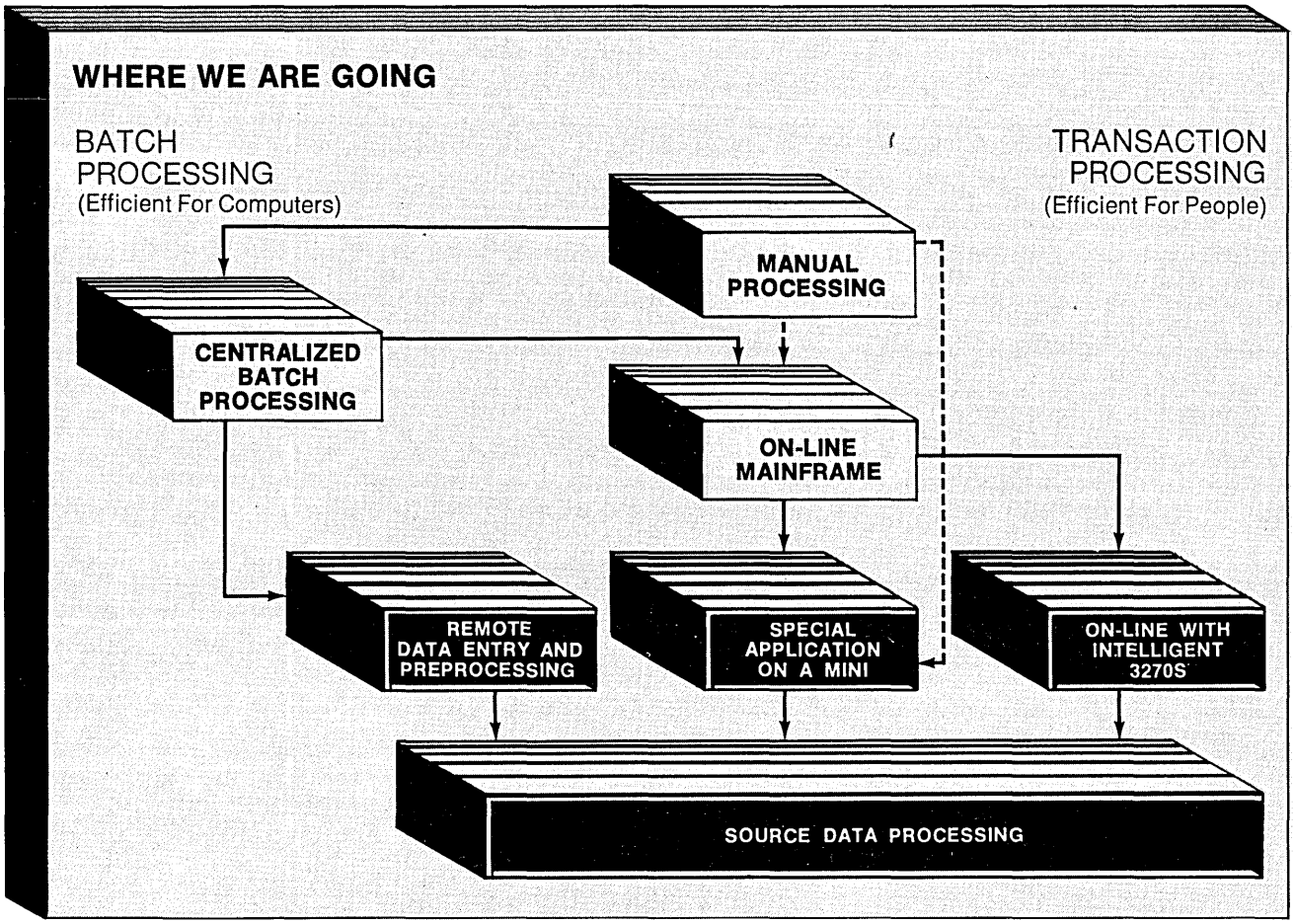
As the cost of collecting data declines, the organization is able to collect more data. It has been proved that the cost of collecting accurate data is by far the largest cost associated with any dp operation. And if you have valid data, the rest of the dp task is relatively easy.

Let's look quickly at the cost trends that affect source dp systems. Hardware costs have been in a steep decline for a number of years that will continue. The



PHOTOGRAPH BY STEVE COOPER

A source dp system should be simple because so many people in the organization need to understand it.



microprocessor has brought about dramatic cost improvements, and in the next few years, we will see considerable speed improvements. Semiconductor RAM has pushed down the price of main memory and will continue through another power of 10. Disk storage costs have dropped by a factor of 25 since 1970, and soon bubbles will take over the cost decline. Data communications costs have held steady. Line costs are up; modems and concentrators, however, are down.

On the other hand, labor has increased an average of 8%-10% a year, and is escalating; in many places, it is hard to find and train and keep highly skilled people. So the economics are saying: "Use more hardware if it will save labor or if it will make labor more efficient and effective." As time goes on, these economics will become even more compelling.

TWO MORE FACTORS

There are two other significant factors motivating the trend to source data processing. First, computer knowledge, and programming knowledge in particular, is much more widespread than it was 10 years ago; students are taught programming in most high schools and colleges. Also, the computer has trained a lot of people, and thus there is much less fear of computers and a willingness to use them to solve problems.

Secondly, systems software for small computers has matured to the extent that features of a mainframe operating system—virtual memory, high level languages, data base concepts, simultaneous operation of many functions—are available on minicomputers.

These two factors have made it possible to consider source data processing; only five years ago, the absence of these features made source dp clearly not economical.

Organizational consideration is the second fundamental reason for source data processing. No business is really centralized. Decisions are made at all levels, in all locations. The people who make decisions need judgment and intuition and data. We hope they have judgment and intuition, and we assume that since they are close to the problem, they have good data. But if you check what data a sales manager really uses to give his sales forecast, I'd wager that 80% of them rely on a manual system. The reports from dp are either too late or too bulky.

A profit-sensitive manager wants to control his operation; that includes controlling the data he needs for making decisions. The result is that successful departmental managers are pressuring companies to let them have their own computing capability. The more an organization says the manager shall be sensitive to profit, the more the manager will respond by saying he needs some tools. And, when he is given his independence, he will probably go out and get a computer on his own with or without help from the central organization.

Again, however, this is happening because economics are favoring source data processing. In effect, the fact that departmental managers who are more profit sensitive are pushing for their own computers is good evidence that the overall economics favor source data processing. If this is true, then companies that fail to adapt will soon be running at an economic disadvantage relative to their competitors.

Dp managers of large organizations who are considering some form of distributed processing should keep in mind two primary ideas: simplicity and evolution.

A manager should insist on simplicity. The source data processing system is, or should be, a tool. More like a personal com-

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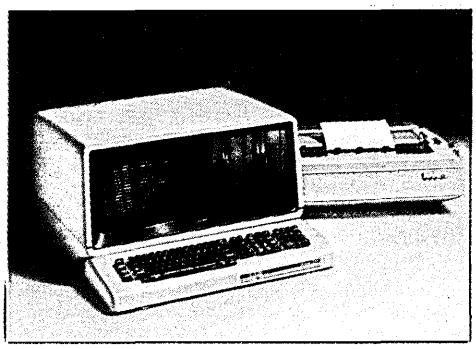

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As you go into source dp, you should evolve to the final configuration, not attempt to get there in one move.

puter than some faraway mainframe, it is important that it be simple because so many people in the organization need to understand it—the bigger the organization, the greater the need for simplicity. Top management and auditors need to understand it. And, most importantly, line managers *must* understand it at more than a superficial level. They don't have to know how to program an entire application, but they should know how the applications work and how the data is structured so they can determine the difference between the easy questions and the hard questions to ask the source dp system.

For example, the sales manager might want to know the top 10 overdue accounts, or the 10 largest orders this week, or the 10 employees with the highest absenteeism. The question will come up time and again after the application is programmed. The line managers should not have to go to the dp group and wait for programming time. If that is their only option, they will keep manual records. The manager doesn't care if the data comes with a nice heading or if it is spaced neatly on the page or even whether he gets extra information or more than 10 names. He simply wants the specific information and he wants it fast.

How can you tell if a system is simple? Try to explain it to several people, and then let them try to use it. Get some middle managers who know nothing about dp to evaluate it. Data processing people—that is, people with a traditional dp education and work experience—have a problem stepping out of the trees and seeing the forest as a non-dp person sees it.

The dp person is comfortable with such terms as "owner," "member," "inverted file," "chain-file," "data dictionary," "contention," "embrace," etc. But to many a line manager these terms will always be some mumbo jumbo designed to keep him out of the computer room. It doesn't have to be this way. There are source data processing systems that will give a user 95% of the functionality of a mumbo jumbo system with a structure the non-dp manager can understand, structure that can be explained in terms of a manual filing system or a local library. In fact, three concepts are all that are needed to explain a data base system: the concept of a file drawer, the concept of a card index, and the concept of a transaction log.

The second consideration is "evolution"—as you go into source data processing, you should evolve to the final configuration, not attempt to go there in one move. In any organization, particularly in large organizations, change is traumatic. Distributing processing too fast is also traumatic. It is difficult to impose drastic change on an organization; either the change gets jammed through over everyone's objections (unlikely to work in a large company) or there must be a massive reeducation. This educational process is why companies that have implemented distributed processing have spent so much time planning.

On the other hand, if you plan for five years while you wait for the organization to adjust, you are not realizing the economies of source data processing and you may be tied to an obsolete technology before implementation is even started.

An evolutionary approach offers immediate benefits and speeds the organizational adjustment because people understand more clearly when they see something rather than when they only hear about it.

EVOLUTIONARY PATHS

There are several approaches to evolutionary installation of source data processing.

Fig. 1 shows some of these paths that can take us from our present situation to a source dp environment. The present situation is either manual processing or centralized batch processing, or on-line processing, depending on the company and the application. The box "Remote Data Entry and Preprocessing" represents an intelligent terminal or a key-to-disk cluster that can be installed without changing mainframe programs or reports. Gradually, though, editing checks can be added and later files (such as lists of valid part numbers or overdrawn account numbers) can be added for validation. Then, slowly, new reports can be added that are produced solely from the data on the remote cluster system.

Over a period of time, the parts of the data base that are important for line management decisions can be maintained on the remote cluster system with transactions being transmitted in batch mode to the mainframe. Then it is probable that the "truth" would come to be considered stored in the data of the remote cluster system and the mainframe's data base would be considered "backup." This then would truly be a decentralized data base. Notice how this process takes several steps. Each step can be very small, but over a period of time it can take you from a centralized batch processing environment to a network of small processors. The hard part is to have patience. The evolution can be totally in control all the way, and the organization will not reject it when it comes in small bits. But if I try to convince you to go to a network of small processors directly, you will have 50 *valid* reasons why it will fail.

The same result can be obtained by other paths, depending on your starting point. The box labeled "Intelligent 3270" can represent the same intelligent terminal or remote cluster system except that it is used in a mode to emulate existing on-line terminals; then, gradually, you can add off-line editing, report generation, and finally data bases.

The last box labeled "Special Application" represents starting with a relatively isolated application that is in need of major systems work, either because it is now manual or because the current data processing system for it is obsolete. The application can typically be implemented on today's source dp systems much quicker than it can be implemented on a mainframe, and it will usually cost less than adding more capacity to the mainframe.

We should also consider how source data processing relates to the office of the future, where the goal is to give a company an economic advantage in managing its total business. But the concept starts from a different perspective than with dp; here it is assumed that everything—text and data—starts at a typewriter. So, in the spirit of source dp, make that typewriter electronic and capture everything. You first capture the characters, move them about, retrieve them, etc., and then add features we would call dp features.

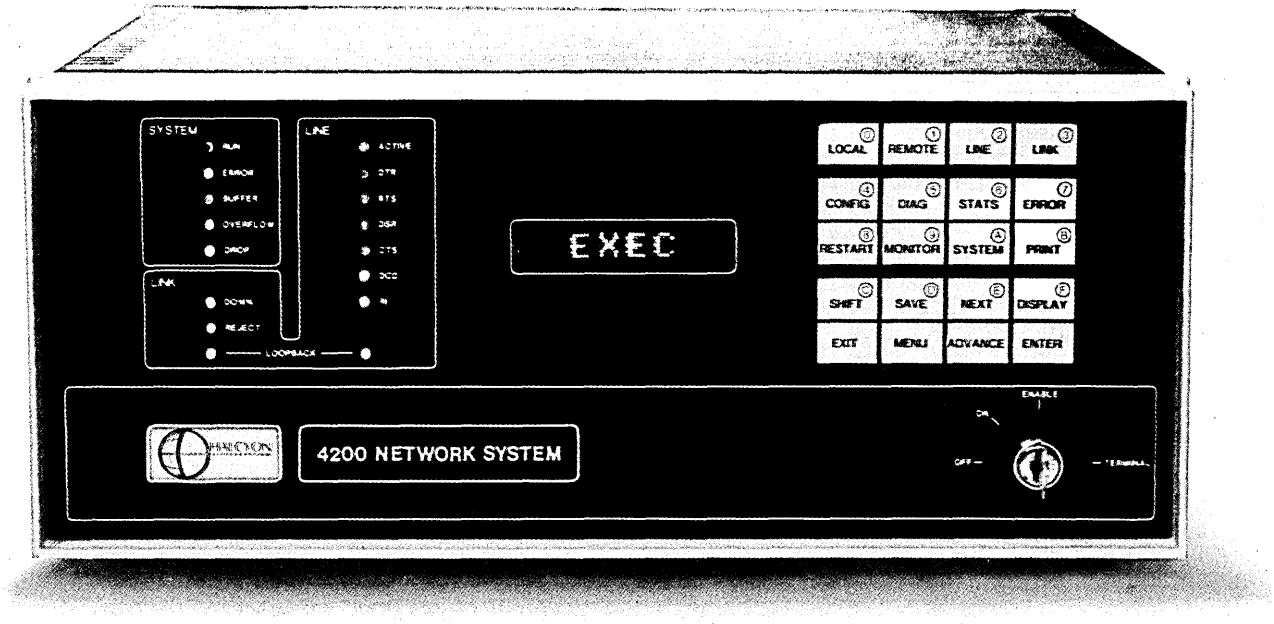
It is clear that five years from now businesses using tools that have evolved from tools now available will have a strong economic advantage over competitors. Their data will be more timely and their managers will not spend time keeping personal records and debating which record is the "truth." They will be able to delegate more decision-making to middle managers, resulting in the retention and motivation of a higher percentage of those managers.

On the other hand, if the dp manager insists on clinging to traditional dp concepts and practices, he will find that somebody's "typewriter" is now churning out reports all night—reports that dp said would take nine months to program.

Data processing managers have a chance to be heroes, but to be a hero carries some risk—not the least of which is the risk that the company won't even recognize your great accomplishment. ✲

W. HARRY VICKERS

Mr. Vickers, a founder of Entrex, Inc., is vice president of advanced technology for Nixdorf Computer Corp. (which acquired Entrex in 1977). His prior positions with Entrex/Nixdorf include vice president-engineering and vice president-marketing support. He has bachelor's and master's degrees from MIT.



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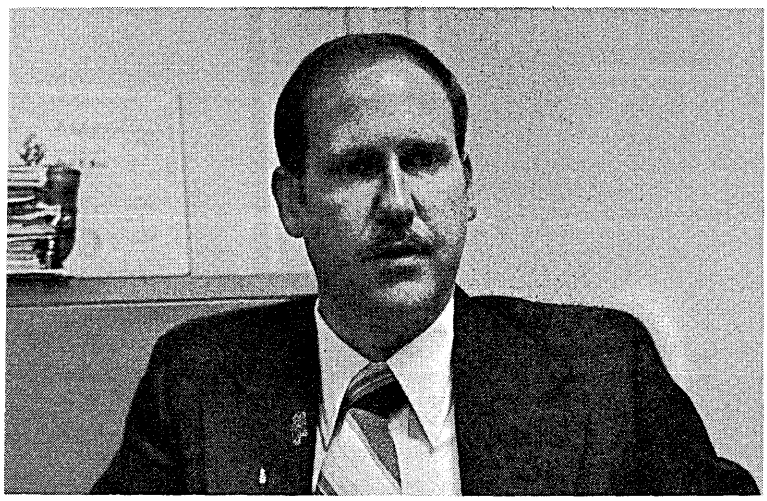

Dean A. Banz, Manager, Information Services, Burr-Brown Research, Tucson, Arizona

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"The versatility of the DECSYSTEM-2040 has contributed greatly to the growth of our business."

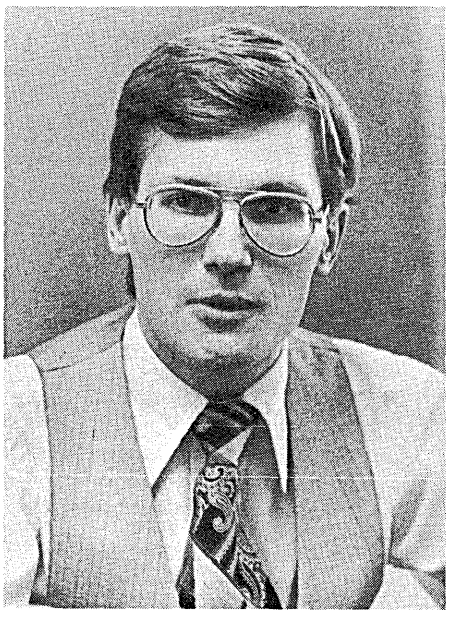
Expandibility.

"We provide computer services to our Research Center for use in engineering and scientific analysis as well as information processing related to cancer and solar energy research.

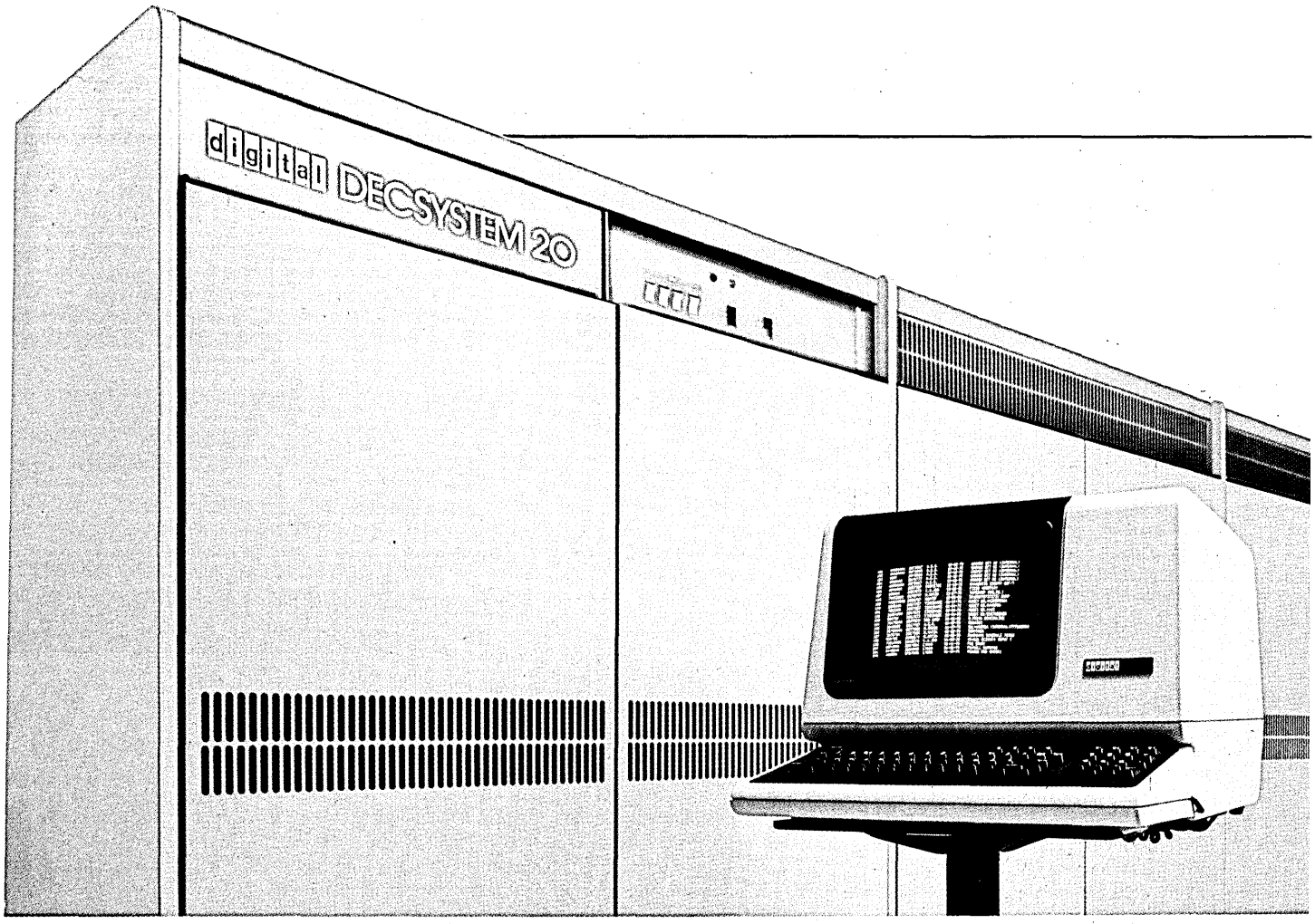
"Because service bureau computer time became too expensive we decided to install our own in-house system, a DECSYSTEM-2040.

"We started out with eight terminals, but when we found out how productive the system was, we began expanding. Today, we have 45 terminals running simultaneously, including one in a vice president's home. We've even added cache memory without any software changes. And we still haven't reached the capacity of the system.

"By expanding the DECSYSTEM-2040, we've been able to lower our costs by 40-50% and at the same time substantially increase our services."



Michael Jaskowiak, Manager, Franklin Institute Computer Center, Philadelphia, Pennsylvania.



Productivity.

"The USRA was created by an act of Congress in 1973 to reorganize bankrupt railroads in the Northeast corridor.

Bill Kelleher, Chief, Computer Facility, United States Railroad Association, Washington, D.C.

"We were using service bureaus, but it became so expensive that we decided to get an in-house computer.

"We chose the DECSYSTEM-2060 because of its low cost, its interactive capabilities and its excellent implementation of APL. We also hoped that the interactive, user-oriented operating system would improve programmer productivity.

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For semiconductor manufacturers, the game is keeping production yields competitive.

THE SEMICONDUCTOR INDUSTRY: AN OVERVIEW

by Michael B. French

What is the nature of the $6 billion U.S. semiconductor industry? Will it continue to create new markets to fuel its 20% annual growth rate? Will it experience a shakeout of marginal suppliers? And, the more recent question, will the independent firms be acquired by larger, often foreign, corporations?

The current dominant concern of semiconductor executives is how to finance growth. The industry has become more capital intensive and simultaneously less attractive as an investment opportunity. Capital expenditures as a percent of sales averaged 10% in 1975, are expected to be 16% in 1980, and may reach 20% by 1985, according to the investment firm of Morgan Stanley. According to a recent study by Merrill Lynch, Pierce, Fenner & Smith, pretax profit margins for semiconductor firms have declined an average of 18%, while return on equity slid 31% since 1975. After problems of capital formation and investment are the concerns about unequal competition with Japanese firms and the critical shortage of people.

The U.S. semiconductor industry is defined by the Semiconductor Industry Association which represents most U.S. merchant and captive suppliers. The SIA reports a $4.1 billion 1979 market for I.C.s and discretes from U.S. suppliers excluding the internal shipments of IBM, Western Electric, and General Motors. The Diebold Group has developed an I/O chart of this market that estimates captive suppliers and import/export balances. Fig. 1 shows the complete $6.9 billion industry for 1979. Fig. 2 forecasts the growth and changes in this industry through 1984 when the U.S. market is expected to reach $13.7 billion. Estimates of captive supplier volumes are included because supposedly captive oems may suddenly purchase large quantities on the open market. For example, since 1978 IBM has purchased an estimated 20 million 16K RAMs and EPROMs, significantly contributing to the scarcity of these parts. Likewise, certain systems firms that now purchase on the open market will increasingly rely on their own semiconductor operations to safeguard supply and proprietary designs—for example DEC, Data General, and HP. By examining the total market interesting characteristics can be seen.

- Since 1973, U.S. semiconductor shipments have grown at an annual dollar rate of over 15% with individual device prices dropping annually by 20%-30%. The fastest growing product is MOS memories. From 1974 to 1984, a 100% annual growth rate is expected in the number of bits (storage capacity) of all the MOS memories shipped.
- The U.S. merchant market is made up of two types of manufacturers. First, there are the independent semiconductor firms that were founded probably less than a dozen years ago by entrepreneurs to make specific devices. Several of these firms have had spectacular growth rates but now show mediocre profits and have trouble financing future growth. The second type of semiconductor is now a division of a vertically integrated technology based firm, with its actual sales and earnings figures hidden. TI, Motorola, and RCA are the best examples. Over the years, all these semiconductor divisions of larger firms have needed infusions of corporate cash. And all have the dual role of achieving management commitment and synergy with the parent firm and success in the open market.
- Imports, principally from Japan, constitute a significant portion of the U.S. domestic market. The U.S. semiconductor industry shows a net negative trade balance with Japan of over $200 million in 1979. Japanese firms have entered markets where U.S. firms have first created customer demand and have then been unable to fulfill it—for example, 16K RAMs. The growing concern is over Japanese governmental policies that support and finance corporate growth and capital reinvestment. U.S. firms feel they confront an indifferent government, overzealous regulators, and a lack of investment inducements.
- "Learning curve pricing," so strongly followed by this industry, is now causing major problems. Traditionally, radical price cuts have stimulated new markets and volume-related reductions in manufacturing costs. Thus, by lowering the prices, vendors sold much more and ultimately made higher real profits. However, as the industry becomes more capital intensive, firms with low profit margins are unable to internally generate funds needed for growth. The cost of new production and test equipment is rising faster than profits even for the industry's leaders. George Heilmeier, vice president of R&D for Texas Instruments, recently observed that a complete new manufacturing line costs up to $40 million and that TI would have to be increasingly selective about new markets. Meanwhile, Motorola is reducing the number of different logic families it can profitably produce. Industry leaders have warned that unless firms are able to improve their profit margins, very few of them will be able to afford the development and capital equipment cost to produce state-of-the-art VLSI circuits.
- As shown in Fig. 3, microprocessors and memory chips are taking market shares away from MSI and linear circuits. As the hardware features and accumulated software bases grow each year, general purpose microprocessors or single chip microcomputers become the preferred choice over custom LSI circuits for an increasing percentage of applications. (GM and Ford Motor Co. both chose microprocessors for million unit applications as more cost effective than custom LSI circuits.) In dp and communications applications requiring high speed custom ECL products—for example, to compete with IBM's 4300 machines—programmable logic arrays (customizable gate arrays) answer the need for "custom" circuits. Industry leaders have been saying that skilled people are their scarcest resource. Custom designs are labor intensive and require ever more design and test time as their complexity increases. Thus programmable devices, such as microprocessors and gate arrays, are becoming increasingly attractive.
- Intel is now the only major semiconductor firm that has not significantly diversified or been acquired as part of a larger firm's diversification plan. Within the last year, the United Technologies and Schlumberger purchases of Fairchild and Mostek added to the list of firms with outside ownership. The significance of this is that virtually all of the semiconductor entrepreneurs who founded firms to produce integrated circuits have been

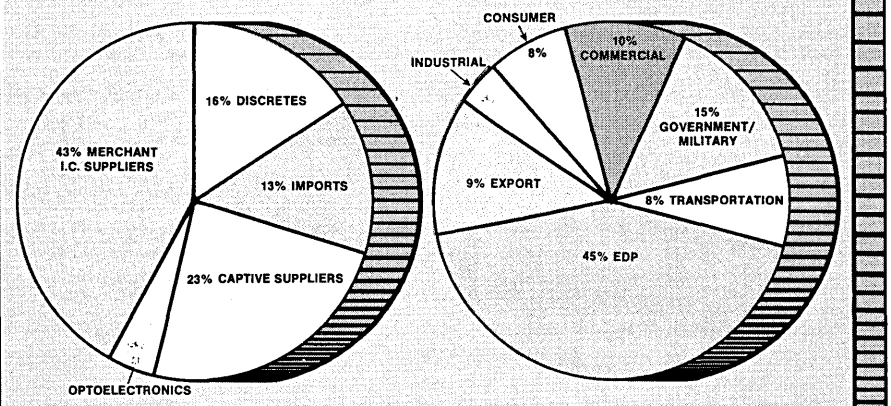
ILLUSTRATION BY RON LOGAN

LOGAN

obliged to sell their companies to finance necessary growth. The usual corporate means of raising funds, through public stock offerings or internal profits, were not adequate. For all its innovation and growth, the industry's cash generative levels are not sufficient to pay for its next generation developments, particularly considering the risks involved.

- It is still possible for energetic new firms such as Standard Microsystems and Supertex to profitably achieve better than $10 million annual sales. But virtually all semiconductor firms with above $25 million annual sales have had to sell equity in the firm to finance necessary growth. Foreign investors have acquired all or a significant part of 19 U.S. semiconductor firms for a total of $584 million in the last decade (Table I).
- While most industry attention, especially concerning LSI devices, focuses on the established industry leaders, innovative small firms continue to be born and sometimes prosper. Often smaller firms begin by selling custom integrated circuits or doing contract design engineering until they can afford to produce and market their own devices. Firms like Monosil, Silicon Systems, Microcircuits Engineering, Inc. and Supertex prove that it is still possible to raise capital and start up a new, high technology company. Supertex and Standard Microsystems Corp. (with its 29% after tax profits on sales in fiscal 1979) demonstrate that it is still possible for innovative small firms to profitably compete.
- Solid technical progress continues in discrete semiconductors, ensuring manufacturers continued profitable growth. The well-publicized $100 million market for microprocessors in U.S. automobiles in 1980 also creates a larger market for discrete semiconductors, displays, sensors, and power transistors. Firms such as Siliconix, Unitrode and G.I.'s Optoelectronics Division see a secure future in putting one semiconductor device—not 100,000—in each package. Each of these firms is prospering in a specialized niche in the broad range of discrete products. In fact, a quiet revolution may be occurring in transistor technology, comparable to the phasing out of germanium devices 15 years ago. Field effect, MOS or VMOS power transistors are setting new efficiency and high frequency standards over conventional silicon bipolar transistors. At the December 1979 International Electron Devices Meeting, six firms reported on advances in field effect transistors, one firm reported new work on bipolars.
- A new programmable LSI device is emerging which will challenge microprocessors, especially in high speed cpu applications. Logic gate arrays, made with low power TTL Schottky or ECL circuits, are roughly 10 times faster than microprocessors. Where less than 100,000 of each circuit type is required (Fig. 4), procurement costs for logic gate arrays are significantly below those for custom LSI (and are usually) available in six months, instead of the one or two years needed for custom LSI designs. Originally pioneered by IBM as masterslice arrays, bipolar logic gate arrays are now manufactured by Motorola, Fairchild, National Semiconductor, TRW, Texas Instruments, and Toshiba. State-of-the-art products, such as the Fairchild F300, contain approximately 2,000 uncommitted gates with switching times as low as 500 picoseconds (0.0005 microseconds).

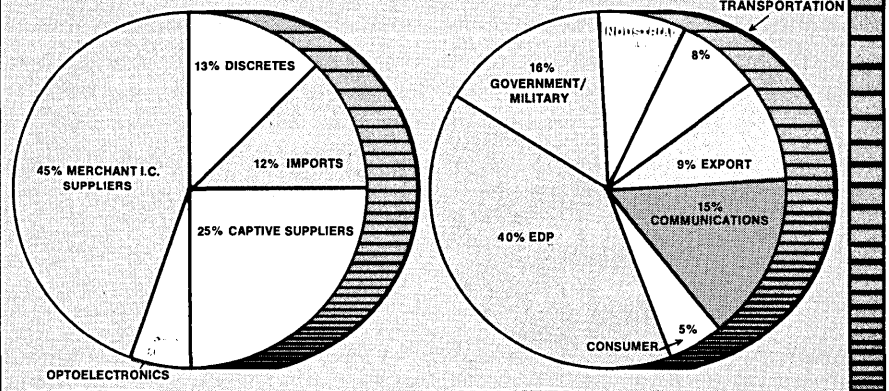
FIG. 1
1979 U.S. SEMICONDUCTOR INDUSTRY



SUPPLIERS **MARKET**
INPUT $6.9 BILLION **OUTFLOW $6.9 BILLION**

Note: Merchant suppliers sell to oem market; captive suppliers sell in-house, e.g., IBM, GM, AT&T.
Source: Diebold Group, McGraw-Hill

FIG. 2
1984 U.S. SEMICONDUCTOR INDUSTRY



SUPPLIERS **MARKETS**
INPUT $13.7 BILLION **OUTFLOW $13.7 BILLION**

Source: Diebold Group

YIELD SETS COST

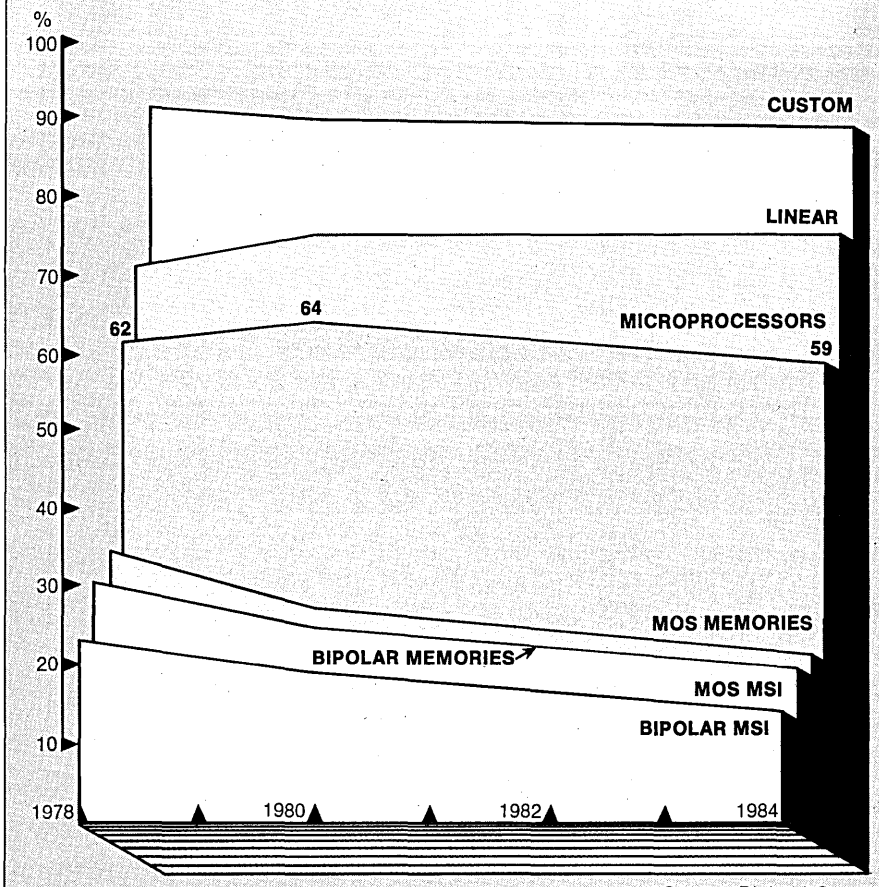
The principal cost determinant for semiconductors is yield. Depending on process complexity, a manufacturer will put between $30 and $90 of direct cost into producting each 3″ wafer, comparably more for the newer 4″ wafers. For complex LSI circuits a probe yield of 15-20 devices per wafer may be acceptable, while for TTL gates, yields of several hundred devices are routine. As complexity—measured in chip size and number of processing steps—goes up, so does the yield uncertainty. One day yields are good; the next day yields are disastrous. Each manufacturer hopes to sell devices at a price sufficient to generate a target revenue per wafer to order to cover costs, profit margin, and yield uncertainties. Unlike the systems business, immediate sales are usually assured; present demand for most semiconductors exceeds supply. Thus, for the semiconductor manufacturer the game is keeping production yields competitive.

Some vendors, notably Intel, choose to do this by concentrating on premium-priced state-of-the-art devices with numerically low yields, but ahead of the competition. Others, like Mostek and AMD, often strategically choose devices with high yields and established markets. Their profits come from meeting a competitive price with yields that generate the company's targeted revenue per wafer. Thus, selling $40 EPROMs or 80¢

CHARTS BY CYNTHIA STODDARD

FIG. 3

U.S. INTEGRATED CIRCUIT MARKET DISTRIBUTION 1978 TO 1984



Source: Diebold Group

TABLE I

ACQUISITIONS OF U.S. SEMICONDUCTOR FIRMS

U.S. FIRM	EST. 1979 I.C. SALES	AFFILIATION
1. TI	$680	div. of TI Inc.
2. Motorola	425	div. of Motorola Inc.
3. Intel	400	—
4. National Semiconductor	320	—
5. Fairchild	305	acquired by Schlumberger
6. Signetics	250	acquired by N. V. Philips
7. Advanced Micro Devices	160	owned by Siemens
8. MOSTEK	155	acquired by United Technologies
9. RCA	145	div. of RCA
10. Harris	100	div. of Harris Corp.
11. American Microsystems	95	acquired by Robert Bosch GmbH
12. Rockwell Semi	85	div. of Rockwell International
13. General Instrument	80	div. of G.I. Inc.
14. Intersil	75	acquired by Northern Telecom
15. Synertek	50	acquired by Honeywell
16. Analog Devices	40	acquired by Standard Oil
17. Monolithic Memories	35	acquired by Northern Telecom
18. Siliconix	30	acquired by Lucas Industries
19. Solid State Scientific	22	acquired by Adolf Schindling
20. Zilog	15	acquired by Exxon

Sources: SIA, N.Y. Times

TTL gates can both be profitable, provided management has selected products where yields and the prevailing sales price generate sufficient revenue per wafer.

Traditionally, as firms learned how to improve their yields, industry leaders—TI, Motorola, or Intel—drove down unit prices and hugely increased available market sizes. In memories, as the state-of-the-art in RAMs, ROMs and EPROMs went from 4k to 64k, markets mushroomed—but because of falling prices, actual net profits as a percentage of sales shrank.

This strict adherence to learning curve pricing created product demand while in the long run making it unprofitable for firms to maintain production. For sound business reasons, TI, National Semiconductor, and Intel are now cutting back on 4K MOS RAM production in spite of strong user demand and 16-week lead times.

In 1979, NCR and Data General both reported reduced corporate earnings due to the inability to obtain LSI semiconductors critical to their systems.In the fourth quarter of 1979 Data General reported the first loss in its history, primarily due to 16K RAM shortages. In late 1979 National Semiconductor and Intel were quietly buying 4K RAMs from Japanese firms to supply to their U.S. customers, and diverting their own production resources to leading-edge products with better profit margins. Overseas suppliers were supplying roughly 35% of the domestic RAM market because U. S. firms could not meet demand.

At the same time, in the highly volatile consumer market, manufacturers sold $500 million in electronic toys and games in 1979 but believe they could have sold $700 million if the ROMs and single chip microprocessors had been available.

WHAT DO WE DO WITH LSI?

Industry leaders, such as William Davidow, microcomputer vice president at Intel, have claimed that LSI, and the new VLSI technology, has progressed so rapidly that it will soon outstrip the user's ability to fully utilize its real power. We have this extremely powerful tool, now what do we do with it? Potentially enormous markets in consumer communications and automotive applications will emerge when LSI designers and the oems learn what these markets need.

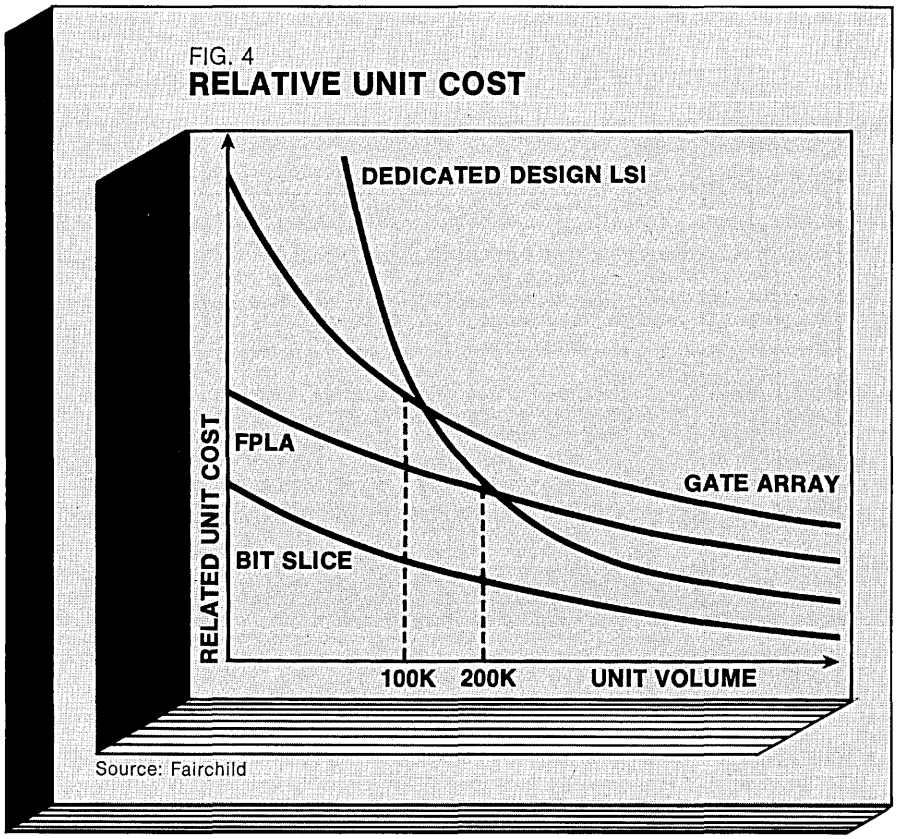
The real problem is twofold. In the past, new semiconductor technologies largely shaped and created new industries. For example, the growth in the dp and telecommunications industries has largely been a function of emerging MSI and LSI. If you doubt this, remember 8K-word core memories and assembly language programming as the norm for minicomputer systems. At this

The principal concern of the SIA is loss of technological leadership and market share to Japanese competition.

moment, semiconductor microprocessor technology has temporarily surpassed the new market identification and product development skills of the projected major markets. Thus, novelty consumer products and games such as language translators, handheld games, and electronic toys have a disproportionate share of the applications, until the more slowly developing markets (automobile and communication applications) mature.

These first consumer applications are projects where a limited amount of software and system development support, often supplied by the semiconductor maker, is all that's required to sell a lot of silicon. For example, TI has sold over 7 million 4-bit microcomputers for the "Simon" game with a one-time software development. Automotive and communications applications now in development require three or four years for hardware, software, and system development.

The second part of the problem involves product and market identification on the part of LSI vendors. The need is for products that improve functionality. Lower cost ROM and RAM storage allows the use of higher level languages and especially structured languages for microprocessors; this optimizes the use of software and applications development resources. The hardware, especially memory, is used less optimally so that the complete system and system development costs can be minimized. Other areas where functionality will be the key to new product successes are special-purpose controllers for communications or peripheral device control. In each of these examples, the LSI or VLSI chip provides a complete function and eliminates repetitive design time.



FINANCE PROBLEM ACUTE

John Weety, senior vp at Motorola Semiconductor Products, said recently, "One of our great strengths in the past has been a willingness to forego a great killing for a stake in the future. A lot of people now say that we have to stop that because industry has become so capital intensive we're having a tough time financing our own growth. We have to increase our margins to finance the growth . . . If industry goes too far in increasing ROI we will no longer be a vital force in the marketplace."

As 1979 closed, both TI and Motorola acknowledged that even with their massive capital equipment investment programs, they needed to be more selective in introducing new products. If the two largest semiconductor vendors (estimated 1979 I.C. sales: TI, $655 million, Motorola, $417 million) are cautious about financing new growth, what about the rest of the industry?

William Kauffman of Intel says the cost of an I.C. wafer fabrication module went from $2 million to $10 million since 1975 and will quintuple again by 1985. With the prime interest rate around 19% and profit margins historically low in the semiconductor industry, the problem of how to finance the needed growth becomes acute.

It is probable, according to Jerry Sanders, president of Advanced Micro Devices, that the present acute parts shortage coupled with the high cost of new product developments will finally slow down the cut-throat price cutting and "I.C. makers will finally make a lot of money." The effect would allow firms a better chance of financing their own growth by achieving more profitable and more stable operating margins between yields and costs instead of financing growth by selling ownership of the firm to an outside corporation from an industry with better cash flow.

The effects of a decrease in learning curve pricing on specific products are to prolong the product life cycles of mature LSI devices that might otherwise become obsolete by the falling prices of newer devices. For instance, 4K dynamic RAMs, 1K static RAMs and 16K ROMs are all products in the declining portion of their product life cycle. Yet by not obsoleting these mature parts immediately, firms can enjoy high profit levels and prepare for the next round of more expensive equipment purchases. For the semiconductor user these devices have become commodity products; the user hopes to enjoy the benefits of his own learning experience and have an assured supply to put into products.

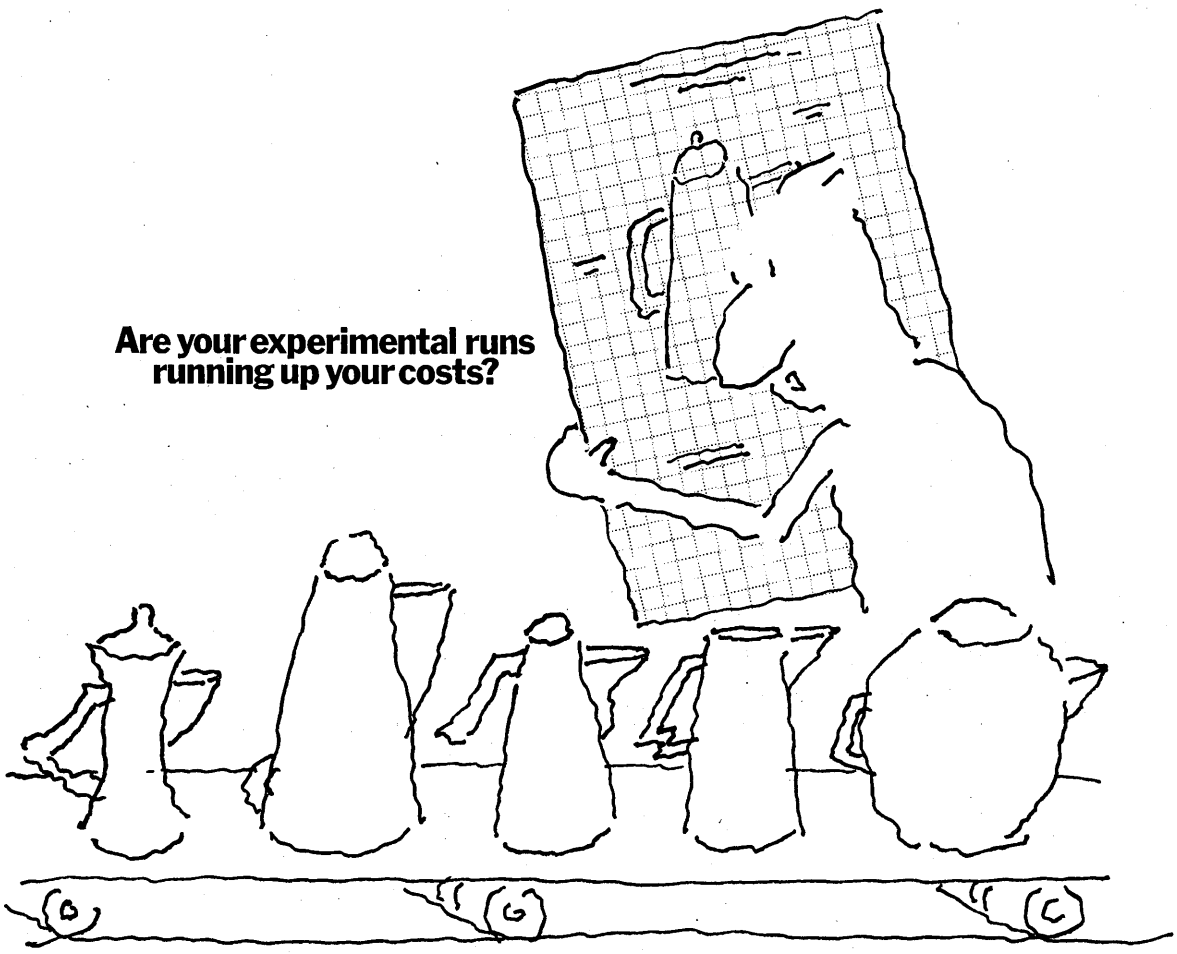
Ironically, it is Nippon Electric advertising the availability of 4K dynamic RAMs through 1981 while Intel and TI cut production. In 1978, C. Lester Hogan, technical adviser to the president, Fairchild Camera & Instruments, said if the industry didn't change its pricing policies only a handful of American I.C. manufacturers could afford to continue. According to Charles Harwood, president of Intel, the industry is maturing. "There is less a view of grabbing market or position with price and more a view of establishing a market or position with good products."

NEED FOR TRAINED PEOPLE

A shared concern among semiconductor executives in the U.S. and in Japan is the critical need for trained people. Personnel ads on TV and trailed behind airplanes in Silicon Valley focus attention on shortages of design and process engineers. But people problems affect all levels of personnel and corporate planning. After years of developing very labor-intensive assembly plants in the Far East semiconductor firms are now hedging bets by investing in automated wire bonders and die attach equipment for domestic expansion.

An effect of design personnel shortages is seen in the growing use of CAD and

Are your experimental runs running up your costs?



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With the prime interest rate around 19 and profit margins historically low, the problem of how to finance needed growth becomes acute.

semicustom logic gate arrays to speed up design and increase productivity. The two new major markets for semiconductors (automotive & communications) may stimulate the need for more trained personnel in a different way. Those applications require millions of low-cost devices with reliability levels normally associated with premium-priced military devices. The Bell System expects that its equipment will operate for at least 25 years. This level of reliability must be built into every device—automated testers are mediocre at spotting latent failures. Achieving this reliability at low cost will require imaginative personnel and strong training policies.

The principal concern of the Semiconductor Industry Association is loss of technological leadership and market share to Jananese competition. A recent report of the U.S. Senate's International Trade Commission verifies that the U.S. is gradually losing market share and technological leadership due to lower productivity and underinvestment in U.S. firms since the 1974 recession. Top executives from Intel, Fairchild, National Semiconductor. Signetics, AMD, and Precision Monolithics journeyed to Washington in May and November to urge Congress to recognize unfair Japanese competitive practices and to take steps to stimulate high technology companies. While Japan has a well-coordinated $250 million program to develop the next generation of semiconductors for the computers of the 1980s, the U.S. VHSIC (Very High Speed Integrated Circuits) development program has not yet awarded its first million-dollar study contract.

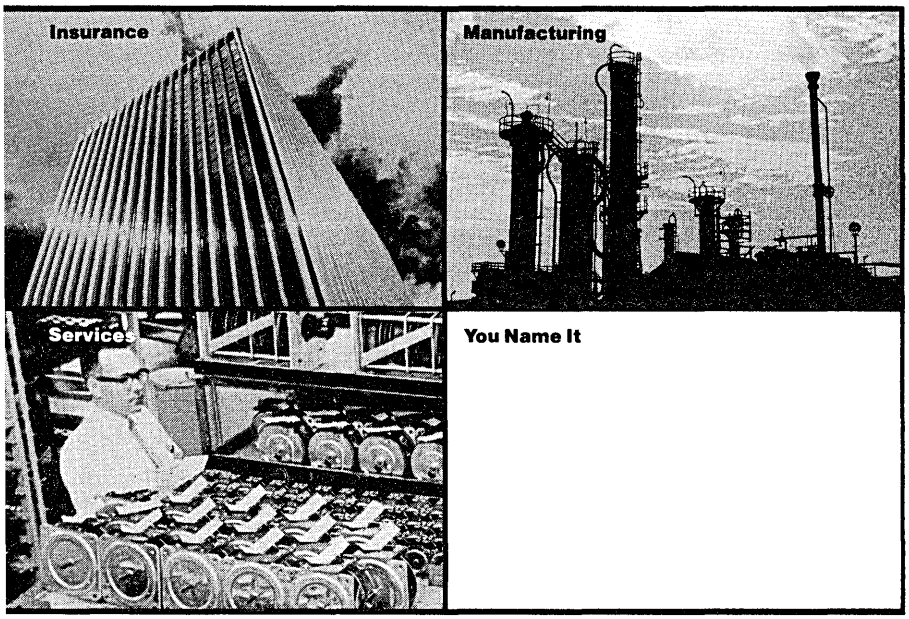
The debate over Japanese competition involves many issues; two-tier pricing, the relative ease of market entry in the U.S. and Japan, investment and tax incentive policies in the U.S. and Japan, government support of innovation, etc. U.S. semiconductor executives fear they are losing technological leadership. If the U.S. is to continue to set the standards in information processing, communications and consumer products, these industries will need the most advanced semiconductors, not the second best.

SIA offices are requesting a variety of investment and capital formation incentive programs: tax credits for research, and faster depreciation schedules to stimulate new equipment purchases, and patent and antitrust protection for joint industrial-university research programs. The concern is to improve the overall return on investment—this will attract the funds to maintain productivity and innovation, and create chips that will be the catalysts for the electronics industry in the coming decade. *

MICHAEL B. FRENCH

Mr. French is a senior consultant with the business planning division of The Diebold Group. Prior to this he was a marketing manager for General Instrument Semiconductor. He holds two patents, for circuit design and for DC motors. His current interest is the environment for high technology companies in the 1980s. He has a BA degree and a BS degree from Brown Univ. and an MS in management science from C.W. Post.

When it comes to companies...



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And at present, more than 4,000 companies have come to Cyborg for its one-of-a-kind payroll/personnel system... for some 4,000,000 employees.

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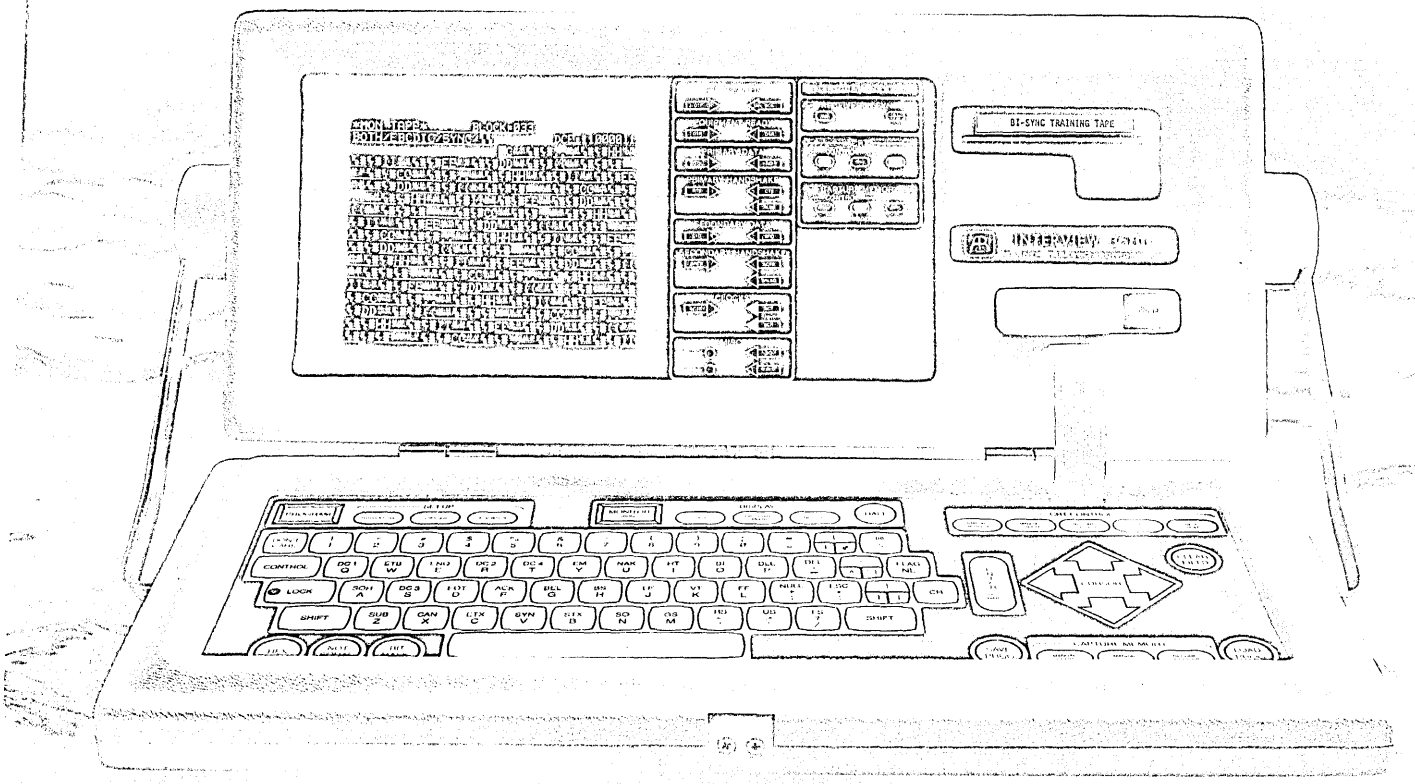
New dimension in diagnostic [illegible] 3000 series is a microprocessor [illegible] mable real-time monitor [illegible] new concept in non-sequential [illegible] eliminating the need for [illegible] ing terms or techniques [illegible] interrupts or macro instructions. The user simply specifies up to 8 "trigger" conditions to cause desired actions.

Network performance measurements. Statistical measurements by counters and timers can be observed and modified anytime in the test.

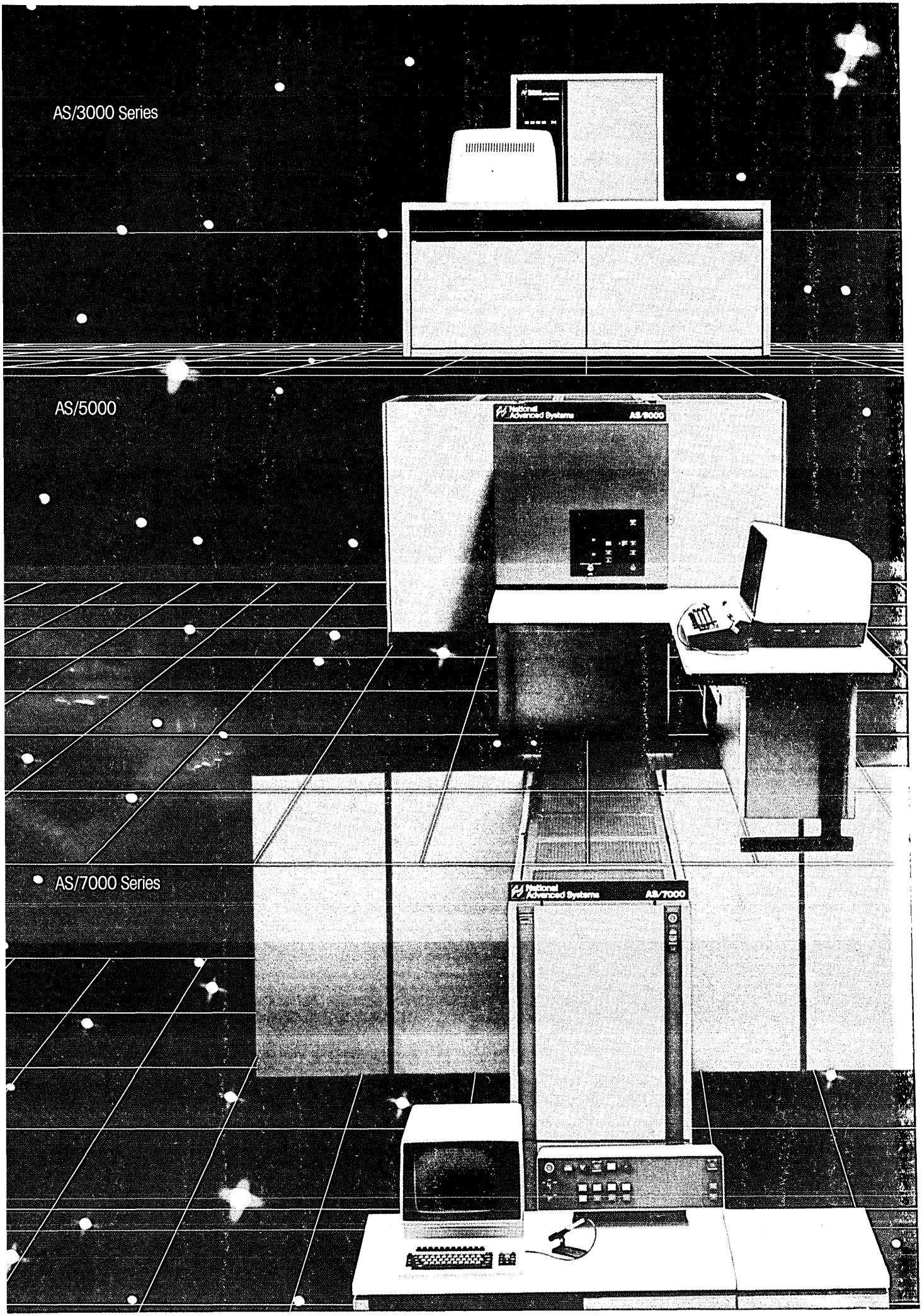
[illegible] **tapes for field support** record all [illegible] simplifying analysis and replay. Test [illegible] can be duplicated in seconds for [illegible] service personnel, tapes [illegible] and interface status.

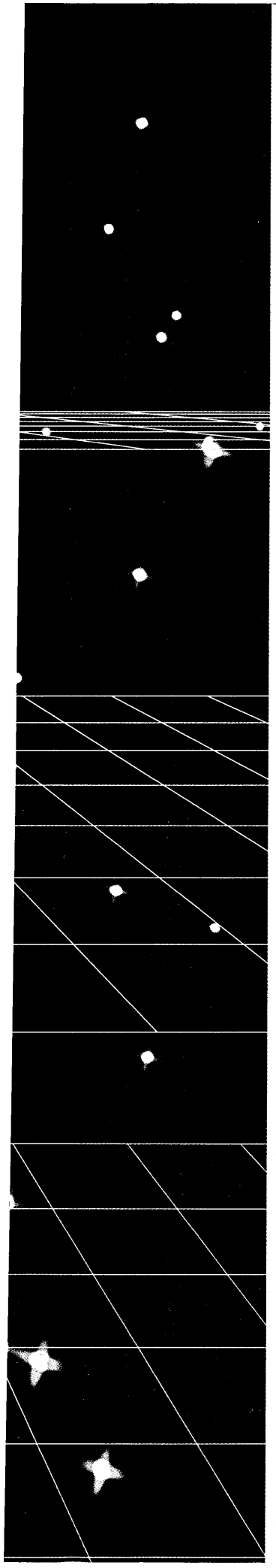
[illegible] Analyzer. A new [illegible] simplicity and power [illegible] representative.



[illegible] Research Corporation

CIRCLE 102 ON READER CARD


AS/3000 Series
AS/5000
National Advanced Systems
AS/5000
AS/7000 Series
National Advanced Systems
AS/7000



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National Semiconductor, our parent company, has been a manufacturer of program-compatible computers for over five years.

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With the recent announcement of new members to our proven Advanced Systems (AS) product family, we now offer the broadest range of compatible computers on the market today. Computers that use a microcode-based design to insure compatibility with current IBM products and future enhancements.

National Advanced Systems, through the AS product family, now offers the user significant advantages in terms of price, performance, reliability, and financing alternatives. We feature the finest post-installation service and support in the entire industry. We have a complete line of products and services that the user can grow with, offering long-term, unparalleled business solutions for your information processing needs.

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Dependability is synonomous with our AS/7000 Series, the true price/performance alternative to the middle and upper end of IBM's 303X series. Increased dependability results from the most recent manufacturing advances and the latest proven technology. That technology plus rigorous testing combine to deliver the highest degree of reliability possible.

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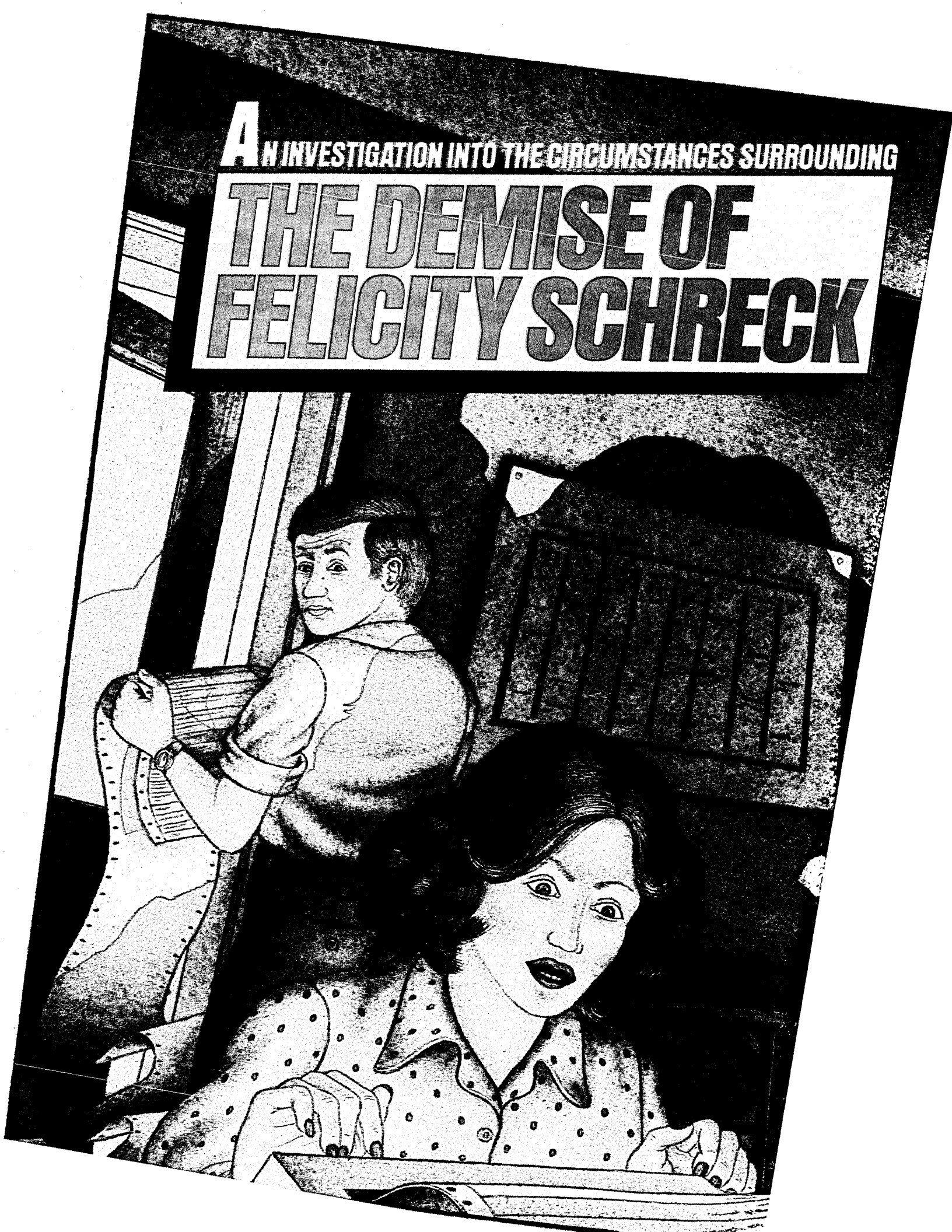

AN INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING
THE DEMISE OF FELICITY SCHRECK

A shocking story about the relationship between a PR man and a data processing manager.

by Marvin Grosswirth

The following is a transcript of the testimony given by Harry D. Mandrill at the Coroner's Inquest on 1 April 1988:

My name is Harry Mandrill. I am president and sole stockholder of a public relations company in New York City. And frankly, I don't understand what this fuss is all about. I mean, I'm sorry Felicity's dead, and all that, but she really brought it on herself, didn't she? I mean, it isn't as if anyone did it to her, although, God knows, she certainly had it coming.

What? All right, all right, I'll "stick to the facts." Where do you want me to begin? I first met Felicity when we were both employed by an advertising agency. I headed up the public relations division and she was the data processing manager. We got to talking one day in the company cafeteria and we complained to each other that we were both stuck in dead-end jobs. In many ad agencies, the PR division is often there just as an accommodation. As for the data processing, it was a number-crunching operation, churning out statistics to justify the megabucks they were billing the clients.

I was really into PR and Felicity had this big thing for computers. It occurred to us —actually, I think it occurred to *me*—that maybe we could combine our talents and establish our own PR agency. We'd have an operation unique to the business: a completely computerized public relations firm. Well, it didn't take long for fantasy to become reality, and there we were, in our own small but tastefully appointed Madison Avenue suite, complete with a back room filled with electronic machinery.

What? Money? Oh, that was no problem. We leased most of the hardware, confident in the knowledge that in a matter of months it would all be supplanted by new product lines and we'd be able to buy the rented equipment from the lessors for a song. At least that was what Felicity claimed. I never got into that area; she was the expert and she handled it, just as I was the PR expert and I handled that aspect of the business. At first. It wasn't until our business really got going that she . . . but I'm getting ahead of myself.

The name? We decided to keep it simple. We called our company Schreck and Mandrill. The basic concept behind our operation was also simple.

Felicity developed a system in which we stored certain information in our data base: stock PR phrases, like "a major breakthrough" and "earnings for the first quarter exceeded . . . " and "before forming his own company he was a marketing executive for Singer office machines."

We also input certain stock PR approaches: press release mailings, press conferences with and without cold cuts, morning tv talk shows in cities with populations of under 50,000—you know, all the tried and proven techniques of your classic public relations campaign.

Then, all we had to do was key in the client's product or service and how much they were willing to spend, and in minutes that computer in the back room ground out a complete PR campaign. We didn't need any account executives, or copywriters, or anybody but ourselves and a few clerks. The best part of it was that if the campaign went sour, we didn't have to take the rap.

Our clients all knew how efficient our computer was. When a PR effort failed to produce results, we simply told the client he had a lousy product. Of course, our consulting services were available in such cases. We were making money faster than we could count it. Fortunately, we didn't have to count it; the computer did.

The trouble started when Felicity had operations running so smoothly she had time to wander out of the computer room and into my office. She began poking into the creative end of the business, despite my constant attempts to dissuade her. When my message finally started getting through, her initial defensiveness and resentment were rapidly transformed into naked hostility. I should have known there was trouble brewing when she locked herself in the computer room for three weeks, after which, looking like the patron saint of *anorexia nervosa*, she reeled into my office and dumped an enormous printout on my desk. "Have a look at that, turkey," she gasped. "Dp people aren't creative, huh? What does that look like—chopped liver?"

I had to admit that it was good—damned good. She had developed a translation program capable of converting a PR campaign from just about any language into any other language—English to French, Russian to Italian, Mandarin to Bantu . . . it was sensational. But in the end, she proved that I was right. She had included a translation between Arabic and Japanese, and anyone with even a shred of creativity would have known that that's the sort of thing that causes nervous reactions in Washington.

Anyway, I told her we'd use the program—minus the Japanese/Arabic capability —and we started soliciting foreign clients. That's when I first discovered that she was out to get me.

The first few presentations were fine and we signed up foreign accounts in droves. But one day, in the middle of a presentation to a group of executives from Polynesian Polytechnics, the delegation, which was reading a translation on this wall-sized crt in our conference room, blanched, got up, and without a word, stalked out. I couldn't figure it out and decided it was some exotic custom with

ILLUSTRATION BY RICHARD EGIELSKI

She had developed a translation program capable of converting a PR campaign from just about any language into any other language.

which I was unfamiliar. About a week later, a group from the Andorra Development Corp. did the same—except that one of them spat on my shoe on his way out. Around the fourth or fifth time, I began to smell a rat, so I called in a friend of mine who speaks Urdu, and I ran the presentation for him. When we got to the part here the delegation had stormed out, my friend became apoplectic. "How could you say such a thing to me?" he demanded, tears welling up in his eyes. "Why, you never even *met* my mother."

Well, I won't bore you with the rest of the details. Felicity had inserted some of the worst insults and obscenities imaginable in those translations. I was losing not only clients, but my reputation as a PR genius as well. Naturally, I scrapped the translator program and decided to keep an eye on Felicity.

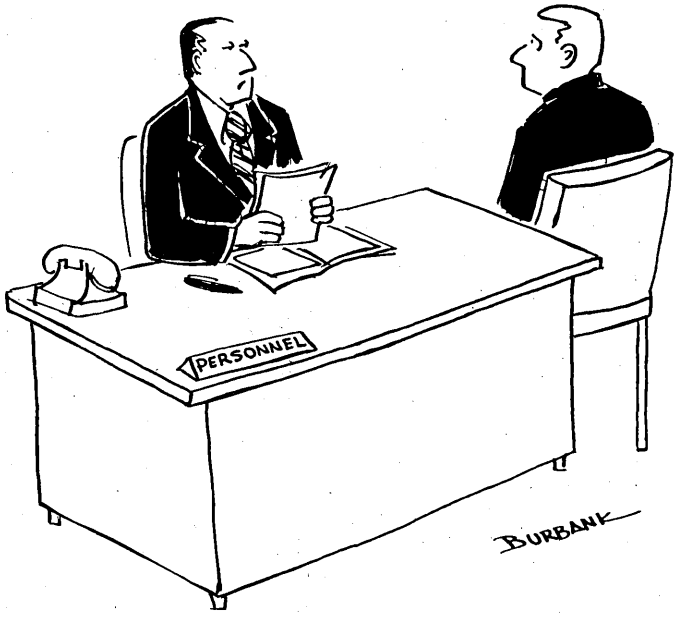
The next thing I discovered was that she was intercepting my electronic mail. Actually, "discovered" doesn't describe it because she wasn't exactly trying to keep it a secret. I walked into my office one Monday morning and found a sheaf of paper on my desk: printouts of some of my personal electronic correspondence . . . well, anyway, all I can say is thank Heaven for paper shredders. That happened a few times until I had no choice but to drastically curtail certain social activities.

Then Felicity started screwing around with my EFTS account—unbeknownst to me, of course. Weird books and records arrived in the mail; someone was ordering this garbage in my name, someone with access to my EFTS payment authorization number. It was no trouble putting two and two together and coming up with Felicity. What do I mean by weird? Well, did you ever hear of *Discopunk: Golden Oldies of the Eighties*? When you play the cassette, it's programmed to bypass the volume control on the home entertainment center and it converts the entire electrical system in your house into an enormous strobe light that pulses to the beat. Why did I play it? I didn't. My kids did.

Right after that I went into therapy. I'll tell you more about that, too . . . but later.

As part of Felicity's campaign to drive me off so that she could have the agency all to herself, she methodically set about to destroy my marriage. She had the ability to act like her old self from time to time, deluding me into thinking that she had just gone through some sort of temporary phase. During one of those periods, she presented me with a cassette that contained the complete personal income tax preparation software for my home computer. But at that time I hadn't realized the extent to which she'd been meddling in my EFTS account and that she had input data into the program. So when my wife and I sat down at the terminal to work on our tax return, there, as big as life, in evil green letters on the screen, it said, under *Deductions*: "Purple Grotto Spa, $1,076.93." I sincerely believe my wife would have bought my story that those payments were for physical therapy if it hadn't been for Felicity's birthday present to me a few weeks later.

"Just go home and turn on your terminal," she said sweetly, "and dial up this code number. It's a surprise."



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It sure was. My wife, my in-laws, the kids, and I had just finished a small birthday celebration when I remembered Felicity's gift. Of course, I should have known better, but I'd had a little too much wine, so with everyone watching, I turned on the set, keyed in the number, and waited. Suddenly, all over the living room wall, there was this fantastic-looking couple, wearing nothing but smiles. Felicity's "gift" was one of those living magazines.

No matter how I tried, I couldn't convince my wife that Felicity had given me this "gift" as an act of pure maliciousness. The next day, my wife went to see her lawyer.

It was then that I finally realized my entire life was on the line. Clearly, Felicity and her damned computers were out to destroy me. I had no choice but to fight back . . . but in my own way.

I used the one weapon for which I felt certain she had no defense: creativity. As a PR executive with lots of experience, it was easy for me. I simply began peppering my conversation with expressions she'd never heard before. Neither had anybody else, but she didn't know that and, typical of her breed, she wasn't about to admit her ignorance. What kind of expressions? Well, let's see . . . things like "selective randomization" and "limitless parameters" and "differential cloning variability"; things like that. Pretty soon, I noticed that Felicity was smoking again, and biting her nails.

The next thing I did was to bring Dr. Schwindler, my psychoanalyst, into the picture. Although, strictly speaking, she was already in the picture because of the teleconferencing. It had long ago occurred to me that there was only one way Felicity could possibly know so much about my private life and its attendant problems. She was monitoring my teleconferencing sessions with Dr. Schwindler. So I began telling Schwindler the things I wanted Felicity to hear. I went on and on about how technical partners were a pathetic pain because they want so desperately to participate in management and corporate policy when all they know is machines. Soon Felicity developed a tic. I went on about how the machines were becoming so self-sufficient that after a while, we wouldn't even need all those high-priced engineers, designers, and dp managers. Felicity's hands started shaking.

My overt attitude toward Felicity also changed. I pretended I wanted to make peace. I found excuses to have more conferences with her, timing things so that she'd arrive at my office just in time to see me typing out a press release on my old Smith-Corona, or pasting stamps on envelopes marked "Personal." In addition to the tic and the trembling hands, Felicity acquired a stammer. And her hair was graying at a rapid rate.

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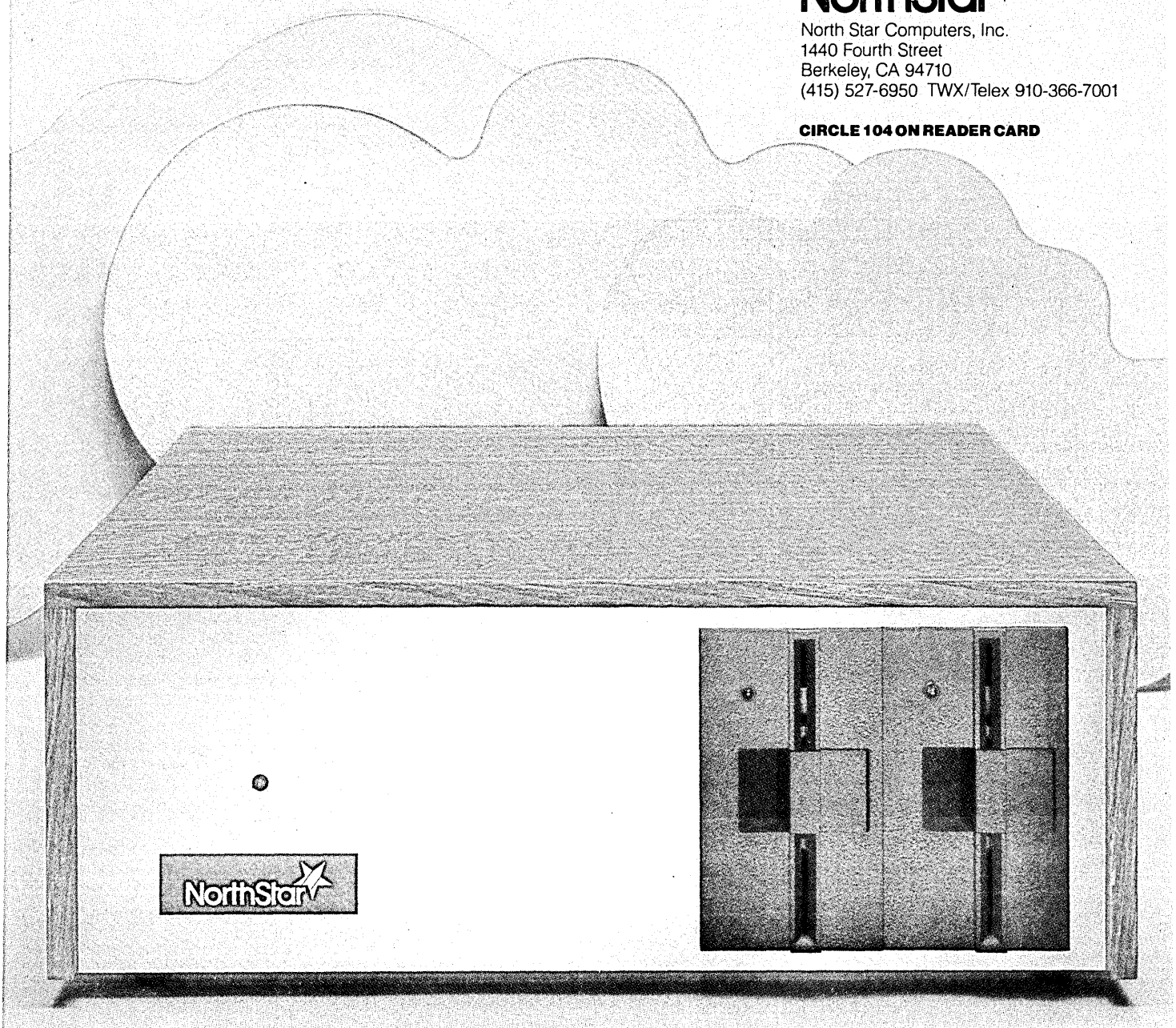

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MARTIN MARIETTA

CIRCLE 168 ON READER CARD

At my invitations, we began having lunch together, as we had in the early days. I always managed to work the conversation around to the philosophical aspects of data processing. One time we got into a discussion about the IBM case, and when I took the government's side, she nearly lost her lobster bisque.

Then I moved in for the kill. What? Hey, wait a minute . . . that's just a figure of speech if you're going to. . . . Well, all right, but watch it.

What I did was fairly simple, but if I must say so myself it was brilliant. I resurrected a few dusty, long-forgotten cliches about the computer-vs-people issue that had been kicking around in the 1960s and 1970s, and, in the time-honored traditions of PR, I dressed them up in new verbiage.

I began by expressing concern about computers becoming so efficient that they would soon take over most of the functions of the human brain. Peoples' decision-making abilities would atrophy from lack of exercise. Then I went for the jugular. I told her I was worried about people like her, that her technological superiority would be her ultimate undoing, that she was instrumental in developing machines that would be soon be able to take over her functions. She was planning her own obsolescence. For the first time in our relationship, I actually saw tears in Felicity's eyes. "You're wrong," she said. "It doesn't have to be that way. Computers and people are a team, Harry. We work *with* each other, not against each other."

Talk, I replied, just talk. Whistling in the dark, I said. Just because she *wanted* it that way didn't mean that it was going to *be* that way.

Suddenly, her eyes burned with a fierce, maniacal gleam. "You're wrong, Harry," she repeated in a harsh, rasping whisper. "You're wrong, and I'll prove you're wrong!" With that, she disappeared into the computer room and stayed there two days.

Then, on the morning of the 17th, my teleconferencing terminal buzzed. I turned it on and there was Felicity. She was calling from her office. She had on the same clothes she had been wearing when last I saw her. Her hair was wild and her eyes stared vacantly. She stood behind her desk, her arms out in front of her. In each hand she held an electric socket from which dangled a heavy cable.

"Look, Harry," she rasped. "This one"—and she extended the socket in her left hand—"is plugged into the wall outlet down here behind my desk. And this one," she continued, holding up the socket in her right hand, "is connected to the mainframe in the computer room." She moved the two sockets so they almost touched, her arms directly in front of her.

"Harry," she screamed, "watch this: I'm going on-line, Harry, *I'm going on-line*!"

And so saying, she plunged her thumbs into the sockets.

I was shocked.

Apparently, so was Felicity. ✻

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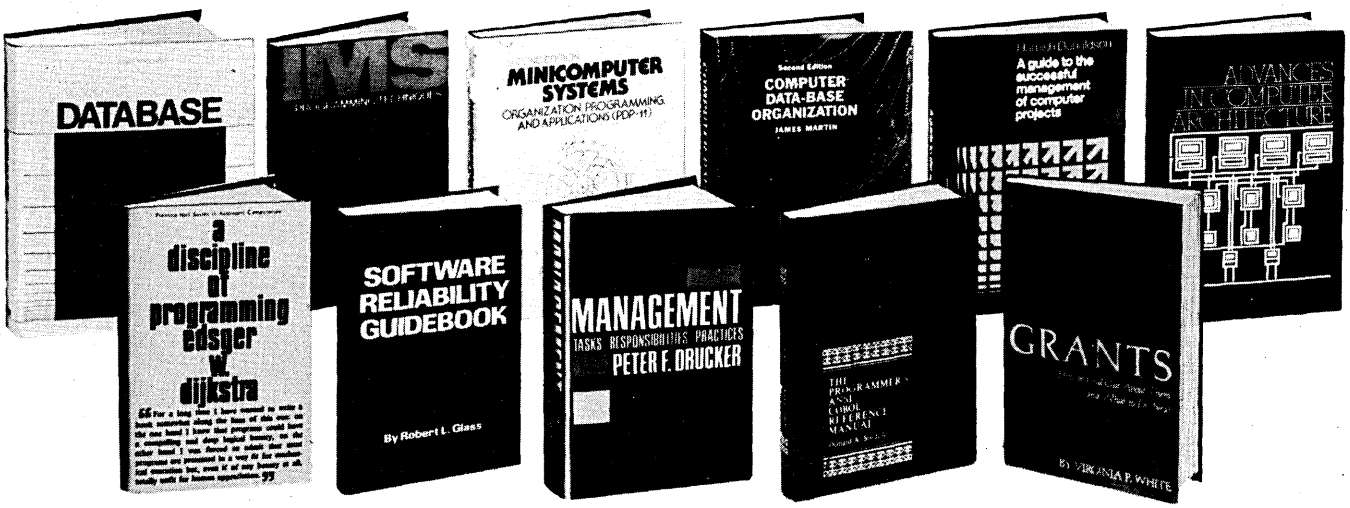

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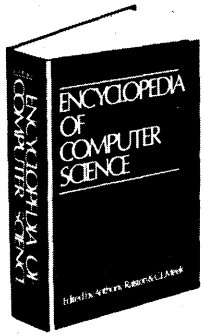

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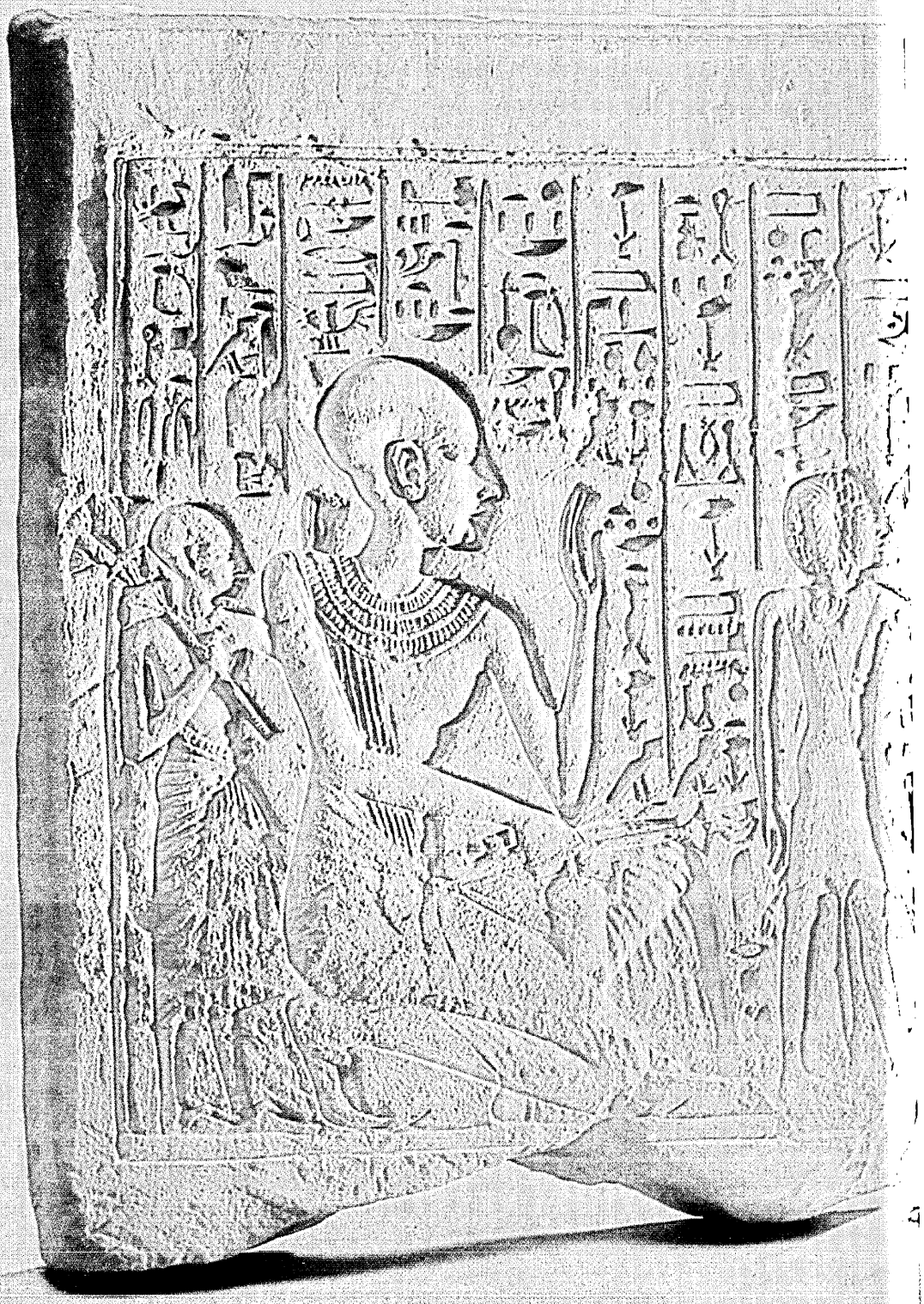

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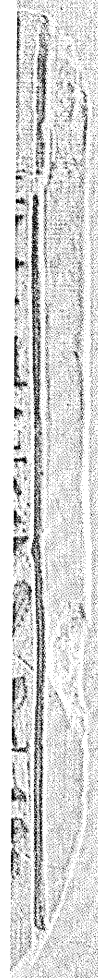

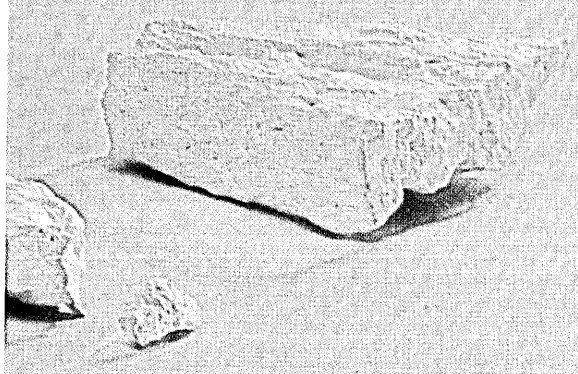

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DCA announces new high-performance network processors that lower data communications costs

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PEOPLE

TRACING ACTORS

Computer scientist Norbert D. Witt left the world of nuclear reactors, missiles, and satellites for Hollywood, and brought a computer along.

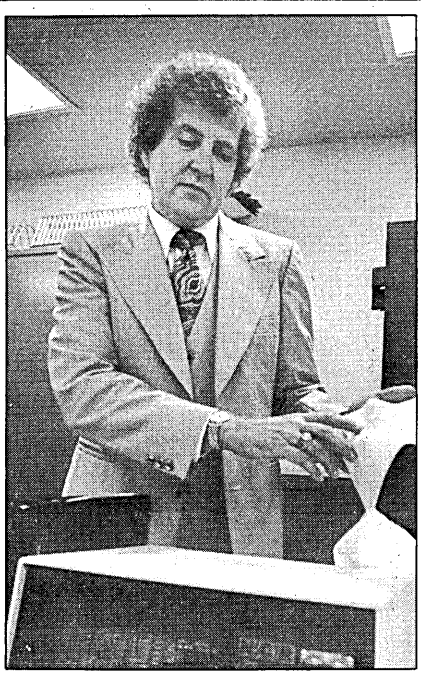
He's the executive vice president of Information Management International, a consulting and software development firm that worked out automated systems to untangle complicated reporting practices in the entertainment industry. Working out of a computer center at the Motion Picture and TV Country Home and Hospital in pastoral Woodland Hills near Los Angeles, his company provides on-line computing services for such clients as the Screen Actors Guild (SAG), Motion Picture Industry Pension Plan, the Screen Health and Welfare Fund and, of course, the hospital.

"This is the only industry that takes care of its own," he says of the hospital that besides the usual hospital services also provides convalescent facilities and a country hotel for actors who have retired.

Witt, who supervised the development of an estimated $750,000 in software for the Screen Actors Guild, talked recently about the peculiarities of the entertainment business which he said created nightmarish problems for I.M.I., a San Jose, Calif., based firm, during conversion to an on-line system.

I.M.I. helps the 52,000 member Screen Actors Guild to keep track of membership dues, pension contributions, residual payments, the names of agents, health and welfare payments, and a host of other things peculiar to the very peculiar entertainment business.

Just keeping track of the mailing list is a huge task. Besides its 52,000 members, SAG also keeps files on some 31,000 contracts between members and studios that employ them. And it keeps track of some 44,000 persons who work under Taft-Hartley rules (a law that allows an actor to work for 30 days without having to join a union), as well as the 400 agents who represent actors, the 3,254 companies who have signed SAG contracts, and some 3,000 names on a "special mailing list." And everything changes. The list of about 80,000 names requires 2,000 changes a week. But that's show business.



NORBERT WITT—at the console of NCR machine.

Actors are a mobile lot. "They'll go to New York for a job and give up their Los Angeles residence. When the New York assignment ends, they'll come back to Los Angeles and live for a while with friends until they find a permanent place. The average U.S. resident moves once in five years; the actor changes his address about once a year," says Witt, who adds, "Of course, even if they haven't turned in a change of address, everybody wants a residual check the day after it comes in to SAG."

Residual payments are written into all SAG contracts and require the studio or ad agency to pay an actor for each time he appears in a tv movie or commercial. Checks are sent to SAG but are made out to the actor. SAG not only has to trace the people who've moved, but also must monitor the payment schedule. For example, a payment for an actor's fourth appearance is higher than the fifth, so some studios find it economically advantageous to make the fifth payment before the fourth. That's a SAG no-no.

"When you consider that SAG receives from 1,500 to 2,000 residual checks a day, it [the distribution and checking] becomes the essence of a nightmare," says Witt. The Guild untangles all of this with 20 crts hooked from its offices on Hollywood's Sunset Blvd. to the computer center in Woodland Hills. SAG also is hooked to Woodland Hills with a terminal and printer in the San Francisco and Chicago offices and with six terminals and four printers in New York.

The same problems occur in regard to membership dues and health, welfare, and pension accounting. Most actors belong to several unions, such as SAG, AFTRA (American Federation of Radio and Television Artists), and SEG (Screen Extras Guild), and depending on their earnings, may be permitted to pay only half-dues to SAG. That means SAG must also keep track of their earnings with each of the unions. Health and welfare and pension funds can be contributed by as many as 2,000 employers in the industry, and over a lifetime an actor could have worked for most of them.

The I.M.I. data center also gets about 1,000 "station 12" inquiries a day—inquiries about the status of an actor with his union. Fines of up to $500 a day can be levied against studios for hiring nonunion actors. And SAG also maintains a skills bank—a list of actors with specific abilities—which the studios can tap.

Keeping track of it all is really "your typical accounting system," says Witt, "only in this case it's a system that runs on exceptions, not rules." I.M.I. handles the work on an NCR model 8560 computer with dedicated 7,200 bps synchronous lines connecting the terminals to the host.

Witt was one of 12 persons who left Lockheed Missiles and Space Co. in the mid-'70s to form what was to become I.M.I., which also has clients in the banking and real estate development business as well as some nonprofit organizations.

Witt has a master's degree in computer science from Stanford Univ. and did graduate studies in business administration at the University of Santa Clara. In 10 years with General Electric, he directed the development of software systems that were used to solve nuclear reactor calculations and nuclear system simulation.

At Lockheed, where he supervised the work of programmers and analysts, Witt was involved in such missile programs as the Poseidon and in satellite development. "Somewhere in my files is a photograph of an automobile's license plate taken on a Moscow street from a satellite 22,400 miles away." He considered that a major feat in space technology at the time, but observes how microcomputer technology has improved in just a few years. Today you can guide a missile right down the throat of a silo that houses the enemy's missile. ✻

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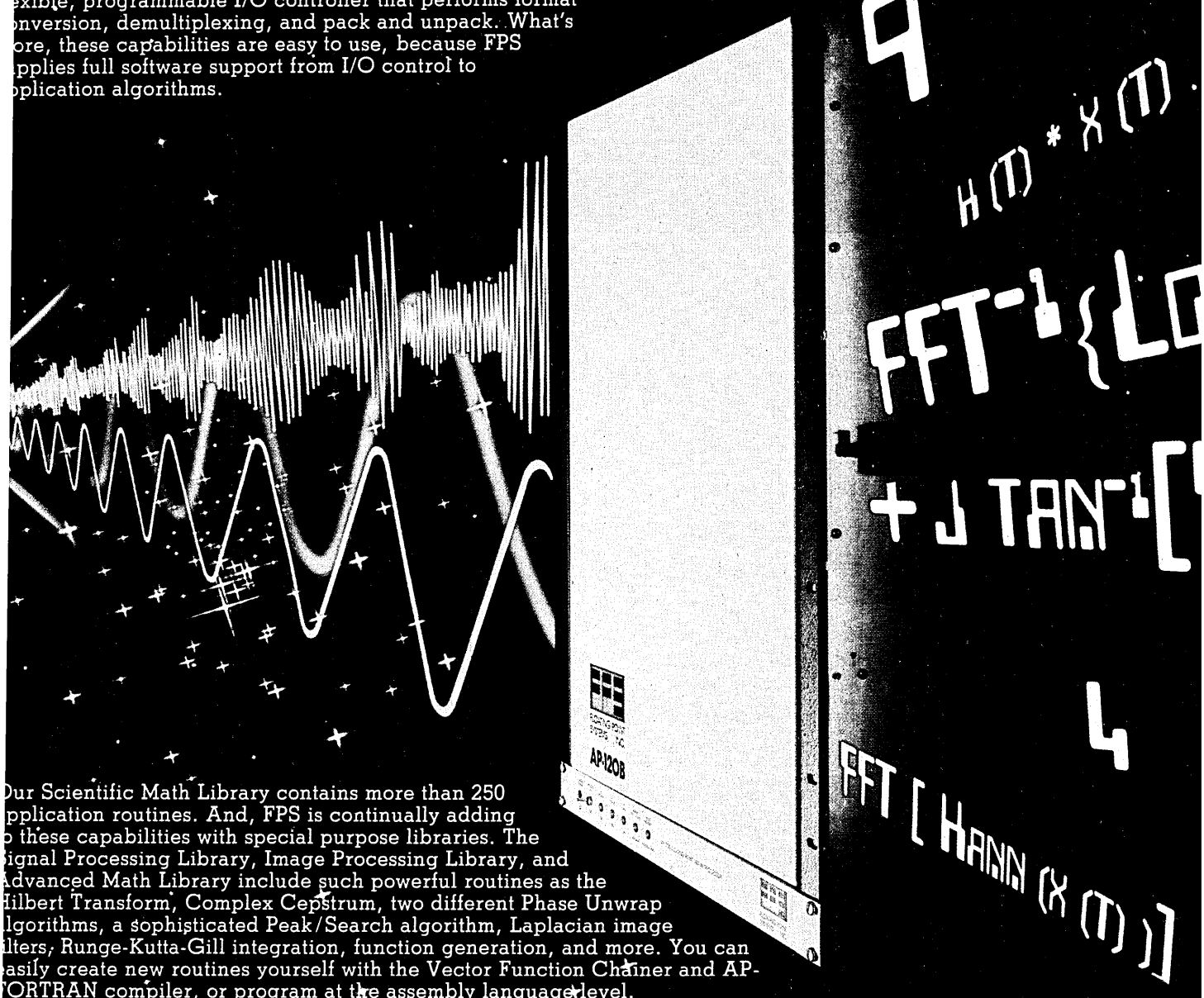

Our Scientific Math Library contains more than 250 pplication routines. And, FPS is continually adding o these capabilities with special purpose libraries. The ignal Processing Library, Image Processing Library, and dvanced Math Library include such powerful routines as the ilbert Transform, Complex Cepstrum, two different Phase Unwrap lgorithms, a sophisticated Peak/Search algorithm, Laplacian image ilters, Runge-Kutta-Gill integration, function generation, and more. You can asily create new routines yourself with the Vector Function Chainer and AP- ORTRAN compiler, or program at the assembly language level.

nvestigate this new power in real-time computing. Over a thousand FPS Array Processors re in use today by people who require the real-time throughput of a mainframe but want the ands-on control and affordability of a minicomputer system. FPS is ready to expand your real-time niverse. Contact FPS or our sales office in your area to find out how.

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Brand Preference Study 1977

Brand Preference Study 1978

Brand Preference Study 1979

Brand Recognition Study 12th Edition 1978

Brand Recognition Study 13th Edition 1979

BRAND PREFERENCE

silent 700 electronic data terminals

Model 733 ASR Data Terminal

silent 700 electronic data terminals

Model 743 Data Terminal

silent 700 electronic data terminals

Model 745 Portable Data Terminal

silent 700 electronic data terminals

Model 781 RO Printer

silent 700 electronic data terminals

Model 783 KSR Data Terminal

silent 700 electronic data terminals

Models 785/787 Portable Data Terminals

THERMAL

silent 700 electronic data terminals

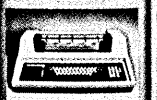
Model 763 Bubble Memory Data Terminal

silent 700 electronic data terminals

Model 765 Portable Bubble Memory Data Terminal

MEMORY

omni 800 electronic data terminals



Model 820 KSR Data Terminal

omni 800 electronic data terminals

Model 820 RO Printer

omni 800 electronic data terminals

Model 825 KSR Data Terminal

omni 800 electronic data terminals

Model 825 RO Printer

omni 800 electronic data terminals

Model 810 RO Printer

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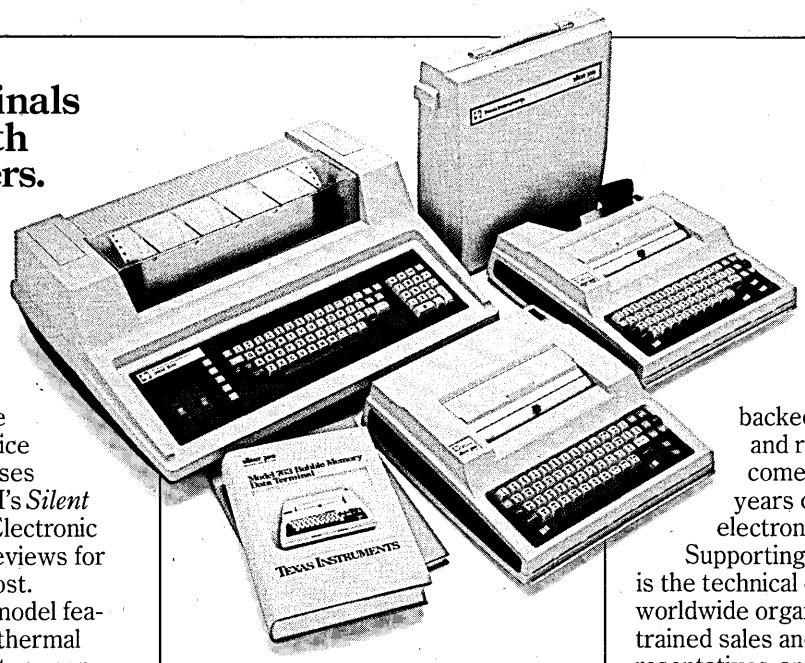
TI's data terminals top the list with industry leaders.



TI data terminals have been the industry's choice for years. Now businesses worldwide are giving TI's *Silent 700** and OMNI 800* Electronic Data Terminals great reviews for performance and low cost.

Every *Silent 700* model features TI's field-proven thermal printhead for 30 characters-per-second virtually silent printing. The Model 733 is ideal for businesses needing the performance of dual magnetic tape cassettes with off-line storage. The Model 743 Keyboard Send-Receive Data Terminal tops the list for low-priced data terminals and is ideally suited for stationary computer input/output applications. And our Model 763's built-in nonvolatile bubble memory recalls locally-stored data, cutting down on computer-use time.

Businesses on the move are choosing *Silent 700* Portable Data Terminals as compact traveling companions. The Model 745 Portable Data Terminal weighs only 13 pounds and uses a standard telephone and electrical outlet to communicate with a host computer. The lightweight Model 765 Portable Bubble Memory Data Terminal takes orders all day, and can then save on communication costs by transmitting at night when phone rates are lower.

The new 780 Series Data Terminal models feature TI's state-of-the-art dual-matrix printhead for 120 characters-per-second virtually silent thermal printing.

The OMNI 800 Family impacts businesses with a collection of standard features, like optimized bi-directional printing speeds of 75 or 150 characters-per-second, and adjustable wide carriages that take the effort out of handling multiple forms. From the reliable Model 810 RO Printer, known for quality performance, to the flexible Models 820 KSR and 820 RO, the OMNI 800 Family provides quick responses to your impact printing needs. Rounding out the family, the cost-efficient Models 825 KSR and 825 RO offer the novel feature of upgradability.

TI is dedicated to producing quality, innovative products like the *Silent 700* and OMNI 800 Electronic Data Terminal Families. And TI's hundreds of thousands of data terminals shipped worldwide are backed by the technology and reliability that comes from over 30 years of experience in the electronics industry.

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. That's why TI has been appointed the official computer and calculator company of the 1980 Olympic Winter Games.

Every member of TI's best-selling *Silent 700* and OMNI 800 Families is ready for immediate off-the-shelf delivery. And our nationwide sales representatives and Authorized Distributors can advise you about quantity discount structures for additional cost savings.

For more information, contact the TI sales office or Authorized Distributor nearest you, or write Texas Instruments Incorporated, P.O. Box 1444, M/S 7784, Houston, Texas 77001, or phone (713) 937-2016.

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CIRCLE 169 ON READER CARD

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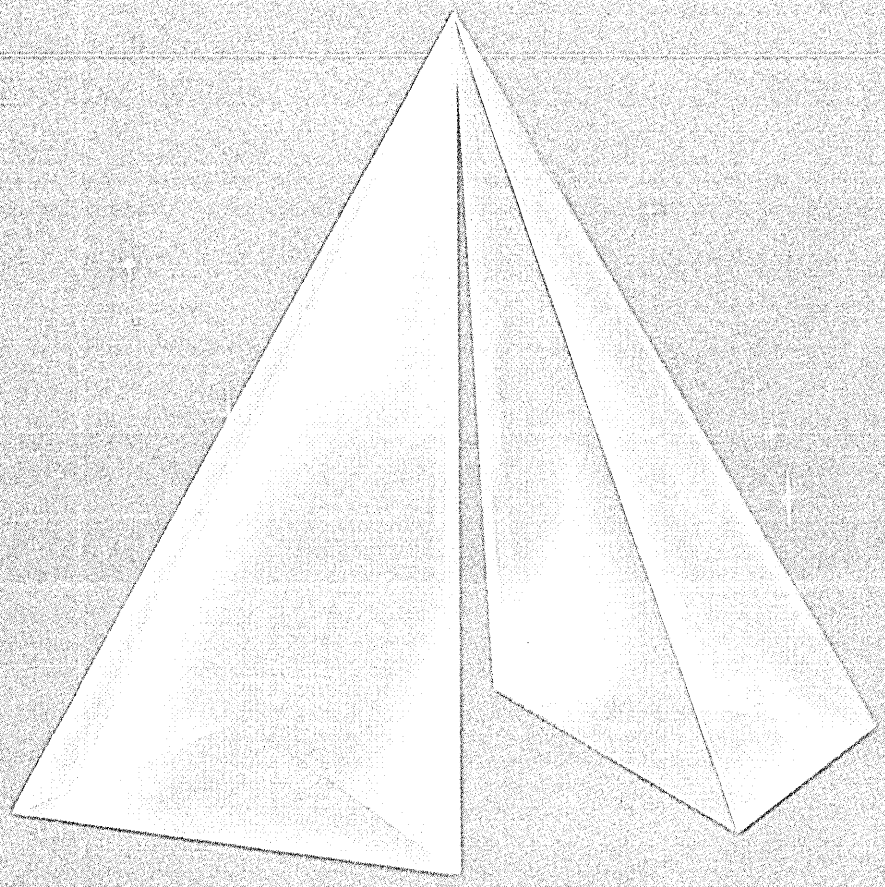

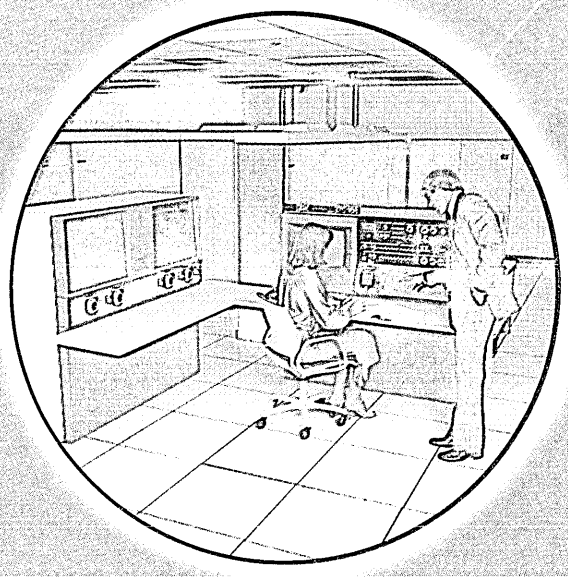

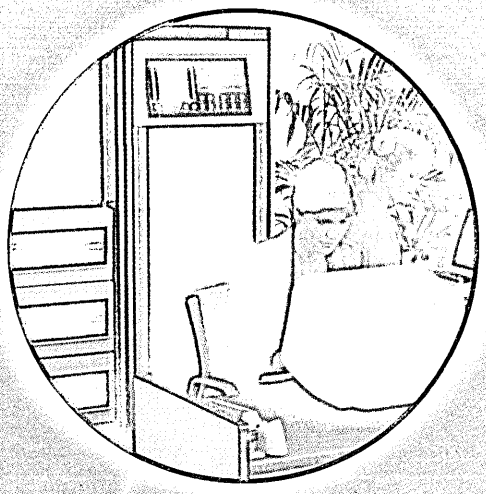

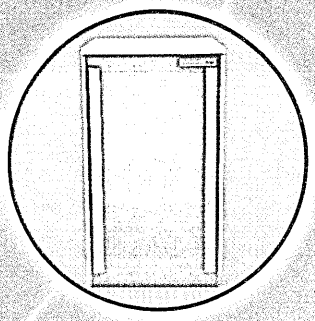

Paradyne's PIXNET™ is an innovative approach to data communication networking and provides simplistic solutions for complex networking problems. PIXNET enables its users to establish or expand data communication networks in a modular fashion, easily implementing those capabilities which fulfill their needs, while providing a truly Coordinated Network Architecture™.

PIXNET's major strength is the simple and efficient transmission of information between a terminal and processing elements. The burden of polling, error detection and correction is eliminated, giving remote users the added benefit of improved response times.

PIXNET's design philosophy allows all devices within the network to appear to the host processor as locally attached. Data is sent and received under complete control of PIXNET's local control unit (LCU), which interfaces to the host's data channel, providing processor to processor and processor to terminal communications. Distribution of data is totally transparent to the host processor, resulting in reduced processor overhead and increased efficiency.

To provide the link between LCU's and remote sites, PARADYNE has implemented synchronous data link control (SDLC) line protocol. PIXNET's SDLC adds additional efficiency because its unique data compression routines result in higher performance throughout the network. The compression scheme is transparent to any combination of device addresses or user data. Thus, the user can expect a significant reduction in the number of bytes transmitted.

Intelligence is placed in PARADYNE's network control units (NCU's), which are positioned at key locations throughout the network. The NCU is minicomputer based and is responsible for all network traffic, providing multiple application access, multiple CPU access, application switching, alternate routing and line concentration. The NCU permits total network control, independent of host processors.

PARADYNE's remote control unit (RCU) provides the interface between the PIXNET communications system and PARADYNE or IBM peripherals located at sites away from the processor. The RCU contains integrated controllers that support PARADYNE card readers, line printers, magnetic tapes, diskettes, 3270's or a hard copy console. Finally the RCU can duplicate the IBM multiplexer channel and allow IBM peripherals to be supported.

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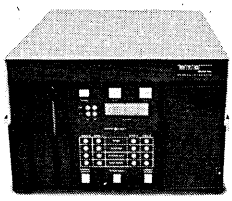
If you have a data system or are thinking about installing one, we're the people you really should get to know.



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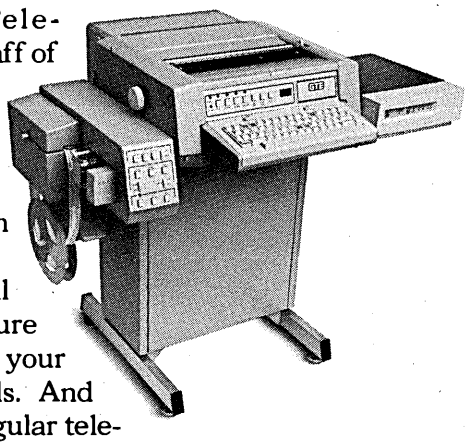

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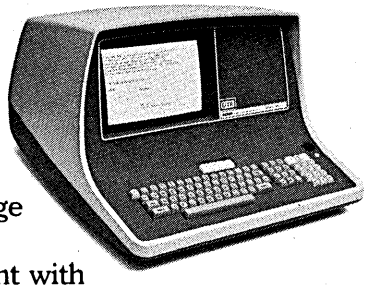

Of course, there's never any extra charge for their services.

Make an appointment with a General Telephone data specialist today. You'll find it's like putting a consultant on your staff without putting him on your payroll.

We keep you talking.

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CIRCLE 110 ON READER CARD

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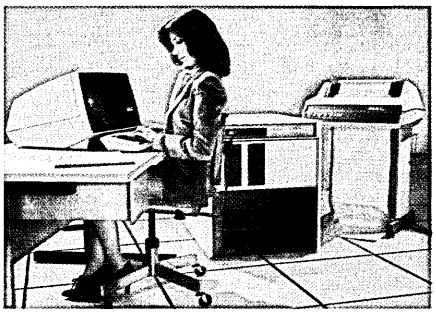
The Information Controller



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Utilizing these systems, they have reduced order processing time at the central office from days to hours. Production efficiency has improved by allowing plant managers to analyze machine operations on a daily basis, and tighten controls on raw material ordering and product shipping.

In short, MDS SERIES 21 Distributed Data Processing Systems have substantially helped improve this company's overall information management–as they have in many industries–worldwide.

Communications capabilities, the flexibility to do multiple jobs concurrently, local programming capability and expandable modular design are just some of the advantages MDS SERIES 21 Systems offer... there are many more. Let MDS show you.

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CIRCLE 116 ON READER CARD

HARDWARE

OFF-LINE

It's April, the traditional time of year for our editorial staff to toss out the dandruff shampoo, and turn flaky. Unfortunately, most of us are too tired (from our day to day duties of shaping the computer industry) to make up funny stories for our readers. So, we'll share with you a few (supposedly serious) excerpts from press releases. To spare the guilty any embarrassment, we'll leave out the names; anyone wishing to claim his or her quote is more than welcome to write a letter to the editor.

". . .for the immediate future apparently there are very few hardware technological breakthroughs or innovations scheduled by computer vendors or their suppliers. . ."

"This complicated machine. . . is well suited for academic applications."

"The standard is intended to be a living document. . ."

". . .is proud to announce the immediate availability of the first and last computer system many small businesses will ever need. . ."

"If people were as coordinated as the finest computers, they would be unable to walk and think at the same time."

Puns, it has been said, are the lowest form of humor, unless, of course, you thought of them. We rather wish we had been first to use "lush vineyard." Then there are the humorous images that defy classification: an "infant (but lusty) industry."

COLOR VIDEO CARDS

Addressing the PDP-11 and LSI-11 market, this vendor has developed video display refresh memory boards and frame grabber boards for capturing and digitizing single refresh frames of video input. The RGB-256 contains a 256 by 256 by 4 bit refresh memory for displays; it is available with NTSC (American) or PAL (European) grey scale and color encoders.

Up to 16 shades of grey or colors can be displayed. The RGB-256 cards drive standard monitors via a 75 ohm co-ax cable; provision is made for synchronizing the output signal to other video signals. Two RGB-256 cards can be "stacked," providing 8 bits per pixel, or 256 colors, or shades of grey.

The frame grabbing FG-01 contains a 30 nsec per conversion video A/D converter, allowing real-time digitizing of live video images. The FG-01 is available in three versions, with four, six or eight bits of resolution per pixel. The FG-01 feeds its digital output to one or two RGB-256 boards, depending on the resolution required (six or eight bit resolution requires two RGB-256 boards). Issuing a "grab" command during the video signal's vertical blank period causes the next frame to be grabbed (digitized).

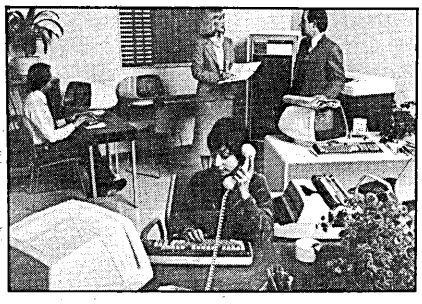
PDP-11 versions plug into the Unibus, LSI-11 versions plus into the Q-bus. A prefix of "U" or "Q" identifies the interface required. Pricing for the video refresh memory (U or Q) RGB-256 starts at $1,395; (U or Q) FG-01 frame grabbers sell for $795 (4 bit resolution), $1,295 (6 bits), and $1,995 (8 bits). These are all quantity one prices. MATROX ELECTRONIC SYSTEMS, LTD., Quebec, Canada.

FOR DATA CIRCLE 305 ON READER CARD

DISKETTE SUBSYSTEM

The double-sided DSD 480 diskette subsystem is said to be compatible with all IBM and DEC formats, including the IBM double-density, double-sided format. The DSD 480 uses both sides of an 8 inch flexible diskette; formatted capacity is 1MB per diskette. The unit has two drives, for a total on-line capacity of 2MB. The units are hardware, software, and media compatible with DEC LSI-11 and PDP-11 computers; the unit features an integral hardware bootstrap, off-line diskette formating, and "Hyperdiagnostics," a diagnostic library for self-testing the unit off-line. A single DSD 480 sells for $4,495. DATA SYSTEMS DESIGN, INC., Santa Clara, Calif.

FOR DATA CIRCLE 308 ON READER CARD

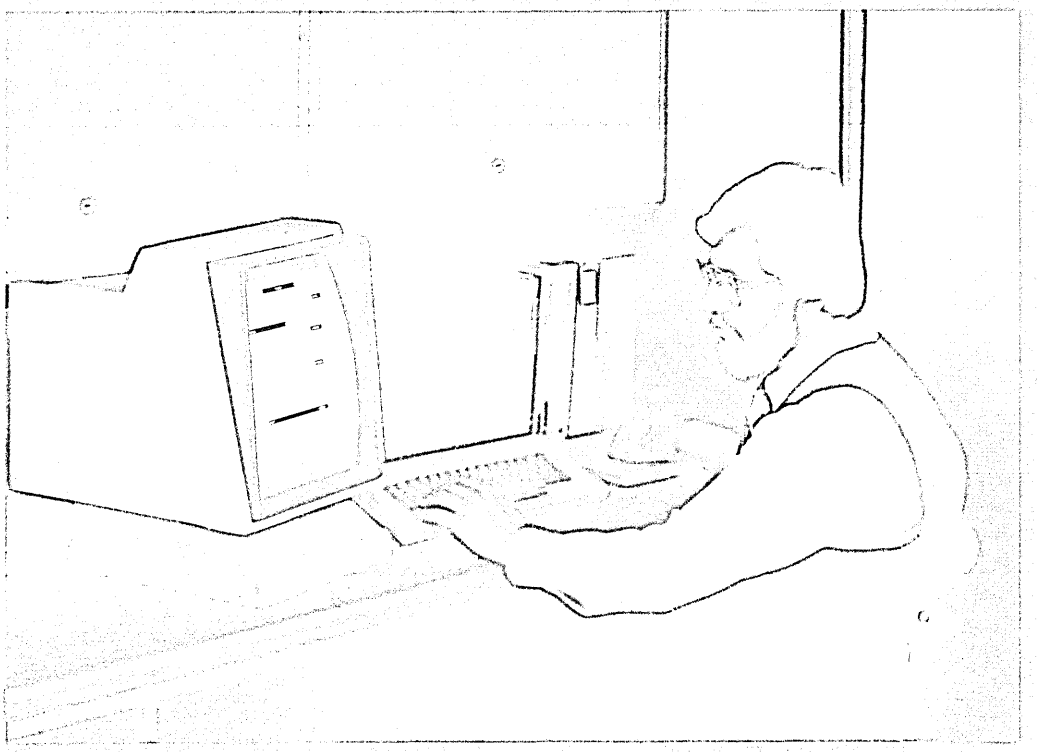


SMALL SYSTEM

Intended for use in small businesses in the $5 million to $20 million range and in field locations of larger concerns, this vendor's CS/50 small business systems support local applications processing and communications with other systems in a network. Available in three basic configurations, the CS/50 can support up to nine interactive terminals, up to 760MB of disk, and 600 lpm and 900 lpm printers. Present users of the vendor's CS/40 systems can upgrade to a CS/50, and CS/50s can be upgraded to the top of the line CS/60 if desired. To be sold to systems suppliers and end users alike, the CS/50 is expected to be used for such typical applications as order entry processing, inventory control, and general accounting. The system also supports program development and communications with mainframes, using HASP II and RJE 80 (2780/3780) protocols.

The CS/50 runs the Interactive COBOL Operating System (ICOS) that supports an interactive version of ANSI '74 COBOL with screen formatting and file management capabilities. An entry level CS/50 system, dubbed the Mod C3 system, includes three Dasher crt terminals, processor with 64KB of memory, 20MB cartridge disk subsystem, a diskette drive and a 60 cps Dasher terminal printer, sells for $38,350, including a license for ICOS and utilities. The same system with a 12.5MB Winchester disk with integral diskette for backup in place of cartridge disk is $32,450. A full-blown Mod C6 with 128KB of memory, five

A Personal Computer for Professionals



- Microprogrammed processor with language directed architecture
- 256K byte memory
- 12M byte disk
- Interactive Graphics Display
- 10M bit Packet Stream Network
- Keyboard and Touch Tablet
- Speech output
- RS-232 and GPIB interfaces

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The End of Boom and Bust Computer Resources. Because Perq provides compute power on a per person basis, installations can be expanded incrementally. No need to buy excess hardware to allow for growth, no delaying until your system is saturated before upgrading. Interactive Graphics and High Quality Text for all. Perq's 768 x 1024 point raster scanned display gives each user full graphics capability, plus high resolution, multiple font, proportionally spaced characters.

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15213

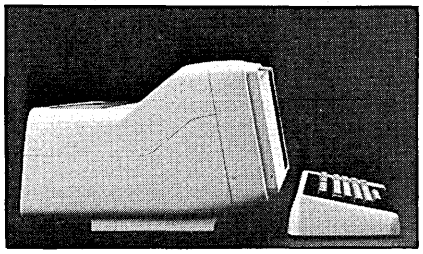
CIRCLE 117 ON READER CARD

tubes, 50MB of disk, mag tape, 300 lpm printer, synchronous communications line, and RJE 80 communications software sells for $76,050. Deliveries are quoted at 120 days. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 317 ON READER CARD

INTELLIGENT TERMINAL

This company, founded in Australia and recently relocated in Silicon Valley, has introduced its 4500 Series smart terminals for use in distributed processing networks or standalone processing. The stylishly packed terminals use a 4MHz Z80 microprocessor that can address 64KB of memory; with bank switching the 4500 can support up to 256KB of memory. The terminals have



a 16KB buffer for display and I/O; the display format is 25 lines of 80 characters, with a 256 character programmable character set. RS232 synchronous or asynchronous communications are provided at data rates ranging from 75bps to 19.2Kbps. Full modem controls and parallel interface options are available, as are protocol options for IBM, Honeywell, Burroughs, NCR, DEC, ICL, HP and other communications disciplines. Dual minifloppy disk drives provide a storage capacity of 983KB. For local processing, the 4500 can accept down-line loaded programs from a host, or locally developed programs written in COBOL, BASIC, or assembler; an editor and debugger also are offered. In a typical configuration consisting of keyboard/display unit, 64KB of memory, dual minidiskette drives, operating system software, utilities, BASIC, on-site setup and training, and one communications protocol, the 4500 sells for $6,100 per unit, in orders of 20 units. ECS MICROSYSTEMS, San Jose,Calif.

FOR DATA CIRCLE 307 ON READER CARD

MINI FLOPPY

The model 9408 single-sided 5¼ inch floppy diskette drive is a recent addition to this vendor's line of peripherals for oems. The 9408 is offered in both single- and double-density versions, having formatted capacities of 71.6KB and 143.3KB, respectively. The drives have "industry standard" mechanical and electrical interfacing requirements, as well as IBM format compatibility. In singles, 9408 pricing starts at $350. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 314 ON READER CARD

HARDWARE SPOTLIGHT

64-BIT ATTACHED PROCESSOR

The FPS-164 is a 64-bit pipelined floating point processor that functions essentially as a "subroutine box" attached to larger minis and mainframes. Rumors of its introduction have been in the wind at least since last NCC, and it's at this year's NCC in Anaheim that the public will have its first opportunity to "kick the tires."

Based on the experience gained by the vendor with his existing 38-bit line of "APS" (the term is used loosely with three meanings: array processor, arithmetic processor, and attached processor), the 164 goes beyond the vendor's existing line, offering increased precision, greater memory capacity, integer arithmetic, and additional instructions that leave one with the impression that a multitasking operating system is in the offing.

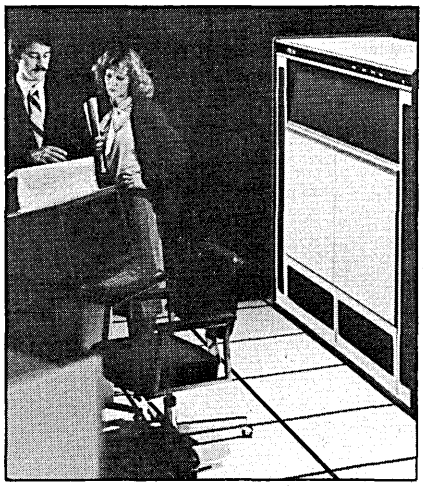
Vendor spokesmen made several analogies, comparing the 164 and large scale scientific processors with the emergence of minicomputers as an alternative to byte-shuffling mainframes. A multitasking operating system combined with an oem's creativity in designing a suitable front end (the 164 operates only in conjunction with a host) may make the 164 the basis for a relatively inexpensive alternative to large number crunchers such as Control Data's 7600. The vendor also suggests, based on discussions with current key customers, that the 164 will sell as well as, or better than, the 38-bit line, of which more than 1,000 have been delivered. The marketing department says that first year production could sell out in as little as three months.

In addition to its larger word size, the 164 is physically the largest of this vendor's processors, occupying two freestanding, shoulder-high bays. As with the 38 bit AP-120B, the 164 has a 167nsec clock and memory cycle time, and a maximum execution throughput rate of 12 million floating point operations (MFLOPS) per second. Programmers already familiar with the 38-bit product line should be able to come up to speed on the 164 in short order, as the supporting software (host-resident APEX operating system, utilities, assembler, and mathematical libraries) is based on the existing 38-bit software offerings. One notable exception is the FORTRAN cross-compiler: the 164's compiler has been updated in light of the FORTRAN-77 standard. The compiler is meant for expressing computational activity; I/O functions are left to the host.

The 164 shares other attributes of the vendor's earlier offerings, at the same time offering features to increase flexibility and circumvent limitations that may have proved troublesome to users with large number crunching applications. The 38-bit line had separate program and data memories; the 164 combines the two. Whereas the earlier machines were limited to a 4K word program memory and 1M words of data memory, the 164 currently supports up to 1.5M words of combined data and program memory. A 1K word instruction cache speeds program execution on the 164. As denser memory chips become readily available, the 164's capacity can grow, up to its maximum addressing range of 16M words. (With 64K chips, the 164 could support 6M words.) An independently addressable 32K word table memory includes commonly needed constants in 5K of ROM and room for additional RAM to hold constants specific to the user's needs.

Four classes of interrupts have been implemented: I/O, exception, fatal, and trap. Additionally, base and limit registers are provided for instructions and data, and privileged instructions have been added.

The actual arithmetic processing of the unit is built around multiple data paths feeding a two-stage pipelined adder, a three-stage multiplier, and a 32-bit integer ALU for maintaining indices and the like. The 64-bit floating point format consists of



an 11-bit exponent (range $10^{\pm 308}$) and a 53-bit mantissa (for accuracy to at least 15 decimal digits). A double precision floating point format also is supported, allowing more than 30 decimal digits of accuracy. The floating point adder and multipliers also can handle 53-bit integers and 64-bit logical data.

A microprogrammed host interface handles communications between the FPS-164 and a host, such as a DEC VAX 11/780 or an IBM mainframe. This interface accepts data descriptor blocks (essentially channel control programs) and handles conversion between host and FPS-164 data formats.

Pricing should range from the $200,000 neighborhood to about $600,000, depending on configuration. Preproduction shipments are expected in October, with production shipments slated to begin in February 1981. FLOATING POINT SYSTEMS, INC., Beaverton, Ore.

FOR DATA CIRCLE 300 ON READER CARD

WHY CAN'T MICROPOLIS DO THINGS LIKE EVERYONE ELSE?

To be honest, we could. But our customers have come to expect a lot more from us.

They've come to appreciate our role as a problem solver and a leader in technology responsible for the highest capacity and best performance drives in the industry.

96 TPI is nothing new for us.

Consider the current hubbub about "new" 96 TPI disk drives. You should know that what may be new to our competition is anything but new to us.

After all, we brought the 100 TPI MegaFloppy™ disk drive to the marketplace more than two years ago. And we've delivered more than 50,000 drives already.

To us, a 96 TPI drive is no big deal. So for the customer who's looking for a double track drive offering compatibility with 48 TPI drives, Micropolis can deliver.

Think of us as double headquarters.

We should also mention that our double track disk drives give you all the storage capacity of an 8-inch floppy in the body of a 5¼-inch floppy. And with our double head version, you get up to 1.2 megabytes. That's more than ten times the capacity of other 5¼-inch floppies.

But our innovations don't stop there. Over the years, many of our ideas have gone on to become industry standards. And many more will.

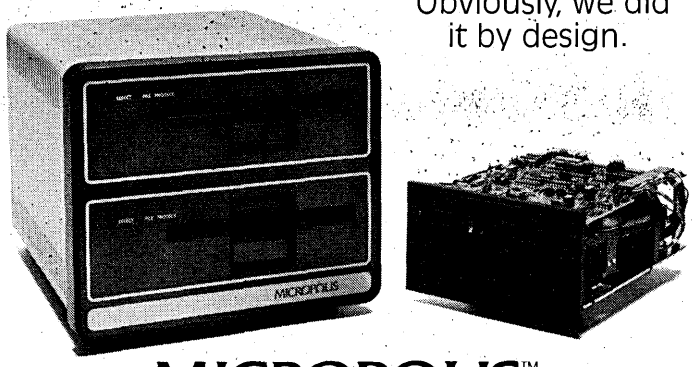
Things like stainless steel, precision-ground lead screws instead of cheaper, less reliable plastic positioners.

We also developed a special disk centering mechanism that is the most accurate in the industry.

And who do you think successfully adapted Group Code Recording technology to the floppy disk drive industry? None other than Micropolis.

Remarkable as our technical achievements may be, some people still wonder how we got to be number two so rapidly in such a fiercely competitive business.

Obviously, we did it by design.



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CIRCLE 118 ON READER CARD

HARDWARE

MODEM

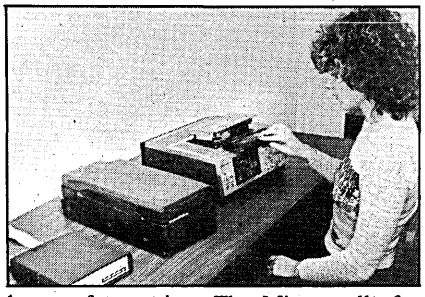
The M103 is an originate-only modem compatible with Bell 103/113 data sets. FCC approved for direct connect to the telephone

network, the M103 uses a conventional RJ11C modular phone jack. Terminal interfacing is RS232 or 20mA current loop. The M103 operates over ordinary phone lines at speeds of up to 450bps. A single M103 sells for $185, with discounts for quantity purchases. MODTECH, INC., Livermore, Calif.

FOR DATA CIRCLE 309 ON READER CARD

WINCHESTER BACKUP

This supplier of 8 inch Winchester disks for personal computers has come up with an intriguing solution to the problem of backing up and restoring the contents of its fixed disk drives. The Mirror, as it is known, provides an interface between the popular microcomputers supporting the vendor's disk subsystems and commercially available video cassette recorders using VHS, Beta, or U-Matic tape formating. A standard video cassette is said to have a capacity of 100MB; backing up an entire 10MB disk is said to take less than 10 minutes. Mirror includes CRC error detection; the vendor estimates an error rate of one error per 15,000

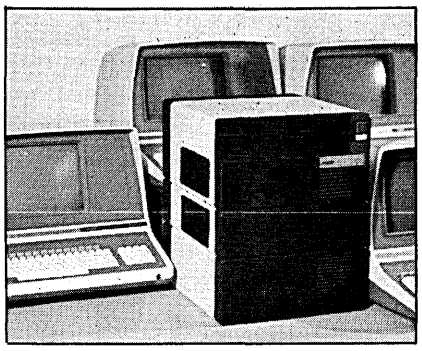


hours of operation. The Mirror sells for $790, and the customer must supply the video recorder. CORVUS SYSTEMS, San Jose, Calif.

FOR DATA CIRCLE 311 ON READER CARD

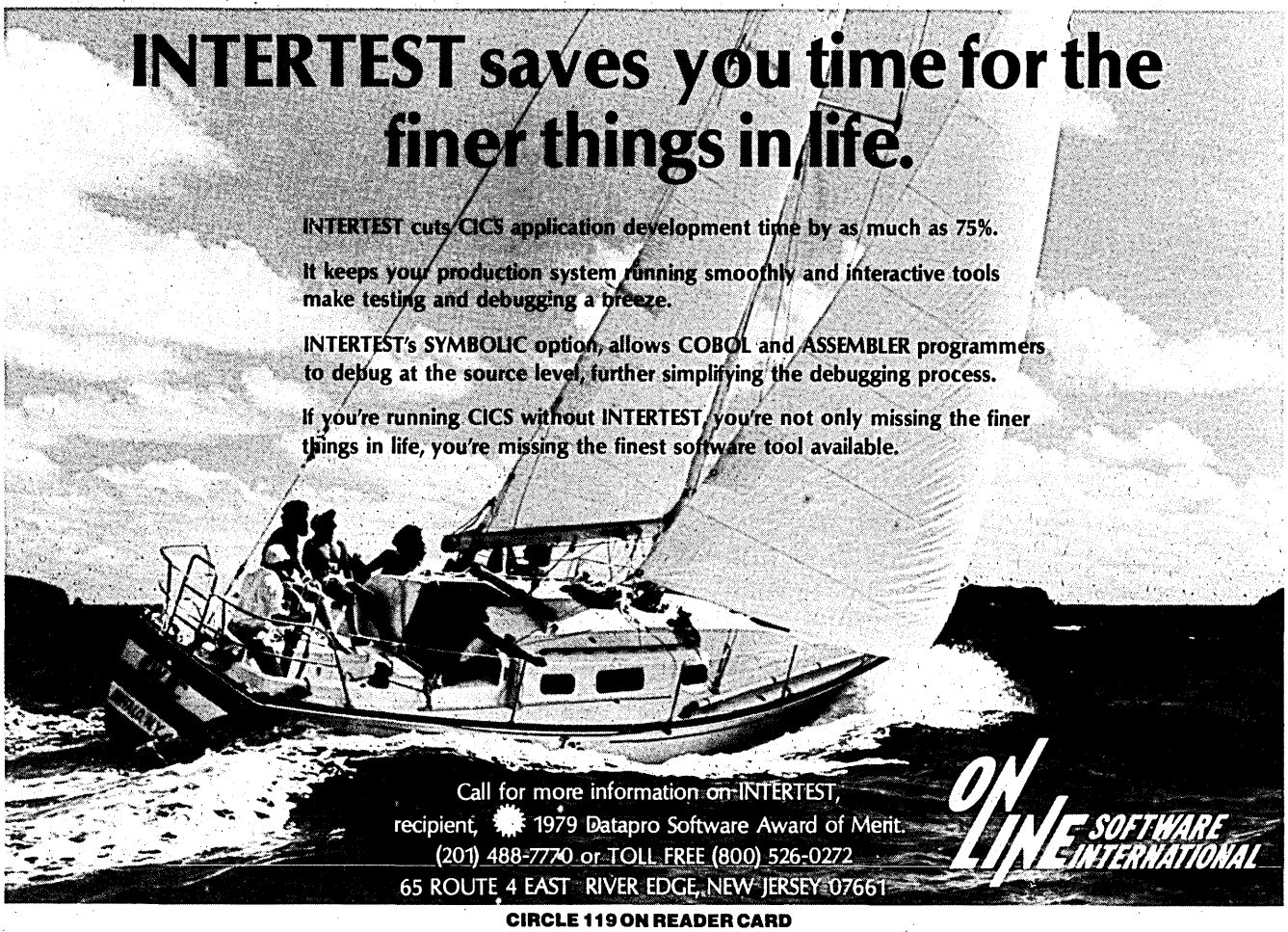
SMALL BUSINESS COMPUTER

This well known crt terminal manufacturer has moved into the small business computer market with the introduction of a modular microcomputer system, dubbed Multivision. The basic building block of the Multivision system is a 64KB microcomputer



packaged with dual minifloppies for 700KB of diskette storage; this configuration, known as Multivision 1, sells for $3,785. With the addition of a display terminal and a printer, the system can handle a small business's accounting and word processing needs. Multivision 2 comes with either 5MB or 10MB of 8 inch Winchester disk storage. Multivision 3 comes with four terminal ports and provision for up to 256KB of memory.

The Multivision processors run a CP/M-compatible operating system; up to four applications can run on the Multivision, using either minifloppies or hard disks for file access. The resident part of the operating system occupies one 16KB bank of memory. Each user can have up to 48KB of memory, with the operating system using



CIRCLE 119 ON READER CARD

While you're waiting, Wang's VS could be working.

If you're waiting for an IBM System 34 or 38, you've got a lot of time on your hands. So why not take a few minutes and closely consider just what you'll be getting a year or two down the road. Most importantly, consider your options.

Options like Wang's VS virtual storage computer, for instance. Compare the Wang VS and the System 34/38. We think you'll find the VS consistently comes out on top. The VS will accept your RPG programs just like a System 3, with RPG II and CCP conversion aids available to protect your System 3 software investment. With Wang's VS, you also get interactive RPG II programming with compilations 5-10 times faster than those on the System 34. Extensive program development aids. On-line and batch operations. Telecommunications. COBOL and BASIC. A fully supported data management system. Up to 4.6 billion bytes of fixed and removable disk storage. And a data compaction feature that could cut your storage requirements by at least a third.

Best of all, Wang's VS gives you the flexibility to grow from a minimum VS configuration to a full-blown system with the power of a high-end 370, without reprogramming or major equipment swap-outs. Plus the ability to do data processing and word processing at the same Wang terminal. *All this now,* for no more than you'll pay for a System 34 or 38 next year.

If your data processing problems in the eighties won't wait for solutions, call or write for more information on the Wang VS family. Better yet, ask for a VS demonstration. We can *show* you what we've been talking about — today.

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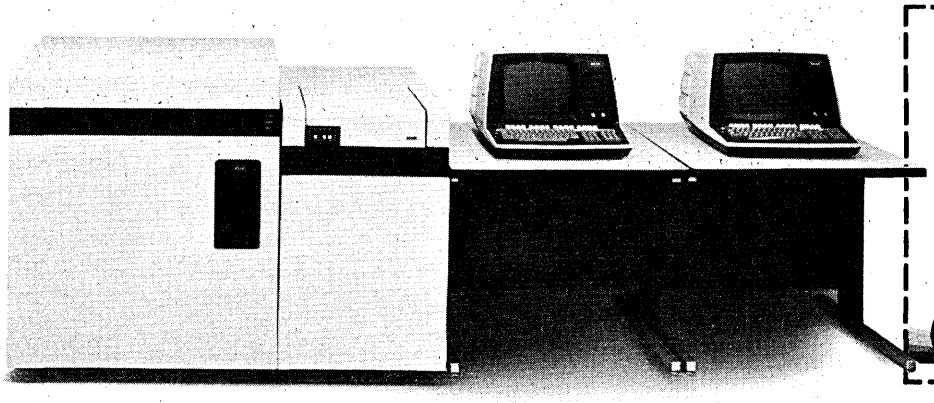

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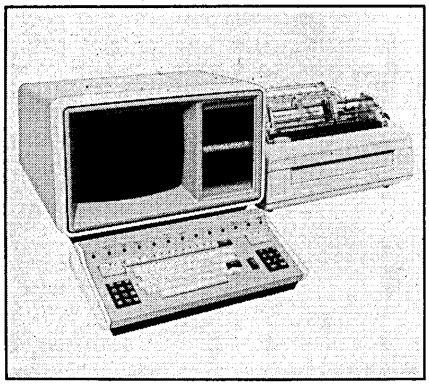
CIRCLE 200 ON READER CARD

bank switching to avoid swapping users' programs between disk and main memory. Applications may be developed in BASIC and other CP/M-compatible languages, including PASCAL, COBOL, and FORTRAN. BASIC is implemented as an interpreter and as a source-code compatible compiler. Applications packages are offered, including accounting functions and word processing. A Multivision 2 with 5MB of rigid disk, sells for $7,995; and a Multivision 3, with 256KB of main memory, four terminal ports, and one printer port, lists at $12,885. APPLIED DIGITAL DATA SYSTEMS INC., Hauppauge, N.Y.

FOR DATA CIRCLE 312 ON READER CARD

DUAL FUNCTION SMART CRT

The model 700/RTE is a smart terminal capable of standalone word processing as well as communications with a host computer. Dual minifloppy drives are included, each with a capacity of 80KB. In word processing mode, the programmable 700/RTE forms characters on an 8 by 12 dot matrix, allowing a screen capacity of 20 lines of 80 characters. For communications applications, the terminal uses a smaller dot matrix, allowing the screen to display 24 lines of 80 characters. Both asynchronous and synchronous communications are supported with a variety of protocol emulators to suit the customer's host. A 700/RTE with a 55 cps daisywheel printer sells for $8,000. MEGADATA CORP., Bohemia, N.Y.



FOR DATA CIRCLE 315 ON READER CARD

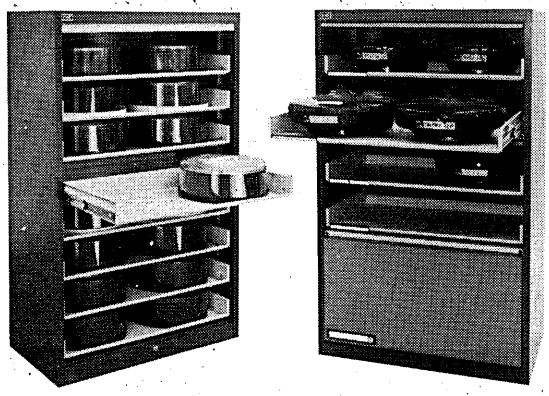
ADD-IN MAINFRAME MEMORY

Second-source add-in memories for minicomputers have been around for years, as have add-on memories for mainframes. Now this add-on memory maker has seen an opportunity to offer mainframe memory for IBM 303Xs, and certain 370/158s and 168s, at 60% of IBM's price: the vendor is offering add-in modules that fit right into IBM's backplane. Using denser chips (64K) each of the vendor's Stor/3000 memory modules contains four times the memory IBM packs on a module. And, if the vendor encounters availability problems with the 64K chips, there's an alternate design using either 32K or 16K chips. Using the vendor's modules also requires an address and buffer board to interface to each specific mainframe model. There's an advantage in this approach: a user facing an upgrade can take his existing Stor/3000 memory modules, add the appropriate address and buffer board,and have additional memory that will work with his new processor. Stor/3000 allows memory expansion to 16MB on 303Xs and 168s; 158 memory can be expanded to 8MB. A megabyte of Stor/3000 memory sells for

$30,000, including installation and first year's maintenance. CAMBRIDGE MEMORIES, INC., Waltham, Mass.

FOR DATA CIRCLE 318 ON READER CARD

DISC PACK FILING



Wright Line's Optimedia® Cabinets provide a safe, convenient, cost effective method of filing all sizes and types of disks. Full suspension roll-out shelves simplify the handling of heavy packs. Custom configurations allow magnetic tape or other media to intermix with disks in the same cabinet. For further information, circle the readers' service number or write: Wright Line, Inc., 160 Gold Star Boulevard, Worcester, Massachusetts 01606.

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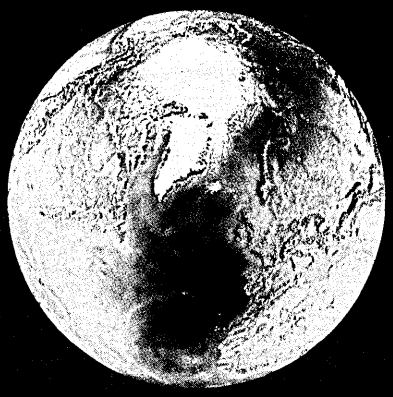

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T-Bar MASS+ is a microprocessor based, state of the art, data communications line accessing system. With T-Bar MASS+, an operator isolates line and equipment faults, restores failed service, reconfigures and expands — MANAGES — your network, using a CRT terminal at one or more dispersed locations.

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SOFTWARE AND SERVICES

UPDATES

Some anecdotes defy verification, yet bear repeating. For instance:

A number of years ago, in a computer center with the then-latest second generation hardware, one job had the whole center in motion. Everything that could move, did move. Tapes spun as printers banged away. Card readers read, while punches punched. And then, it happened. All I/O stopped cold. In a millisecond the room went from a dull roar to silence. The operator took a quick look at his console, only to find the indicator lamps lit in a peculiar pattern: they spelled out "TILT." A second or so later, everything picked up where it had left off, the noise resumed, and somewhere, one programmer chalked one up on another operator.

Operators have been known to get sweet revenge. Take the case of the poor programmer who had to have his project done by the time his boss got in the next morning. Returning to his terminal at three a.m. with his nth cup of coffee, the programmer found the message "SYSTEM GOING DOWN IN 10 MINUTES." He sent a quick message to the operator, asking for more time. "SORRY," was the reply. "WHY?" queried the programmer. "DoD HAS PREEMPTED THE ENTIRE ARPANET," replied the operator. The next morning, long after the operator had stopped giggling, the programmer's boss found him staring catatonically at his terminal, awaiting the arrival of WW III.

And, from the mouths of babes comes the wisdom of a 13-year-old computer hack, who so eloquently opined, "Everyone knows conniving is more effective than planning."

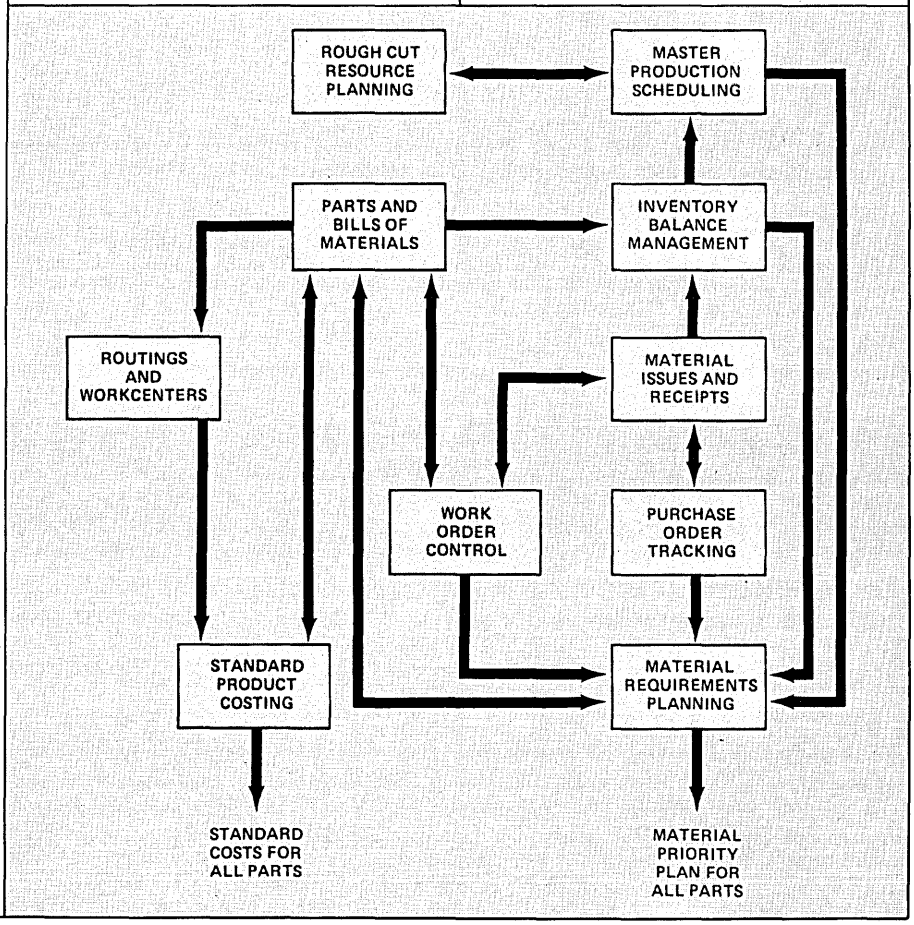
SOFTWARE SPOTLIGHT

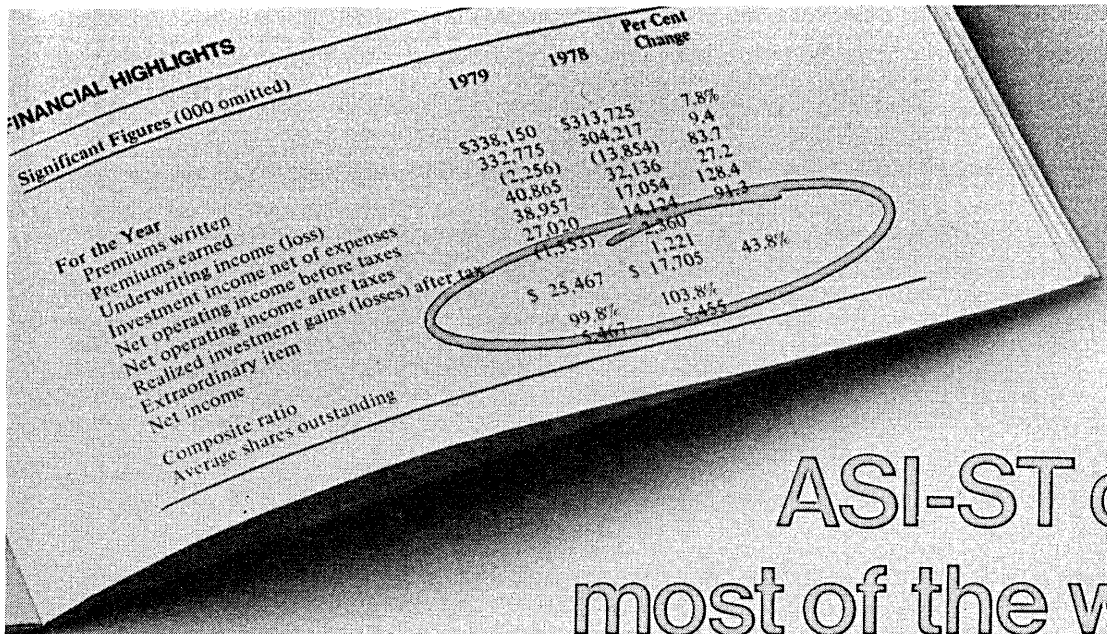
MANUFACTURING SYSTEM

This mini-maker is increasing its emphasis on the manufacturing market. Its first applications software package, MFG/3000, has now been joined by Materials Management/3000. In terms of support, Materials Management/3000 allows customer modification without compromising the vendor's commitment to support the package. The menu-driven package can be installed and tailored on the vendor's 3000-series of computers without resorting to the use of programming languages or professional programmers. Users interact with the online data base oriented system via crt terminals; an applications monitor provides the customer interface, allowing manufacturing managers and their materials control people to handle most implementation and day-to-day operations.

The vendor can offer support for the system and its modifications because customer changes are treated as data, not as reprogrammed code. An "applications dictionary" lets the user define security, data entry screens, HELP messages, report formats, processing sequences and their specifications.

Materials Management/3000 includes a number of materials planning and control tools. Master Production and Scheduling provides both actual scheduling and a simulation capability for evaluating alternative schedules. Bills of Materials handle item details and their interrelationships in product structures. Inventory Balance Management keeps track of inventory balances, provides cycle counting, and tracks inventory locations. Materials Requirements Planning generates materials plans, recommending what, when, and how much to order. Other functions handled by Materials Management/3000 include Rough-Cut Resource Planning, Routings





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By eliminating up to 90 percent of the programming effort usually required to perform data management functions, ASI-ST is saving time and money for hundreds of users. Typical examples:

- COMBUSTION ENGINEERING, INC. (CE) currently executes from 18,000 to 22,000 ASI-ST runs every month. Some runs produce more than 100 reports in a single pass of one or more TOTAL data bases and conventional files.
- Using ASI-ST, AMERICAN EXPRESS COMPANY recently required only four minutes of CPU time to process over 12 million records. AMEX also uses ASI-ST with IMS.
- CORNING GLASS WORKS now executes an average of more than 16,000 ASI-ST runs monthly against TOTAL data bases and standard files.
- UNION CARBIDE's usage of ASI-ST averages over 6,000 runs per month at each of its worldwide data centers where ASI-ST is used with IMS.

Uses Less Machine Time
Although not originally intended to replace higher-level computer languages, ASI-ST can solve 70 to 90 percent of your commercial data processing problems. And ASI-ST can process your IMS or TOTAL data bases more economically — because it uses less machine time. In a single run, for example, it can create and update related or independent files; retrieve, manipulate, calculate, and display data; and generate detail and summary reports. How's that for versatility — and efficiency?

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- IBM 360/370, AMDAHL, ITEL
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and Workcenter, Materials Issues and Receipts, Work Order Control, Purchase Order Tracking, and Standard Product Costing.

The nontechnical user is free to customize data item definitions, to define the forms that will appear on various terminals' screens (both entry and report formats), to limit menu selections to various users, to define how the system will print reports, to set security limits, and to modify any of these specifications as needs dictate.

A manufacturing industry specialist is available to help customers plan and install their systems; this specialist will continue to be the key vendor contact for later support services. The manual set is designed to allow customization for each installation. Telephone support is said to handle most problems, and on-site service also is available when needed. The package is priced at $25,000 for the first system and $5,000 per copy for each additional system. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 329 ON READER CARD

TEXT EDITOR

TSedit is a text editing program written in time-shared DIBOL for use under CTS-300. Said to duplicate the command structure of DEC's EDIT program and offer almost all of EDIT's functions, TSedit runs concurrently with other programs (EDIT operates in single user mode). TSedit adds command file processing, program chaining, and other new facilities. TSedit requires 12K of memory. Supplied as source code on diskette, TSedit carries a one-time charge of $300. For an additional fee, the program can be supplied on other media (RK05, RK06, RK07, and RL01). FUTURENOW SOFTWARE, Orono,

FOR DATA CIRCLE 344 ON READER CARD

INTERNAL READER

Jobs can be submitted from other running jobs using this vendor's Hotreader, an internal reader for VS1 systems. This dependent job scheduling facility is said to reduce operator errors and provide VS1 installations with facilities available in ASP, HASP, JES2, and JES3. Hotreader reportedly increases efficiency by reducing job initiation overhead; the package allows job submission from GIS, Panvalet, and The Librarian. Benchmarks run by the vendor show Hotreader running significantly faster than SVC34; an example of 100 jobs took SVC34 fifty minutes on a 370/145, while Hotreader took only three minutes on a 370/138. Installing Hotreader takes only a simple link-edit. The package is priced at $4,000. SOFTWARE MODULE MARKETING, INC., Sacramento, Calif.

FOR DATA CIRCLE 339 ON READER CARD

EDITOR AND LIBRARY SYSTEM

Series 80 LMS-II is an interactive on-line program development and testing tool; said to be a "completely new product," LMS-II replaces the vendor's Library Maintenance System. (Conversion utilities are provided to migrate from the old system to the new.) Capable of running on IBM mainframes ranging from the smallest 370/115 up to the largest 303X, LMS-II is fully compatible between OS and DOS; it can access Panvalet and The Librarian standard system libraries.

Said to be designed from the ground up as an on-line system (as opposed to being an adaptation of a batch program), LMS-II has on-line printing capabilities, logical deletion, complete audit trail and restore facilities, and full recovery from the task/terminal level. Programmers can access and manipulate all programs, subject to the user's security limits. The LMS-II editor provides full-screen edit capabilities, allowing the user to ammend source programs and data stored in the system. Functions include string search and replacement and line updating. The user can page forward or backward to review programs and data.

Jobs can be entered directly into the system from LMS-II. Compilations, core dumps, and test results can be viewed on-line, allowing the programmer to cancel un-

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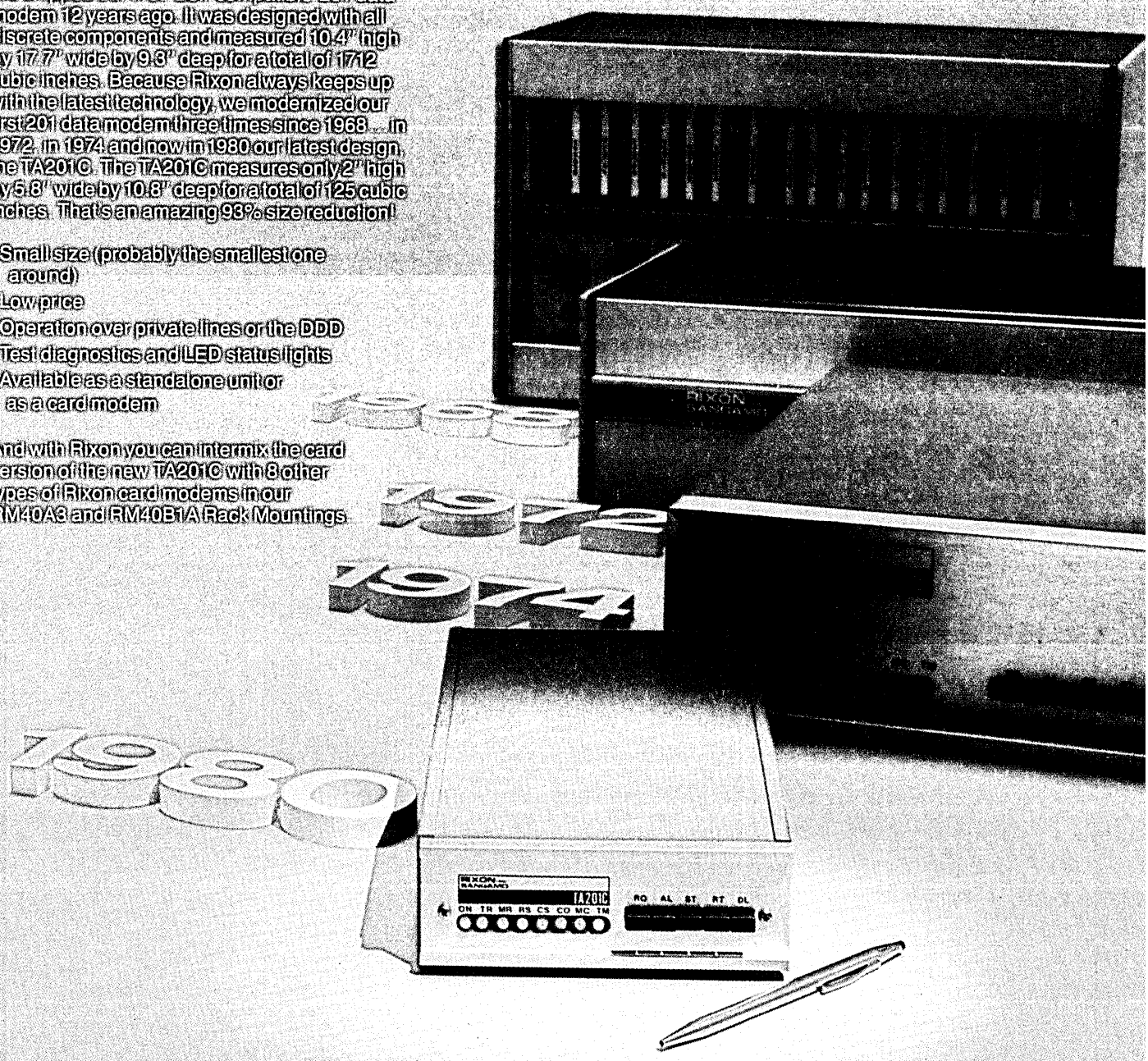
- Low price
- Operation over private lines or the DDD
- Test diagnostics and LED status lights
- Available as a standalone unit or as a card modem

And with Rixon you can intermix the card version of the new TA201C with 8 other types of Rixon card modems in our RM40A3 and RM40B1A Rack Mountings.



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The RIXON TA201C Data Modem is manufactured under license from Western Electric.

CIRCLE 127 ON READER CARD

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3024

necessary printed output. The user also can request status information, including a list of programs awaiting execution, those running, and jobs waiting to be printed; the operator can change the sequencing of jobs as desired. The OS version of LMS-II sells for $17,500; the DOS version is $15,500. Lease rates are $425 and $375, respectively; annual usage rates are $1,750 and $1,550, respectively. The installation fee for either version is $1,500. CINCOM SYSTEMS, INC., Cincinatti, Ohio.

FOR DATA CIRCLE 334 ON READER CARD

COMMAND LANGUAGE

The same Digital Command Language (DCL) that has been human-engineered for users of VAX/VMS and PDP-11 RSX-11M Plus operating systems now is available to RSX-11M users. This outside software vendor's RSX-11M DCL uses English commands such as COPY, RENAME, ASSIGN, DIFFERENCES, etc. DCL is said to be easy to learn, and easier for users to master than DEC's Monitor Console Routine (MCR) supplied by DEC with RSX-11M. RSX-11M DCL supplements (but does not replace) the MCR routines; the command language runs under RSX-11M version 3.2.

Standard DCL command and file qualifiers are used, and a HELP command provides on-line assistance to the user. Issuing a command with missing parameters causes RSX-11M DCL to prompt for mandatory parameters. Instead of the MCR command PIP TI:=MYFILE, a DCL user commands TYPE MYFILE. Had the DCL user commanded only TYPE, he would have been prompted to specify the files to be output. Command syntax error messages include an error indication and the command reprinted with the error indicated by a pointer. The RSX-11M DCL package goes for $750, including documentation and one-year maintenance. Source code is offered for an additional fee. ANDREW RUBEL & ASSOCIATES, INC., Boston, Mass.

FOR DATA CIRCLE 331 ON READER CARD

CICS AID

CICSFLOW aids in debugging CICS COBOL applications by generating a trace table showing the last 46 to 128 paragraphs executed before invocation of a dump (caused by either an ABEND or programmatic use of the DUMP macro). The module can be used with other teleprocessing monitors as well as in batch programs. In a multitasking environment, CICSFLOW shows the task associated with each paragraph. CICSFLOW is offered as a COBOL source program for $99 for a 99 year lease. MACKINNEY SYSTEMS, Springfield, Mo.

FOR DATA CIRCLE 337 ON READER CARD

TRANSACTION PROCESSING

The Tran-Pro transaction processing monitor, originally operative in the nonvirtual Century Systems environment on the vendor's Century series and 8000-series computers, now runs under the Virtual Resource Executive (VRX) operating system on the vendor's V-8455 and larger V-8000 series systems.

VRX Tran-Pro is a set of modules to handle the complex and time-consuming procedures involved in an on-line, real-time computer network.

Basic modules of Tran-Pro provide for systems security, scheduling, decoding format control, logging messages, and backup/restart/recovery. Tran-Pro provides an interface between on-line data base management systems and applications programs. Simplified systems generation, automatic validation procedures, and more flexible formats have been added to VRX Tran-Pro.

VRX Tran-Pro requires a minimum system consisting of a V-8455 with 512KB of memory. The package is available for a one-time license fee of $25,475, with an annual maintenance charge of $1,500. Under a monthly license fee plan, the software goes for $675 per month, including maintenance. NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 330 ON READER CARD

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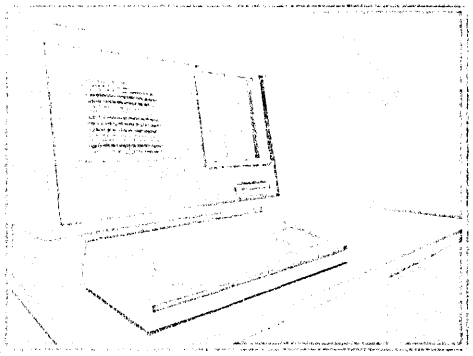

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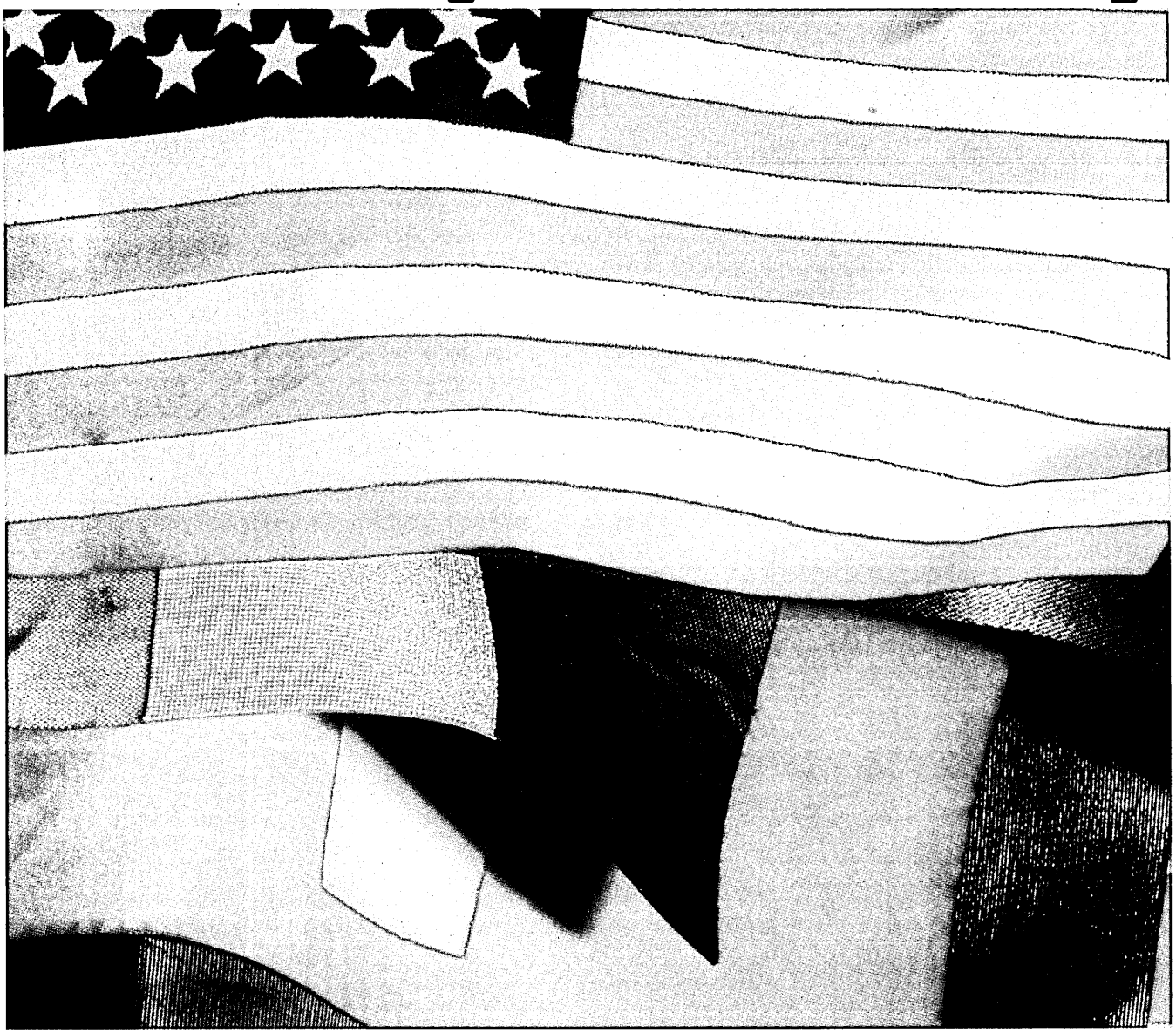

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CIRCLE 130 ON READER CARD

SOURCE DATA

BOOKS

ON THE DESIGN OF STABLE SYSTEMS
by Gerald M. Weinberg and Daniela Weinberg

Gerald and Daniela Weinberg warn readers of their new book *On the Design of Stable Systems* not to be ashamed to confess they do not know exactly what to make of it all.

Apart from being an extremely good defense for any parts of the book that are obscure, this warning is an ill-fitting conclusion to a work that claims at the outset to be a contribution to the development of general systems theory, that "curious and general way of thinking."

What the book is good at, and what Gerald Weinberg's work has always been good at, is the explanation of imaginative approaches to the organization of systems (of humans or of machines). I remember the joy with which I first read Weinberg's *The Psychology of Computer Programming* when I was an operations manager. Here was real material, I thought at the time, with which to rebut the sterile thinking beginning to take root in systems design and system management.

The chapter of *Stable Systems* on "The Search for Regulations" stands out as a prime example of the Weinbergs' imaginative analysis. Yet stable systems, and hence their design, depend on two principles not directly addressed in this book—control, and the understanding that "rational" systems are embedded in a larger system of institutions and values.

Control of a system is essential to keep it from degenerating into chaos and to prevent it from adopting a different set of objectives from those embedded in the control mechanism. (A clear example is an operating system on a mainframe or mini which, if effective, will provide access to processor and peripheral resourses according to the overall priorities of efficiency, and will, therefore, regulate the access each program has to the resources.) We in data processing, know that control is essential. When a leading writer in this field presents a *general* systems theory without an explicit analysis of the function of control, he is treading a very dangerous path indeed.

It is necessary to recognize that any system we deal with, any program we write, any network we build, is embedded in a larger system that includes a set of values. Eminent sociologist Philip Selznick wrote in an seminal work published 32 years ago: "As we inspect these formal structures we begin to see that they never succeed in conquering the nonrational dimensions of organizational behavior. The latter remain at once indispensable to the continued existence of the system of coordination, and at the same time a source of friction, dilemma, doubt, and ruin."

The Weinbergs are very good at presenting *parts* of the dp "system of coordination," but only as a discrete set, at best, of overlapping systems. Aside from holding up the most stupid and inept examples of manipulation for ridicule, however, this book contributes little to the development of systems theory.

Every form of scientific or technical endeavor reveals not only its institutional roots, but also the condition of the science in which it has been bred. As Thomas Kuhn showed in *The Structure of Scientific Revolutions*, there is either a generally accepted framework into which efforts in a particular field fall, or that field is in crisis, with various paradigms conflictingly trying to explain the empirical events that have broken the previously accepted framework. The Weinbergs concentrate on some of the methods of general system design, devoting much of their book to an exposition of a few of the mathematical and logical tools available. But the cases showing these tools in use are all discrete, that is, separate, and few of them mention the "dimensions of organizational behavior" to which Selznick refered, nor is the essential role of control considered.

In avoiding these subjects the Weinbergs reveal that the design of stable systems as a scientific endeavor is in crisis. Disappointingly, they point to few ways in which this crisis can be overcome.

Does it really matter that we in data processing are left contemplating empirical events without an understanding of the values behind them? The answer has to be yes. Indeed, it not only matters now, but will continue to grow more important.

Systems design should provide us with the tools to apply universal methods of abstract representation to a variety of concrete problems. Many of the problems we have in data processing come from the lack of such tools, an inadequacy that forces us back again and again to the specific when the needed approach is the general.

The high order of abstraction we should seek from systems design should also reflect the humans that exist within and on the boundary of the system by allowing for their humanity. There is a grave danger that, instead of doing this, humans will become just another material of systems design. Robert Boguslaw provided a chilling example of this danger when he referred to human beings as "human operating units," and said they are "frequently stupid, unreliable, and limited in memory capacity; but beyond all this they seek sometimes to design their own circuitry. This in a [systems] material is unforgivable, and any system utilizing them must provide appropriate safeguards." Of course, the safeguards will be embedded in the control mechanism.

I would hazard a guess that Boguslaw's approach would horrify the Weinbergs as an example of that heavy-handed approach Gerald so humorously took apart in *The Psychology of Computer Programming*. Yet it is by now surely plain that the work the Weinbergs are offering is an inadequate response to the type of approach I have used Boguslaw to represent.

As data processing penetrates more and more areas of our lives general systems theory must provide an approach that allows people "to design their own circuitry" if it is to avoid playing the role of manipulator. John Wiley & Sons (1979, 353 pp., $21.50).

—Richard Sharpe

COMPUTER FRAUD AND COUNTERMEASURES
by Leonard I. Krauss and Aileen MacGahan

This book is a complete and very readable treatment of some of dp's hottest managerial issues, such as: How can computer-based applications be more secure and error-free? How can an organization protect itself against computer-assisted crime and/or losses resulting from system errors? How can systems be developed to produce results on which management can rely for decisions?

Although the primary focus of the book is the prevention of fraud, the point is made that error-prone systems provide opportunity for fraud. Krauss and MacGahan have thus written this excellent guide for developing accurate, secure, private,

and effective applications. They also explain what controls are necessary in the processing environment to ensure proper use of the application software.

One of the book's strengths is that it presents wide-ranging material in careful definitions and easily remembered lists. Some of the techniques used in program modification schemes, for example, are defined as:

- breakage—siphoning off small sums from numerous sources
- undocumented transaction codes
- balance manipulation
- deliberate misposting
- file modification
- fudging control totals.

Technical subjects, such as encryption and operating system controls, are handled adequately for the book's intended audience of auditors, dp managers and analysts, security people, and financial management. However, the emphasis is clearly on easy-to-implement controls. Seemingly obvious techniques such as rotation of duties, required vacations, and separation of responsibilities have frequently been ignored as organizations rushed to use the latest computer technology. Stories abound in our industry of the programmer who maintained, operated, and distributed the results of his company's payroll system, without taking a vacation, for many years—thus violating every rule established for the prevention of fraud in the manual payroll system.

Computer Fraud and Countermeasures begins with a description of the various ways in which computer systems are used for fraudulent purposes; followed by a description of the control techniques for prevention and detection of fraud or system errors. Everything from establishing an ethical business climate to maintaining output control logs is included, and the approach is practical. All the dp auditor's checklists of questions, for example, are included and explained. We are not only told to maintain a program change log, but are also given examples of the data to be included in the log. While little of this material is new or complex, Krauss and MacGahan present it more completely than many other texts on computer controls and crime.

Legal aspects of fraud prevention and the methods for implementing a loss control program are also discussed. Emphasis is on problems of securing management commitment and staff compliance.

Rounding out the book are useful appendices such as a comparison of commercially available audit software and a sample form to be used when confessing to computer fraud. A more extensive bibliography would have been helpful.

Computer Fraud and Countermeasures covers more substantive ground than most other texts on the subject and usually indicates additional sources of information. It is an excellent book for the practitioner, and may well be used as the basis for an in-house controls course. Prentice-Hall (1979, 509 pp., $28.50).

—Naomi Lee Bloom

MACHINES WHO THINK
by Pamela McCorduck

The Artificial Intelligence (AI) community is a tight knit, comparatively small group of workers, mostly at Stanford, SRI, MIT and Carnegie-Mellon. Connected by the ARPANET as well as by teacher-student relationships, AI can appear as the ultimate "in" group in the exploding world of computer science. To be respected in the AI world you must be named Simon, Newell, Minsky or McCarthy—at least this is what McCorduck would seem to believe. This book is a considerable defense of the group—lengthy, detailed, and sometimes feisty in support of the key workers.

McCorduck begins with elaborate discussions of the varying philosophies toward thinking machines. The opposite ends of the poles are the Hebraic tradition—thou shalt make no graven images—and the

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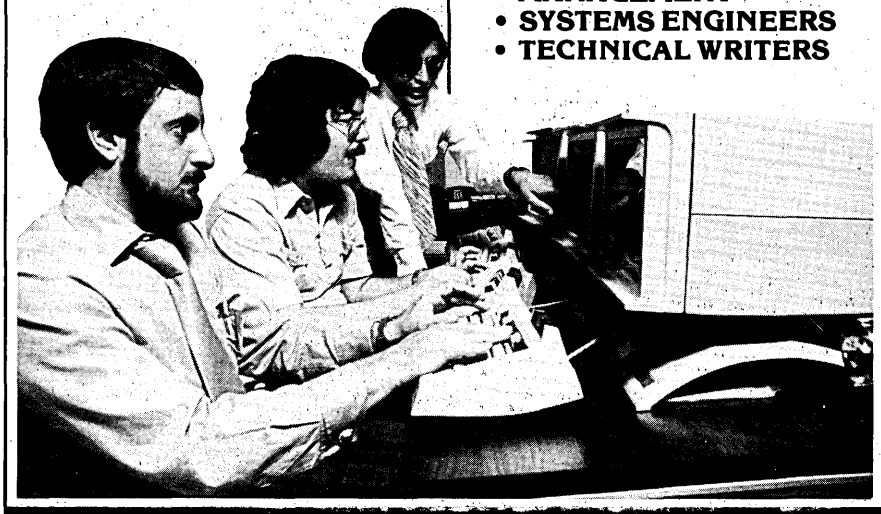

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Hellenic—machines are useful, praiseworthy, and even appealing. An important point, this philosophical distinction, and McCorduck properly raises the ethical issues involved. But is it fair play for an admitted Hellenic to discuss Joe Weizenbaum's *Computer Power and Human Reason* (see Dan McCracken's review in the April 1976 DATAMATION)? McCorduck's philosophy makes an objective analysis of Weizenbaum's Hebraic position nearly impossible.

What makes this whole volume both interesting and infuriating is that McCorduck writes about AI as a passionate believer. The author has connections with the community and has spent a great deal of time with the most important practioners. Since the AI failure rate is high, one wishes McCorduck had spent more time on these failures, clarifying why, for example, a research effort went off the deep end. At the same time, the few great AI triumphs, ELIZA, GPS, IPL-V and LOGO, really ought to get more credit than this book (or the community at large) gives to them and their developers.

As an apologist for AI, McCorduck gives extensive space to the tempest in a teapot controversy surrounding Herbert Dreyfus, author of *What Computers Can't Do* and general troublemaker for the AI crowd. McCorduck may not be aware of it, but fully 99% of the computer industry simply doesn't care about this affair. The rest of the computer world is too busy doing its own work to worry greatly over minor feuds even though the personal disagreements are long and loud.

McCorduck, a professional writer, writes well and has a very special flair for dealing with extremely complex subjects in a popular style. Unfortunately, the editorial process failed to detect many instances of repetitive writing. It is enough to tell readers once that Seymour Papert is from South Africa, or that Newell and Simon did their *Logic Theorist* over Christmas; three times is twice too many. Individuals are institutionally identified over and over again. Biographical materials are in bits and pieces, scattered throughout several chapters. This is particularly disappointing as McCorduck's style when dealing with individuals is so good that one would hope for *New Yorker*-style profiles from this author.

Writing about science is not easy. It is a privilege and a burden of perhaps no more than 1% of those who claim computer science as their discipline. Newell, Simon, et al. have done original, creative and extremely important work leading to increased understanding of human thought processes. The case for some of the hangers-on isn't as clear but the relative percentage of superstars is always small. This volume firmly notes the contributions. While it is probably not sufficiently powerful to cause professional AI skeptics to rethink their positions, if only a few people are moved the volume will have done its work well.

The problem a reviewer is faced with is finding a bottom line for a book. Certainly one is not happy about a book that takes some cheap shots, notably at Joe Weizenbaum but also at a number of others outside the AI axis. On the other hand, McCorduck does call attention to the very special work done by such pioneers as McCulloch and Shannon and the newer breed represented by Papert and Feigenbaum. On balance, the book's assets outweigh the liabilities Read the book, but never forget that it is written from a very special point of view. W.H. Freeman and Co., San Francisco (1979, 392 pp., $14.95).

—Philip H. Dorn

BOOK BRIEFS

THE GROWTH OF MEDICAL INFORMATION SYSTEMS IN THE UNITED STATES
by Donald A. B. Lindberg

Medical information systems are viewed as a potential means for reducing medical/health care costs and handling hospital management. This book is an evaluation of the past, present, and future of medical information systems technology. Lexington Books, D.C. Heath and Co., Lexington, MA 02173 (1979, 194 pp., $21).

HOW TO MAKE MONEY WITH COMPUTERS: A GUIDE TO SUCCESSFUL INVESTING IN THE COMPUTER AND INFORMATION INDUSTRY
by Jerry Felsen, PhD.

Another self-help story, this one geared toward finance and computer-assisted investment. Supposedly aimed at the general public, the book promises to transform those who read it into millionaires. Its 10 brief chapters cover What Is a Computer, Overview of the Computer and Information Industry, How to Invest in Computer Securities, How to Double Your Money in Less Than One Year by Trading in Listed Options of Computer Stocks, How Your Own Personal Computer Can Help You Improve Your Investment Performance, How to Start and Organize Your Own Computer Business, 27 Low-Capital Computer Businesses You Can Start from Your Home, How to Successfully Market Your Computer Products and Services, How to Forecast Computer Technology, and A Summary of Computer Technology Forecasts. CDS Publishing Co., Jamaica, NY 11432 (1979, 214 pp., $15).

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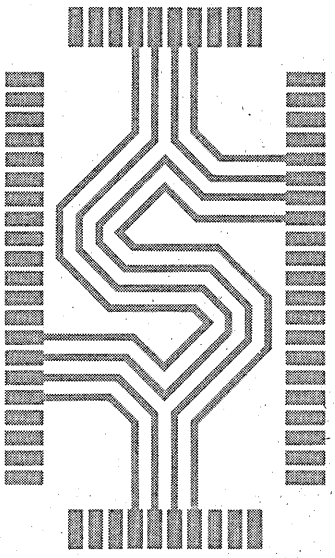

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REPORTS AND REFERENCES

EUROPEAN TRENDS

Martin Simpson has a new report, "The European Office Equipment Market: Trends and Outlook for the 1980's." The information gathered for the report was done largely on-site at the companies covered: CII Honeywell Bull, Sperry Univac Int'l, IBM Europe, Amdahl Int'l, Nixdorf Computer, Wang Labs, Tandem Computers, Texas Instruments, Intel Corp., Nashua Europe, and Rank Xerox. Market share and installed base information are included in the in-depth report.

Among the trends noted are significant increases in orders for IBM, Univac, CII Honeywell Bull, and Amdahl, although a shift to more leasing has reportedly affected IBM and Amdahl adversely. Component shortages are said to have held back some product shipments at CII Honeywell Bull and NCR. Rank Xerox has had a strong year and has been particularly successful competitively at the low end of the product spectrum.

The European economic outlook is also discussed in the report. The accompanying chart shows one perspective on that topic. The report sells for $395. Martin Simpson & Co., 115 Broadway, New York, NY 10006 (212) 349-7450.

BE A SYSTEMS HOUSE

Everything you always wanted to know about selling small business systems is in a fat handbook for beginning entrepreneurs called *How to Start Your Own Systems House*. The information is basic and thorough, and addresses seemingly every aspect of the potential business, including whether one is ready to start. Samples of necessary documents are included, such as lease agreements, software license agreements, nondisclosure agreements, business plans, and even direct mail advertising letters. This is the fifth update of this volume. $36. Essex Publishing, 285 Bloomfield Ave., Caldwell, NJ 07006 (201) 783-6940.

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Italy	(0.5)	0.5	2.2	3.0
Spain	(4.0)	(8.0)	(1.0)	5.0
Netherlands	12.4	5.0	5.5	3.0

Sources: ITT, Martin Simpson & Co., Inc.

PERIODICALS

ANOTHER WP NEWSLETTER

Advanced Office Concepts has been announced by Amy Wohl, editor of the new publication. The monthly newsletter will address research projects, business applications, new products, and market commentary. Three special supplements per year are planned for in-depth looks at specific technologies. $95 per year. *Advanced Office Concepts*, 354 W. Lancaster Ave., Suite 214, Haverford, PA 19041 (215) 649-7310.

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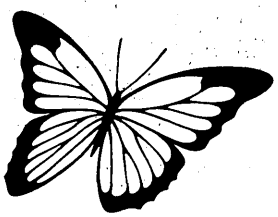

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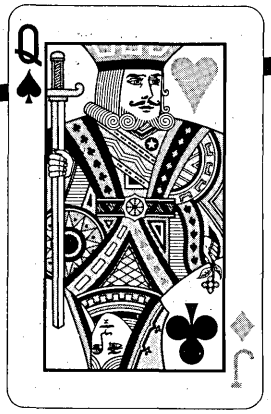

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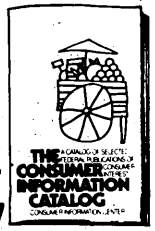

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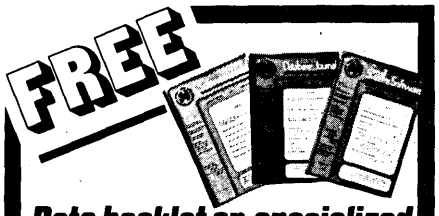

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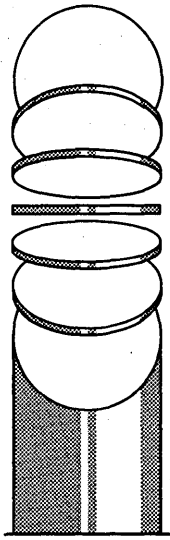

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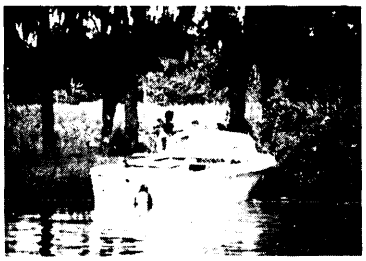

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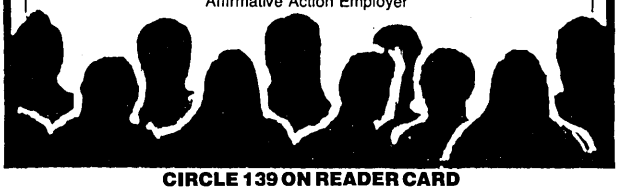

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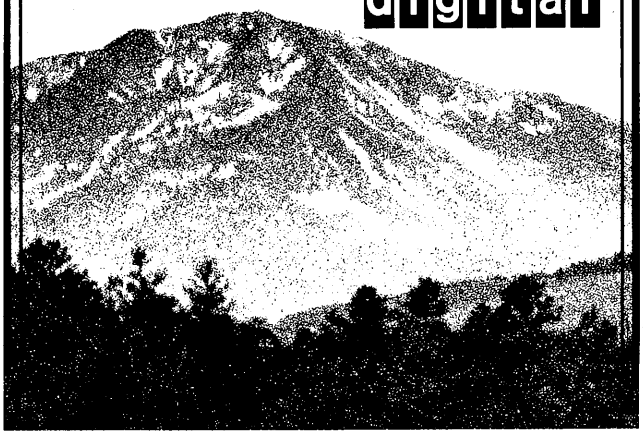

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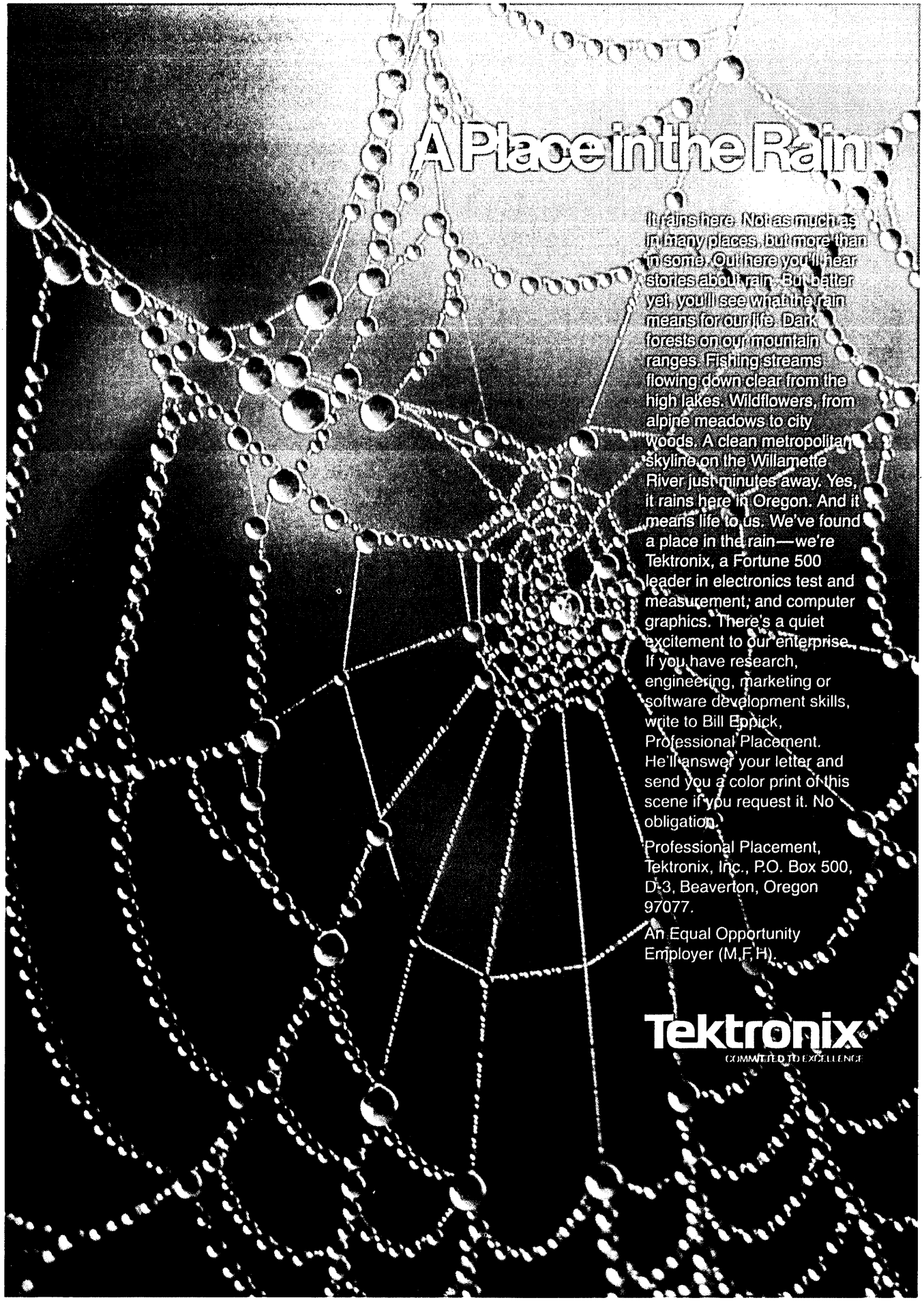

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SCIENCE/SCOPE

A new video link for remotely piloted vehicles revives an old but surprisingly simple technique to resist jamming. The approach calls for video signals to be transmitted using phase modulation (PM) rather than frequency modulation (FM). Hughes engineers have found that with this method the TV picture gradually degrades as the jamming signal strength increases. By contrast, the performance of an FM system deteriorates rapidly after falling below a certain threshold. Phase-modulated signals, when properly processed, require less bandwidth and can be coded using pseudo-noise and spread-spectrum techniques, thus reducing the chance of enemy detection.

A ground-based radar now being developed will be so "quiet" that anti-radiation missiles will be less likely to home in on its beam. The new radar will have two antennas, one to transmit low-energy beams continuously and the other to listen for returns. (Conventional radars differ by transmitting high-energy pulses so that one antenna can alternately transmit and receive.) A new antenna technique reduces the radar's side lobes -- the secondary patterns of energy that enemy missiles can home on. Hughes is building a prototype quiet radar antenna for evaluation by the U.S. Army.

Computers are freeing electronics engineers from monotonous tasks and giving them more time to be creative. With Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) systems, engineers sketch designs on terminal screens and let computers create final drawings. They can have the computers assemble their parts or circuits and simulate the way they actually would work. In an important step toward "paperless" production, the computers also convert designs into coded form to run automated machinery in manufacturing. One Hughes CAD/CAM center helped to significantly reduce development costs of the AN/APG-65 radar, produced under contract to McDonnell Douglas for the F/A-18 Hornet.

Hughes Industrial Electronics Group -- with locations in Carlsbad, Irvine, Newport Beach, Torrance, and Sylmar, Calif. -- is seeking electrical, mechanical, and industrial engineers and physicists. Programs include digital/analog circuits, microprocessor communications, fiber optics, telecom switching, connectors, flexible circuits, semiconductor material and processes, MOS/bipolar/CCD, MOS test, hybrid microcircuits, lasers, mm-wave subsystems/devices, GaAs FET devices, GaAs IC devices, microwave communications, microwave amplifiers/tubes, cryogenics, and solar cells. Send resume to John G. Wilhite, Hughes Aircraft Company, IEG-SE, P.O. Box 2999, Torrance, CA 90509. Equal opportunity M/F/HC.

Improvements to a U.S. Navy torpedo will enable the weapon to remain effective against enemy submarines through the 1990s. Hughes has been awarded the prime contract to develop a new digital guidance and control subsystem for the Advanced Capability (ADCAP) Mk-48 heavyweight torpedo. The electronics will improve the torpedo's guidance and effectiveness, particularly in adverse open-ocean environments. Twenty-four electronic kits will be developed for installation and test during the 36-month validation phase of the contract. Teamed with Hughes is the Gould Corporation, builder of the Mk-48 torpedos.

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An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

MIDDLE MANAGEMENT'S INEVITABLE DECLINE

The return-on-investment of a typical computer acquisition has been very slow in arriving. This has not stopped the growth of the computer industry in the U.S., which is expected to reach some 500,000 installations by 1985, of systems with a purchase value of more than $50,000. In addition, the industry expects to have a similar number of mini- and microcomputers, with a value between $5,000 and $50,000.

Apparently American management feels that modern information systems are a necessity, regardless of economic consequences. The prestige of ownership, competitive prices, and the "keeping up with the Joneses" syndrome all have made their contribution to the mass belief in computer necessity.

Fortunately, the power of the technology, and its maturity, can (and will) rescue many companies from a poorly justified decision. This is due to the fact that promises made by the industry at its inception that computer use would be justified are beginning to be fulfilled. The realization of these promises, however, will have a far-reaching impact on the functions of middle and upper management. This will be the most significant development in managerial structure and technology for the next decade.

There are three primary justifications for the use of a computer, all of which have economic effects. These, in sequence of their historical realization, are:

- *Elimination of Rote Functions.* To a large extent this goal has been reached in the U.S. economy. All large organizations use computers for basic volume clerical functions, which has resulted in the elimination of millions of low-level jobs mostly through attrition and hiring reductions. This began in clerical labor-intensive areas, and has gradually spread to all industries as computer prices plummeted.
- *Integration of Customer Services.* This allows quantum improvements in customer relations by providing immediate access to needed customer information. This started in "customer-intensive" industries, such as airlines and savings banks, but is now gradually spreading to manufacturing and distribution companies with on-line order entry, inventory management, and the like.
- *Management Information Systems.* An elusive concept, this attempts to provide management with more and better information for intelligent decision-making. This form of justification has not really been achieved, but there are signs its turn is near. Achievement of this objective will have the greatest organizational impact.

The primary impact of the development of a real management information system will be the gradual elimination of middle management. The basic function of most middle managers is information condensation: the filtering of masses of data to obtain facts necessary for the next level of management, and to allow decision-making at this level. When intelligent management information systems are substituted for this function, it disappears. Decision-making functions are then concentrated in the hands of a few managers, presumably at the upper level of the organization.

The lower levels of management are already under pressure; many of the mechanical functions of information distillation have disappeared in the primary computer-using industries: banking, insurance, and government. There is considerable resistance but the inevitability of information availability will gradually reduce the number of roles and functions of middle management.

At the same time, other changes will take place within the company hierarchy. We can expect the emergence of a stronger and more powerful technical management level. Information systems management has to assume a much stronger role. The entire systems organization, through its very control of the design of information systems, will control the corporate decision-making process and its data base.

There is, therefore, an immediate need to improve the quality of the systems organization, and, within top management, a corresponding need for increased awareness of the direction and magnitude of coming corporate changes. If this goal can be planned and realized in an orderly manner, the U.S. will still be able to retain some semblance of management superiority in the business world, and individual companies will retain competitive positions in the market economy.

—Dick H. Brandon
New York, New York

A PRIORITY DELIVERY FORM

Over a long career of working with sales and sales management people in a variety of industries, I find computer people are unique in their single-minded obsession with immediate delivery commitments. ASAP is the standard delivery requirement: anything over 60 days constitutes long-range planning.

Therefore, it would save us all a lot of time if we used a standard form containing all the information salespeople require to convince the factory staff an immediate shipment is absolutely essential. Completed by the salesperson and preapproved by his field management staff, the form might look like this:

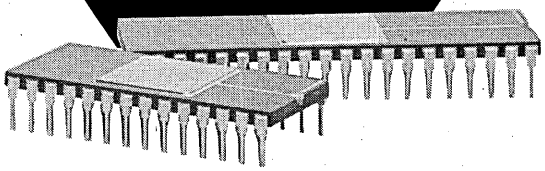
THE UNIVERSAL STANDARD SALES PRIORITY ALERT NOTICE

Urgent Transmission! Hand-Deliver to Manufacturing Vice President and General Manager, Return Receipt Requested.

Our customer (1. Account Name) is
(*circle one*)

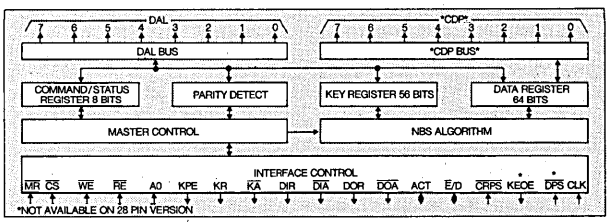
2.1 An agency of the American Red Cross
2.2 An international manufacturer of silicon burners
2.3 The largest privately held firm in Instanbul
2.4 A CIA front
2.5 The energy arm of the United Nations

THE WORLD'S FIRST HIGH-SPEED ENCRYPTION PRODUCTS ARE HERE. NOW!

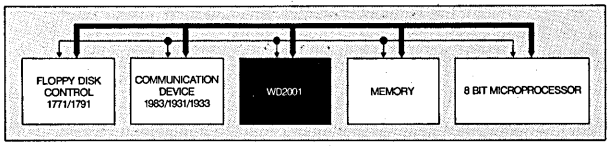


The Data Encryption Standard (DES) is a MOS/LSI device which implements the NBS Data Encryption Algorithm. DES is implemented in N-Channel, silicon gate technology and all inputs and outputs are TTL compatible. Two configurations (WD2001E/F and WD2002A/B) are available ***now*** for preliminary sampling; a third (WD2003), which performs NBS Algorithms with high-speed cipher feedback and complies with Federal Standard 1026/1027, will be available for preliminary sampling in the near future.

The DES interfaces with a wide variety of processors and mini-computers. A typical system implementation and the DES block diagram are shown below.



IMMEDIATE DELIVERY!



FEATURES:

- Guaranteed minimum data rate of 167K bytes/sec.
- Higher speed versions available
- WD2001 has a Common Clear Data and Encrypted Data I/O Bus
- WD2002 has 2 separate and independent I/O Buses: one for Clear Data, one for Encrypted Data
- Implements NBS Data Encryption Algorithm
- Single Key
- Encrypt in the block mode

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CIRCLE 144 ON READER CARD

FORUM

From a financial and credit standpoint, it
(*circle one*)
3.1 Is triple A-1
3.2 Prepays in gold bullion
3.3 Pays upon receipt of quotation
3.4 Collects worldwide royalties on the coat hanger

It now has funding as well as the necessary internal authorizations to purchase and evaluate one of our (4. State Company Product) with the understanding that if it fulfills requirements it will purchase
(*circle one*)
5.1 Over 3,000 during the first six months
5.2 A minimum of a gross each week
5.3 A googol over three years
5.4 Many, many, many

The only thing now separating us from the order is
(*circle one*)
6.1 Delivery requirements
6.2 Acceptable shipping commitment
6.3 Availability of the product
6.4 Factory schedules
6.5 Reasonable promise date

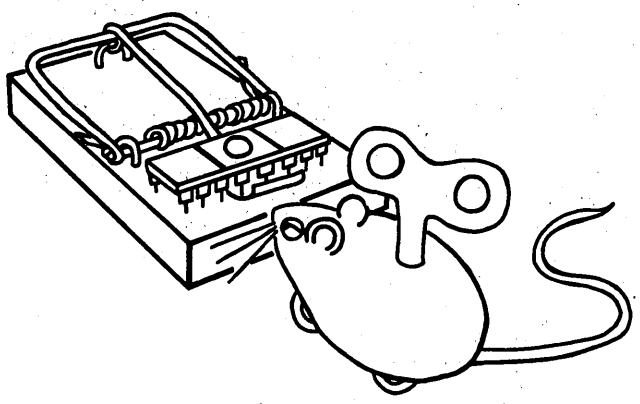
If the product does not ship immediately, the customer may very well
(*circle one*)
7.1 Lose its funding
7.2 Go bankrupt
7.3 Lay off staff
7.4 Execute staff

This situation is, without doubt,
(*circle one*)
8.1 The highest priority in corporate history
8.2 The most significant event of the 20th Century
8.3 An opportunity without parallel in annals of business

As important as these facts show the stituation to be, there is also an ethical side to the issue. Immediate shipment will also
(*circle one*)
9.1 Eliminate world poverty
9.2 Bring peace to the Middle East
9.3 Save the whale, seal, redwood, and caribou
9.4 Cure the common cold
9.5 Safeguard the Free World's essential bodily fluids

We must ship
(*circle one*)
0.1 When the little hand is on 8. . .
0.2 At dawn
0.3 This afternoon
0.4 Before sunset
0.5 When the moon comes over the mountain

Edward C. McManus
Marlborough, Massachusetts



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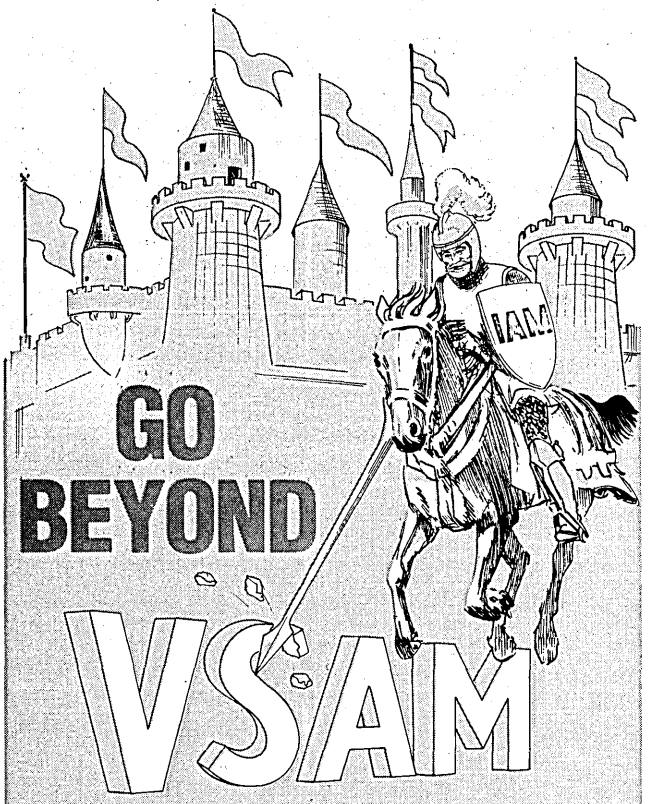

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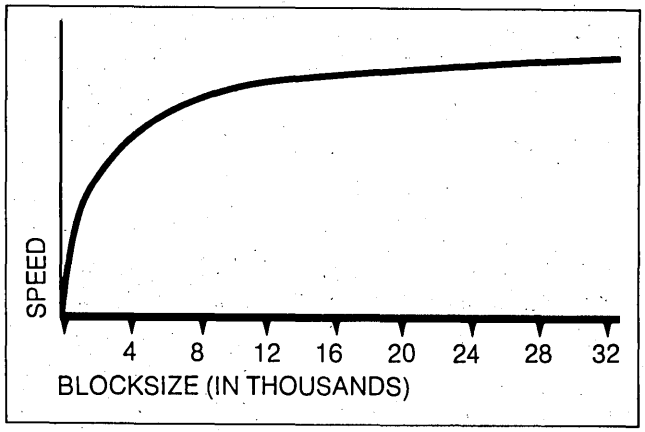
FORUM

HOW TO MAKE TAPE DRIVES RUN FASTER

Waiting for a long tape job to end can be frustrating. About midnight, you start wondering, "Why do tape jobs have to run so long?" Tape jobs don't have to run so long. There is something that you can do to speed them up. Not many programmers realize that the block size of a tape data file can dramatically affect the speed by which it is read or written. The following figure illustrates the relationship between block size and file read/write speed for IBM 6250 bpi tape drives.



Some interesting facts result from this relationship. Did you know that:

- An IBM 6250 bpi tape drive will read/write data twice as fast if a block size of 4,000 is used instead of 1,000?
- An IBM 6250 bpi tape drive will read/write data almost 2½ times faster if a block size of 8,000 is used instead of 1,000?
- An IBM 6250 bpi tape drive will read/write data 17 (yes, seventeen!) times faster if a block size of 4,000 is used instead of 80?
- An IBM 6250 bpi tape drive will read/write data 21 (twenty-one!) times faster if a block size of 8,000 is used instead of 80?

Choosing a good, average block size for an installation's tape data sets can be a complex task, involving trade-offs between programming standards, operational practices, the computer system architecture, the operating systems, the resource usage profile of the installation's application systems, and management direction.

It is a much simpler task to determine an optimal range of tape data file block sizes for an installation. Our rules of thumb for IBM 6250 bpi tape drives:

1. Tape data files should have a block size of at least 4,000.
2. Tape data files with block sizes of over 16,000 probably waste other computer system resources and should be avoided—unless the tape file is to be archived.

How can you determine the optimal range for tape data files at your installation without experimenting? Some excellent sources of information are the Institute for Software Engineering, Inc., P.O. Box 637, Palo Alto, CA 94302, and *EDP Performance Review*, P.O Box 9280, Phoenix, AZ 85068.

Change block sizes to the optimal range, and start getting home earlier.

—Gregory Berryhill
Galveston, Texas

The OEM Tape Transport For The 80's.

Now, Datum innovation brings you the next generation in mini-computer magnetic tape transports, the D-451. A transport that thinks for itself thanks to Datum's smart new single-board microprocessor.

Self-diagnostics, a reduced electronic component count and hybrid chip read amplifiers are examples of Datum's entirely new microprocessor design architecture.

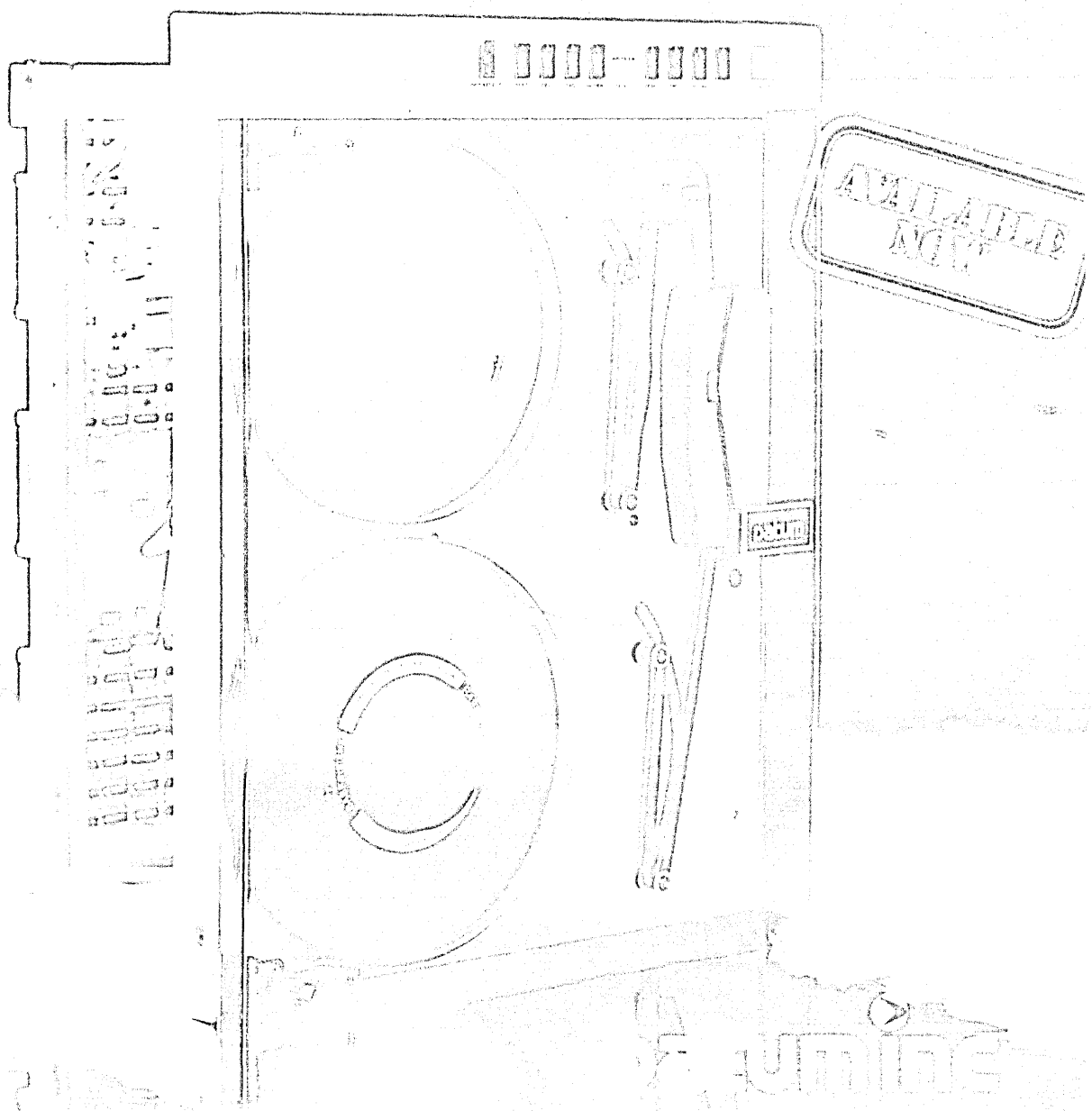
You won't need an external test box with the D-451. Fault-isolation, and skew verify alignment are among internal microprocessor controlled self-test diagnostics.

An embedded Dual/Density formatter controls up to four tape transports.

Every aspect of the intelligent D-451's design and engineering makes its contribution in superior performance and reliability when reading and writing IBM/ANSI compatible, ½" magnetic tape. Featured are 7- or 9-track, NRZI and PE formats; dual format is standard for 9-track. Phase Encoded density is 1600 BPI, while densities of 800, 556 and 200 BPI are available for NRZI.

And Datum's painstaking research provides the D-451 with IBM tape path geometry, ceramic blade tape cleaners, photoelectric writering detection, low-inertia capstan drive and digital write deskew control.

Find out more about the reel thing, the tape transport that thinks for itself. Call or write your local Datum representative or Datum Inc., 1363 South State College Boulevard, Anaheim, California 92806. (714) 533-6333.



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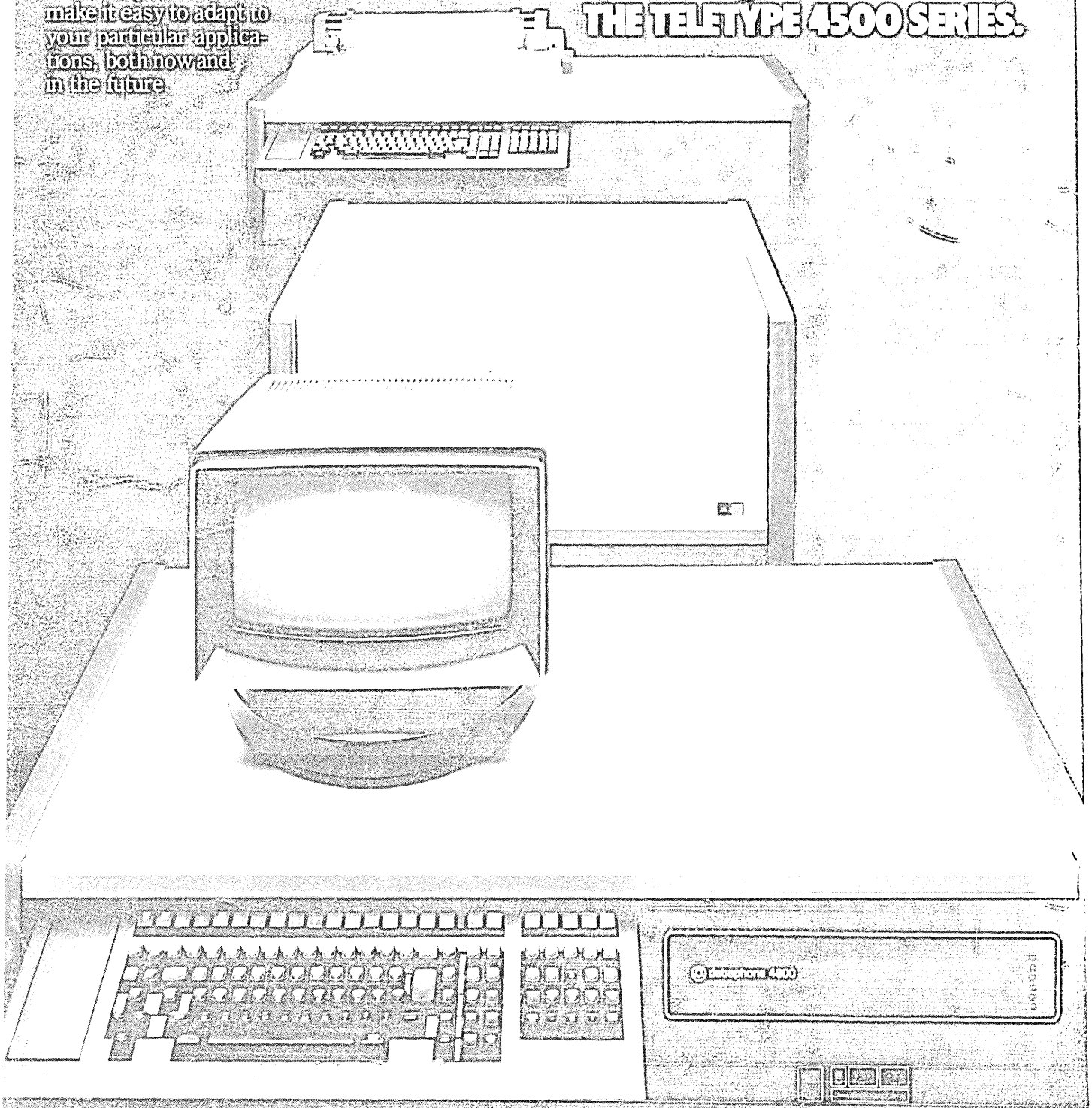

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