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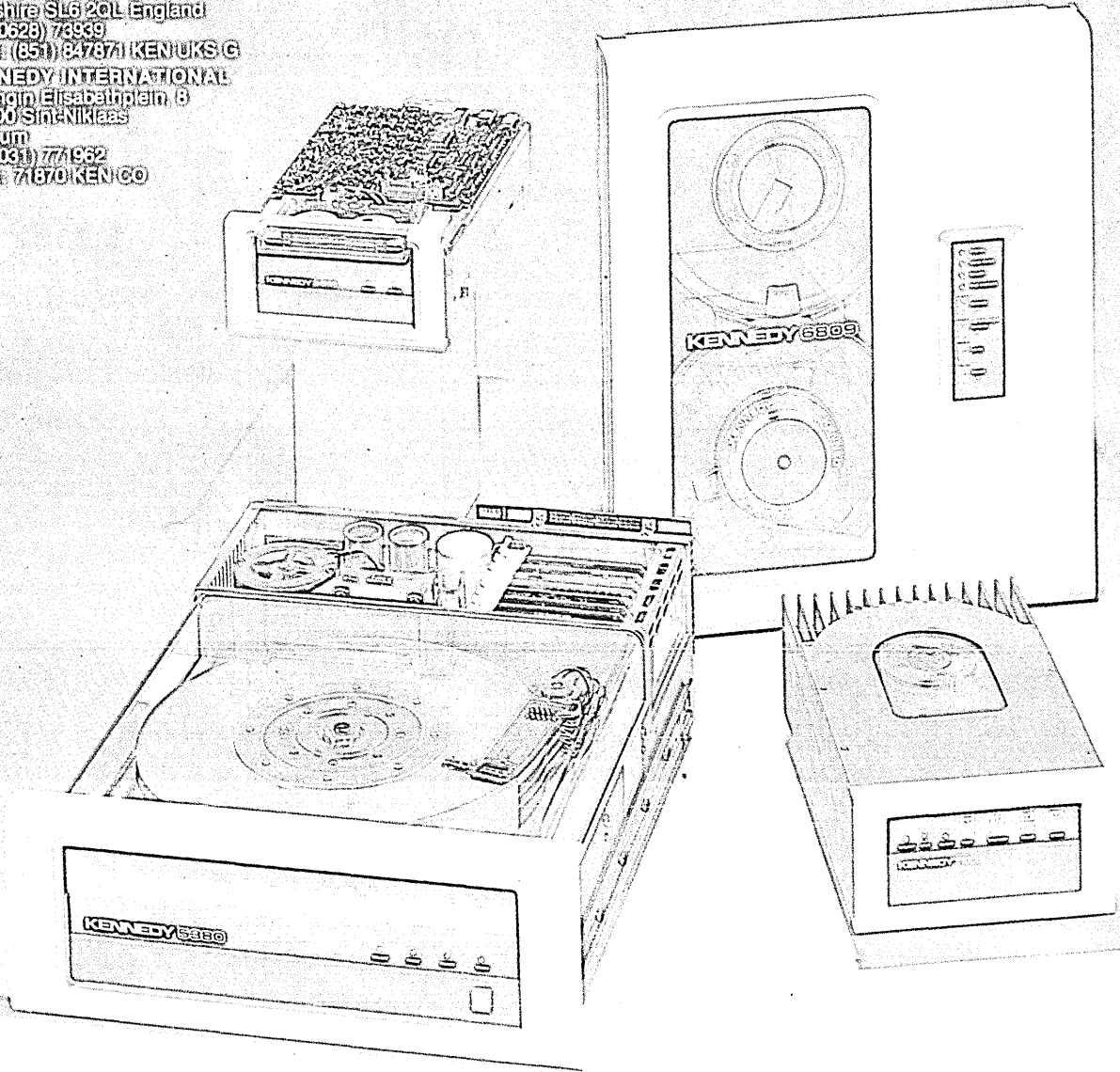
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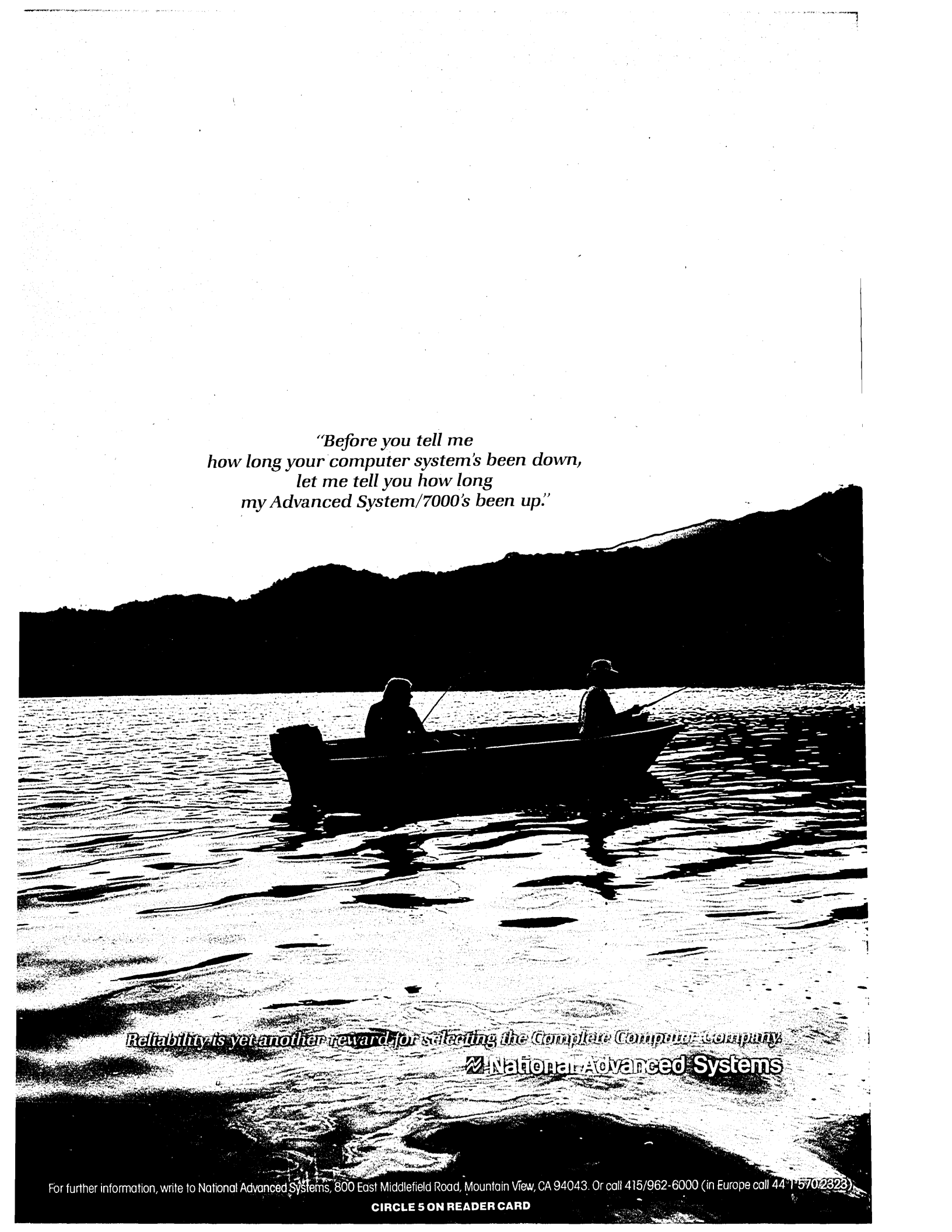
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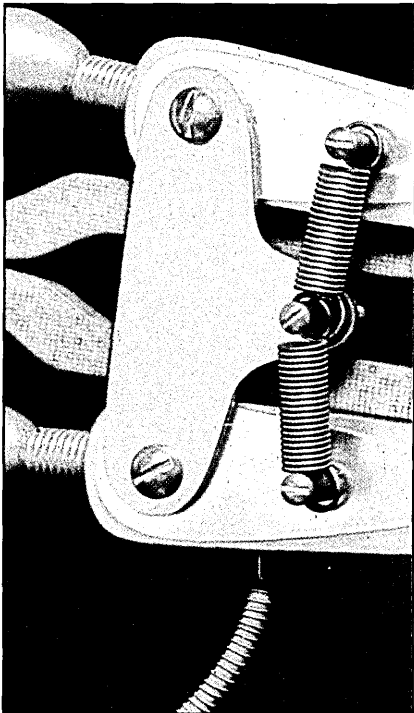
FEATURES

34 IN FOCUS

Merrill Cherlin interviews Jeremy Rifkin, author of *Entropy*, who talks about his philosophy and his life in "Waste Not, Want Not."

110 CAD/CAM: WHO'S IN CHARGE?

An introduction to an in-depth examination of four aspects of computer aided design and computer aided manufacturing.



112 PUSHING THE STATE OF THE ART

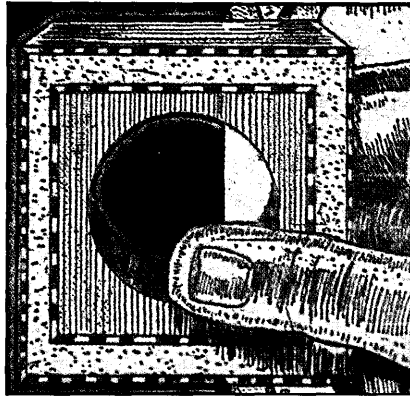
Jan Johnson

Its membership reads like a worldwide *Who's Who* of software and hardware makers: CAM-I, an organization that is trying to establish the direction of the technology.

118 CHOOSING A TURNKEY CADD SYSTEM

Eric Teicholz

Computer aided design and drafting systems can open the door to better productivity and higher quality.



126 MEASURE TWICE, CUT ONCE

Daniel S. Appleton

An exploration of the new concept of data driven manufacturing automation, including some specifics on how it can work.

140 MESSAGE FROM PORKOPOLIS

Leopold Froehlich

Is computer aided manufacturing ready to remake our society for the better, or is it a pig in a poke?

146 THE SHORTER CATECHISM OF STAFFORD BEER

Though not a computer expert by his own admission, the English cybernetician has applied his science to the problems of business and management and MIS.

156 WINNING THE MERCHANTS

Geoffrey D. Austrian

Inventor of the punched card tabulating machine, entrepreneur, and a father of modern information processing, Herman Hollerith is the subject of a biography excerpted here.

175 IN-HOUSE DP TRAINING

Mark Johnson and Jim Murchison

A North Carolina company developed a coordinated program that recruited new dp staff from within the company, and educated and trained people in the user departments.

NEWS IN PERSPECTIVE

46 ANTITRUST

IBM wins again.
Hold the phone.

61 MAINFRAMES

Making it in an IBM world.

71 PCMS

Soft key to IBM's kingdom?

74 SOFTWARE

A house is still a home.

87 PERIPHERALS

Cashing in on caches.

89 COMMUNICATIONS

Super Telex is coming.
Not just black boxes.

95 LEASING

Double dipping in dp.

101 MINIS & MICROS

The low end is wagging.

101 BENCHMARKS

DEPARTMENTS

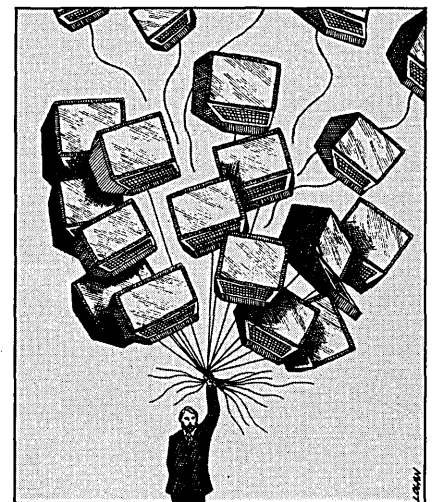
8 LOOKING BACK

13 LOOK AHEAD

18 CALENDAR

23 LETTERS

31 EDITOR'S READOUT



179 PEOPLE

187 HARDWARE

195 SOFTWARE & SERVICES

203 SOURCE DATA

208 MARKETPLACE

214 ADVERTISERS' INDEX

217 READERS' FORUM

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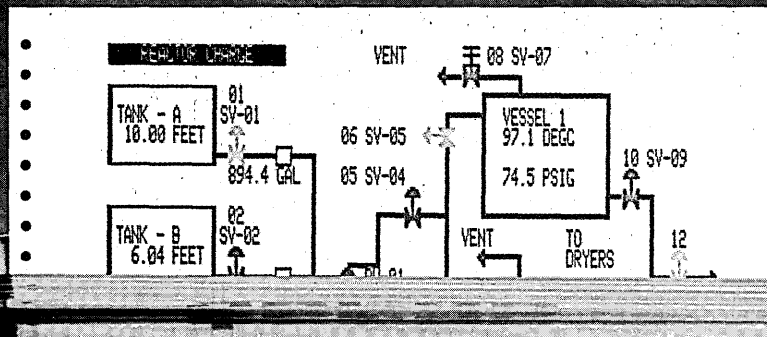
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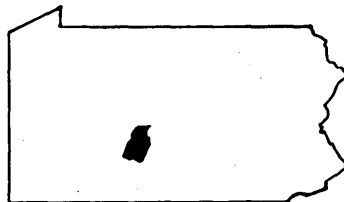
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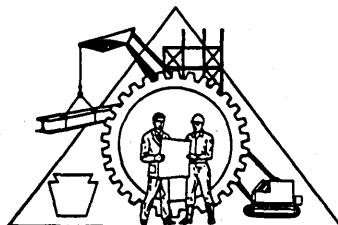
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CIRCULATION

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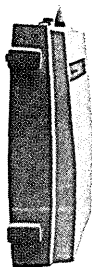
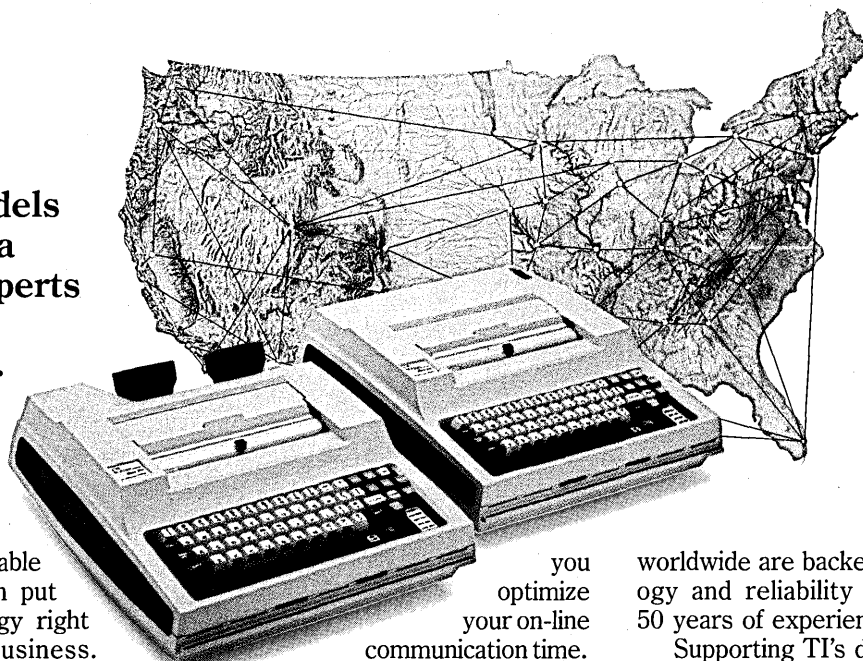
DATAMATION (ISSN 0011-6963) Magazine is issued monthly on or about the first day of every month, with the exception of August, which is semimonthly. Published by Technical Publishing, a company of the Dun and Bradstreet Corp., 1301 South Grove Ave., Barrington, IL 60010. James B. Tafel, Chairman; John K. Abely, President. Executive, advertising, editorial offices, and subscription department, 666 Fifth Ave., New York, NY 10103. Published at East Greenville, Pa. Annual subscription rates: U.S. and possessions: \$40; Canada: \$55; Europe: £48 air freight, £90 air mail; Japan, Australia, New Zealand: £52. All other foreign countries: £48 surface, £90 air mail. Reduced rate for qualified U.S. students, public and school libraries: \$30. Sole agent for all subscriptions outside the U.S.A. and Canada is J. B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA13QT, England, (01422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Second-class postage paid at New York, NY 10001 and at additional mailing office. Copyright 1982 by Technical Publishing Corporation, a Division of Dun-Donnelley Publishing Corporation. All rights reserved. "Datamation" registered trademark of Technical Publishing Company. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 No. Zeeb Road, Ann Arbor, Michigan 48106. Printed by Brown Printing Co., Inc. POSTMASTER: Form 3579 to be sent to Technical Publishing Company Circulation Office: 666 Fifth Avenue, New York, NY 10103. Single copy: \$4.00 in U.S.A.

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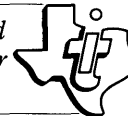
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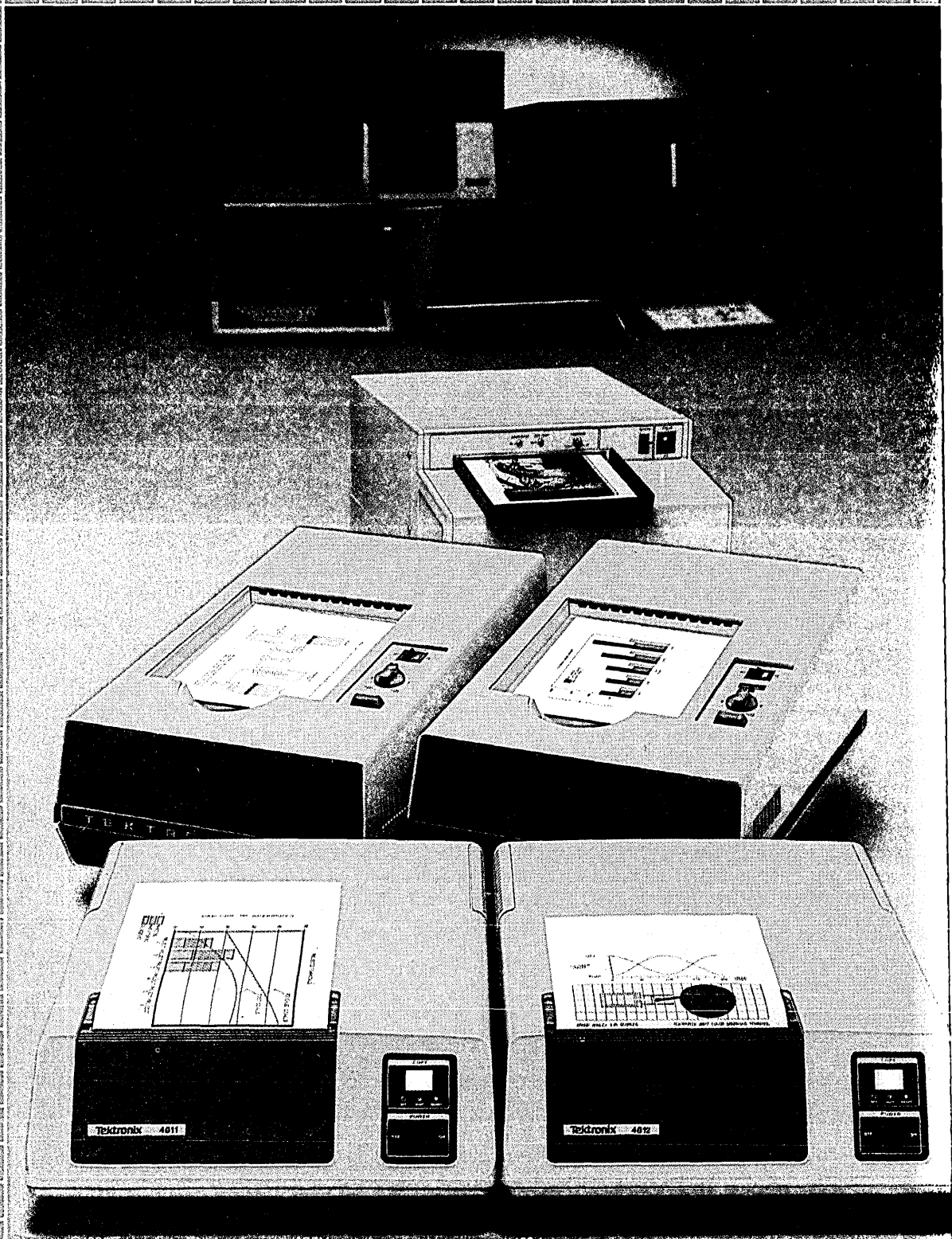
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LOOKING BACK

SYMBIOSIS

February, 1962: Dr. H.R.J. Grosch, DATAMATION contributing editor, had his dander up because an article in the ACM's *Computing Reviews* had referred to this magazine as the "yellow press" of technology.

Grosch was surprised by the attack because he thought the struggle between the "Reform Party and the Diehards—between dollars and scholars, as it were—" was abating. But no: here was a fellow named Sander Rubin averring in the pages of a stately publication that DATAMATION was, well, not quite up to academic snuff. Rubin had conceded that DATAMATION served a purpose by keeping its readers "superficially and relatively painlessly informed," but he thought it was pretty plain that its articles were "quite inadequate to the needs of the specialist." After all, those articles were not required to possess "originality or aptness of thought." Worst of all, the meretricious rag had a controlled circulation and was therefore bound to be edited for the benefit of vendors.

Hogwash, riposted Grosch. It was ACM, not DATAMATION, that had a captive audience—members paid for the *Reviews* whether they wanted it or not. Where DATAMATION tried to please its readers, ACM printed what its editors and referees wanted. Many of DATAMATION's contributors, and all of the companies that sent in press releases (of which the magazine made considerable use), were indeed looking for financial gain, but because that was common knowledge, readers could judge the stories accordingly—and decide whether they wished to renew their subscriptions.

It was true, Grosch admitted, that DATAMATION didn't really meet the needs of the specialist—it would never print a piece on "the convergence rate of Lafayette's method of inverting a matrix of quaternions." But that, after all, was the ACM's job. There were more kinds of originality and aptness, said Grosch, than were dreamed of by Mr. Sander Rubin.

ACM finances and editorial board policy (including an official aversion to "over-colorful" language) would compel the associations' magazines to remain hotbeds of purity, Grosch figured. And that would leave DATAMATION and its trade competitors plenty of room to flourish.

IN THE GHETTO

February, 1972: Getting involved in the business was an accident, outguessing the machine was the fun part of the job, and being in a small group with plenty of access to the computer was what made it all worthwhile.

Those were some of the findings offered in a report on the quality of life in the dp industry. Programmers, analysts, and managers were asked what they liked and disliked about their jobs and where they saw their career paths leading.

Some saw themselves becoming managerial types, which for them meant achieving the status of "top technical honcho." If that was where they wanted to go, their friendly IBM salesman could help them. Gary Huggins, who was running a shop for a small, family-owned engineering firm, reckoned that when the time came for him to move on—which both he and his employers regarded as inevitable—the IBM sales rep would put in a good word for him. He eventually hoped to "work for the top guy somewhere," with all administrative services reporting to him.

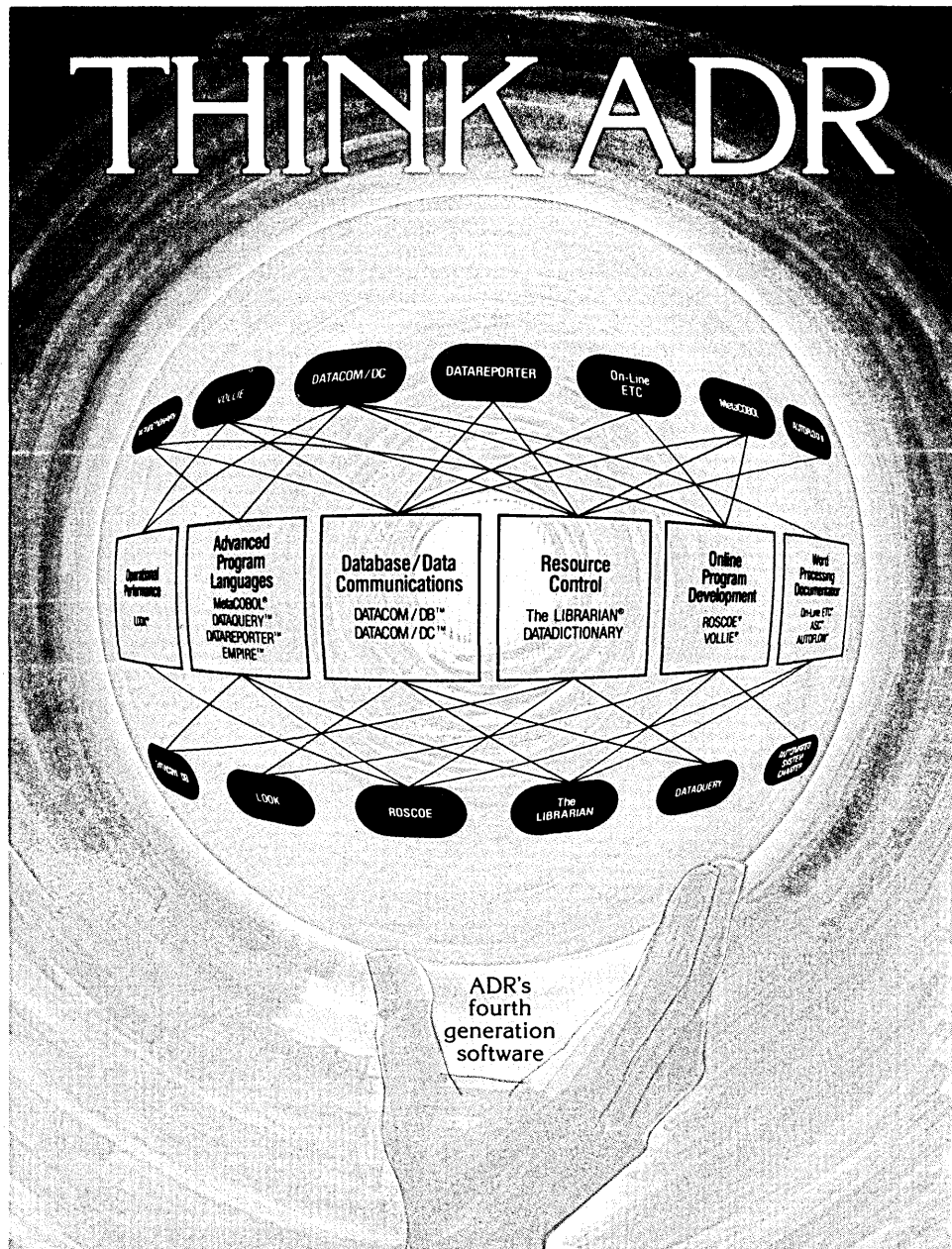
Other dpers were not so sanguine. One complained of a management interdiction against developing new applications, with the result that the staff spent all its time "maintaining current software," including an inventory program which, after six years, still didn't work very well. A sense of isolation from the rest of the business was a common complaint. Computing was regarded by many managements as a necessary evil, not nearly as respectable as finance or manufacturing. After nine years and 13 jobs, one programmer described his best career path as "out of the company, out of the field."

Over 40% of the people interviewed were looking forward to a "new and better career which has nothing to do with the management of edp, or in which the edp function is absorbed into a grander, more pervasive activity over which they have control." Said one: "Frankly, I don't see a career path until the edp organization is the rest of the company, serving the whole works with a voice at the top. We have to put our arms around the whole animal and, in our embrace, make it hum."

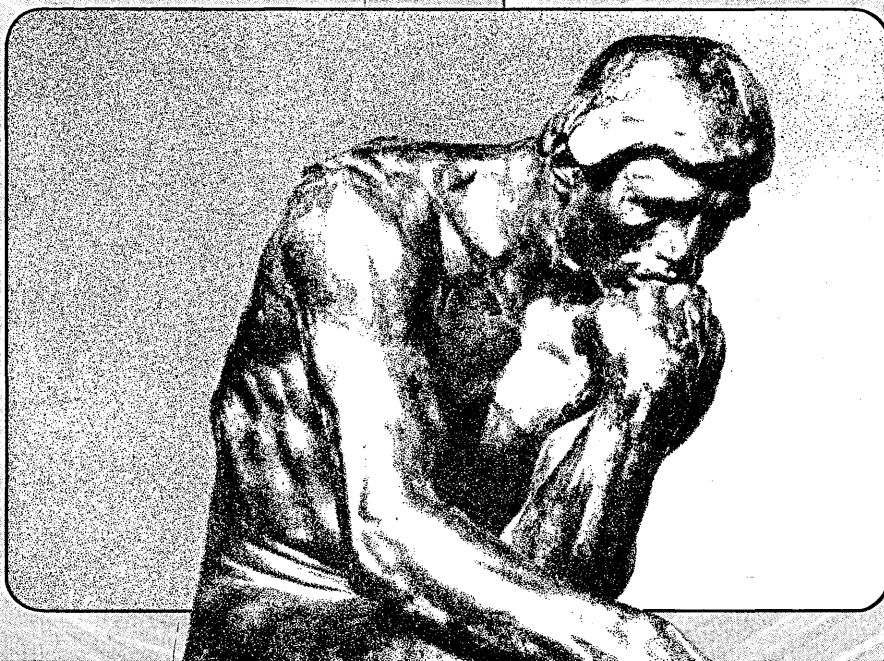
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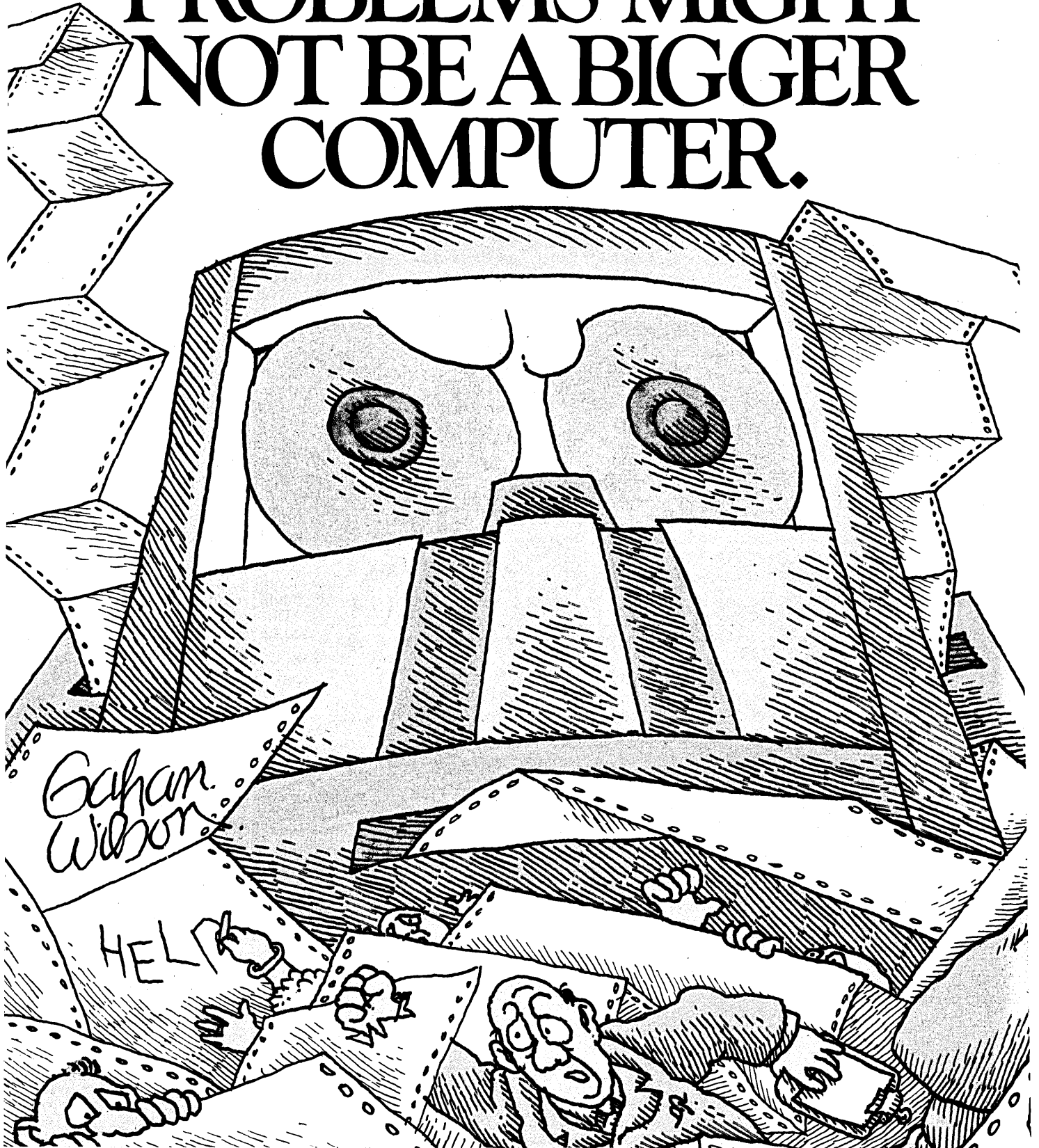
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Information Resource Management Technology. It's more than software. And more than hardware.

You can't get anything like it from any mainframe manufacturer. Or any independent software vendor. Only from us.

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Instead of bigger problems.

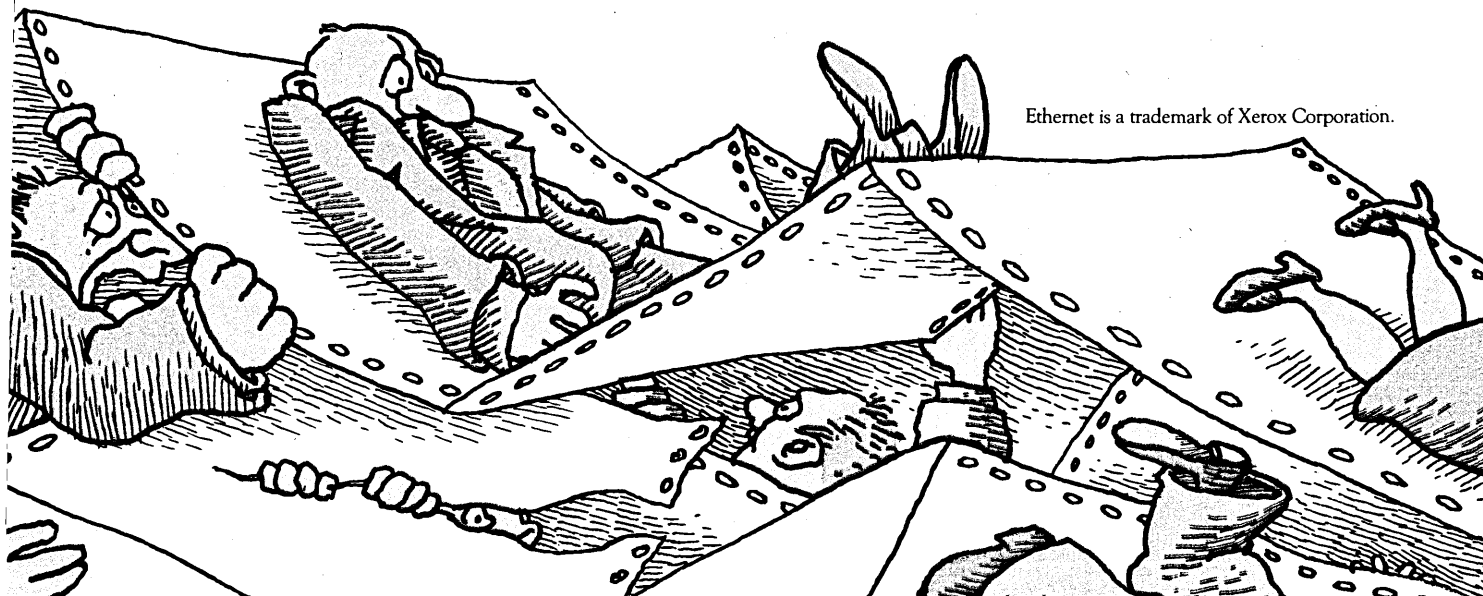
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CIRCLE 13 ON READER CARD

LOOK AHEAD

LIFE AFTER ANTITRUST

With the antitrust era behind it, IBM is ready, willing, and able to go after some of AT&T's lucrative markets. Reliable sources say Big Blue has quietly inked a pact with Northern Telecom to market its SL-1 low-end PBX. But why, ask other sources who expect IBM to bring out its own PBX, marketed in Europe for years, within a few months. Meanwhile, AT&T may have a little competition in the PBX mart from none other than the basic operating companies. While AT&T retains rights to customer premises equipment, the BOCs get to keep Centrex -- both types of gear competing at the functional level.

NOT TO BE OUTDONE

When you look at all the firms touting local networking schemes, which company is noticeably absent? IBM, of course, which is rumored to be readying a baseband net that will be announced perhaps as early as second quarter. The only other details we hear are that it will use token passing and, would you believe, twisted pair?

JAPANESE JUMP ON ETHERNET

Even the Japanese have jumped aboard the Ethernet bandwagon. Laox Systems, a small systems house, has entered the fray with a 1 megabit/sec. Ethernet controller selling for about \$1,700.

BROUGHT TO YOU BY IBM

Predictions of the next 3081/H Series mainframe from IBM are centering on a first quarter intro for the so-called H3. It will come in under the recently unveiled H4, or 3081 Model D. Considerably further down the road comes the top-end machine, the H6. Other IBM goodies at the top of the grab bag are a System/38 mod 7 cpu, a front-end processor to finally replace the 3705, and a big E Series machine, rumored to be an attached processor 4341 coming in June.

THE WORLD ACCORDING TO ROACH

In an unusually candid mood, Tandy Corp.'s John Roach has a number of comments to a number of competitors. To Commodore on its so-called "universal computer": "horse manure." To AT&T on its antitrust settlement with Justice: "gives us the chance to sell telephone equipment to home users, a market we've had very limited access to in the past." And to the FTC on its antitrust investigation into Tandy's proposed buy of Memorex's consumer tape division: opposing it could be "the kiss of death to another American industry."

NTI PULLS ITSELF TOGETHER

Proclaiming PBX systems as the "key" to the integrated office, Northern Telecom president Edmund Fitzgerald named Desmond Hudson as executive vice

LOOK AHEAD

president of the firm's newly created Integrated Office Systems group. The tough work lies ahead as the managers of NTI's operating divisions -- electronic office systems, business communications, and network systems -- who now report to Hudson hammer out a new sales strategy and a plan for consolidating all products under one marketing umbrella. "At the moment I don't know how it will end up," admitted Fitzgerald, who wants to see overlapping sales calls reduced and an "integrated" NTI product line with a "common architecture" emerge.

CLONING THE 3279

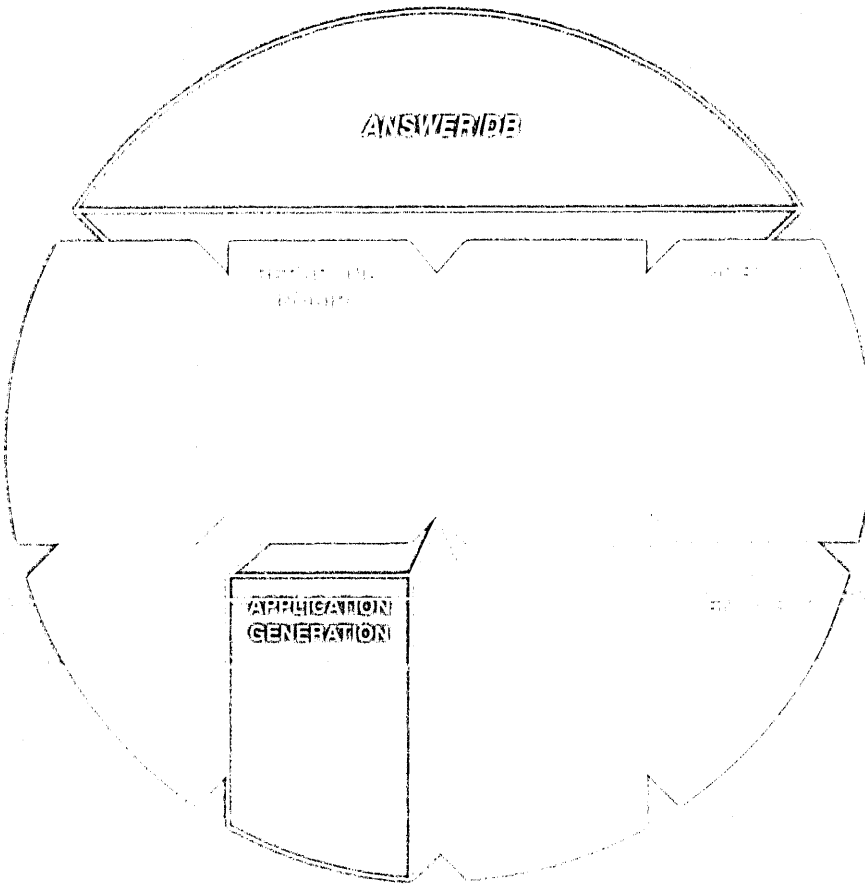
In the 3279 color market, Lee Data Corp. appears to have leapfrogged IBM, Telex, and Raytheon by offering a four-color system packaged in a smaller cabinet -- 14" x 16" -- with tilt and swivel features. Called the 123X series and priced 10% below IBM's, the system will be announced sometime this month or next, followed by announcement of a seven-color graphics display system in the second quarter. Don't get too excited though; production capacity for the 123Xs tops out at a little over 2,000 units for 1982, said a company source.

ANTITRUST AFTERMATH

With the IBM antitrust case closed, Univac believes it faces a more predictable future. Says Univac vp of strategic planning and development Glen Haney: "Without having to consider such a major unpredictable event as IBM divestiture, we are in a better position to assess our competitive posture in relation to both markets and products. I guess you could say we feel happier having to deal with one IBM rather than several."

RUMORS AND RAW RANDOM DATA

We hear that people at Ohio State Univ., under contract with IBM, are working to put Unix on the Series/1 minicomputer. Jean Yates of Gnostic Concepts also hears rumors about IBM putting the popular operating system on its 4300 mainframes.... Expensive production equipment sits idle at Control Data's peripherals company as engineers rush to find a cure for the ailing 8 in. Larc drive.... After several consecutive years of flat sales at Audiotronics' video display operations, a number of changes are under consideration, including layoffs and moving production capacity to the Far East....Competition for qualified software people must be heavy in Japan. A dp magazine there reports that some software houses are actually offering dormitory space to single employees as part of their company benefits....Look for IBM's educational products subsidiary Science Research Associates to latch onto IBM's Personal Computer.



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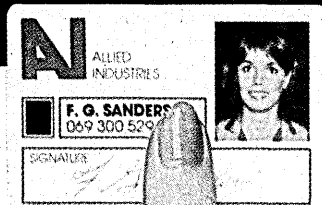
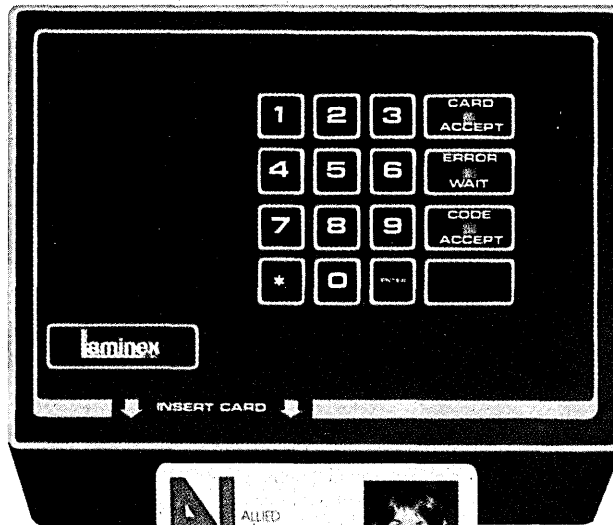
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be stored in highly efficient code for future references. A three-tier Answer/DB security check screens every request before it is ignored.

Answer/DB is, at the same time, completely responsive to the user. Inquiries and report requests are entered interactively in an easy-to-learn natural language syntax. Extensive diagnostics allow non-DB personnel to create their own error-free requests. Users can retrieve multiple data bases and files as a single user-oriented logical data view. Turnaround time is reduced; productivity of the professional DB staff is increased.

Any further questions? Answer/DB them by giving us a call. Or fill out the coupon and mail it today.

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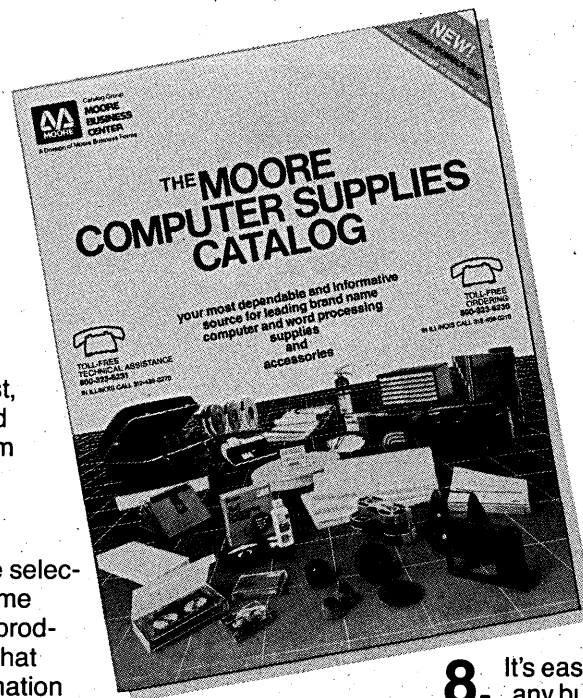
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CALENDAR

FEBRUARY

Industrial Productivity Conference and Exposition, February 16-18, Memphis, Tennessee.

The Society of Manufacturing Engineers (SME) is sponsoring this show, which will emphasize plant maintenance and cost-efficient plant operations. Contact SME, PR Dept., One SME Drive, P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.

Federal DP Expo, February 22-24, Washington, D.C.

This is the eighth annual conference and exposition for computer systems users in the U.S. government. Hardware and software products, and systems and services will be included in the show. Contact The Interface Group, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

Compcon Spring, February 26-28, San Francisco.

Sponsored by the IEEE Computer Society, this season's theme is "High Technology in the Information Industry." Contact IEEE Computer Society, 1109 Spring St., Silver Spring, MD 20901, (301) 589-3386.

MARCH

Robots VI, March 1-4, Detroit.

Industrial robot manufacturers from the U.S., Europe, and Japan will exhibit at the conference sponsored by Robotics International of the Society of Manufacturing Engineers. Contact RI/SME, One SME Drive, P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.

Computers/Graphics in the Building Process, March 22-26, Washington, D.C.

The conference is hosted by the National Academy of Sciences and the World Computer Graphics Association. Contact WCGA, 2033 M Street N.W., Suite 250, Washington, DC 20036, (202) 775-9556.

Interface '82, March 22-25, Dallas.

This is Interface's 10th annual appearance, and once again the conference will be devoted to data communications, ddp, and networking. Contact the Interface Group, 160 Speen St., P.O. Box 927, Framingham, MA 01701, (617) 879-4502.

National Conference on Information Systems Education, March 22-24, Chicago.

The conference is sponsored by the Education Foundation of the Data Processing Management Association (DPMMAEF), an organization established in 1975 to "expand the educational opportunities for system professionals and to conduct research and programs to benefit dp industry, educators, government, and the public." Contact the Conference Manager, USPDI, 12611 Davan Dr., Silver Spring, MD 20904, (301) 622-0066.

CAD '82 March 30-April 1, Sussex, England.

The entire project development cycle, from concept to manufacture, will be discussed at this international conference and exhibition on computers in design engineering. Contact Alan Pipes, Conference Organizer, IPC Science and Technology Press, P.O. Box 63, Westbury House, Bury St., Guildford GU25BH, England.

APRIL

OAC '82, April 5-7, San Francisco.

The third annual Office Automation Conference provides a showcase for products and services that are dramatically changing today's office environment. There is also a full schedule of technical program sessions. This year's program theme is "The Human Connection." Contact Betty Lou Cooke, AFIPS, Inc. 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3612.

Viewtext '82, April 13-15, New York City.

The second conference focuses on "Business Applications of Videotex." Contact Ellen Bond, Information Gatekeepers, Inc. 167 Corey Rd., Suite 111, Brookline, MA 02146, (617) 739-2022.

International Symposium on Local Computer Networks, April 19-21, Florence, Italy.

Sponsored by IFIP. Conference topics are operating systems, performance evaluation, architecture, protocols, integrated voice and data, VLSI technology, and applications. The program includes a product exhibition. For openers, there will be a welcoming party in the Palazzo Vecchio. Contact Terry Parsons, Olteco-Olivetti Telecommunications, 10062 Miller Ave., #204, Cupertino, CA 95014, (408) 996-8128.

Info/Manufacturing '82, April 27-29, Chicago.

Called the "Information Management Exposition and Conference for Manufacturing," this show is billed as the only event devoted exclusively to manufacturing corporations. Contact Clapp & Poliak, Inc., 245 Park Ave., New York, NY 10017, (212) 661-8410.

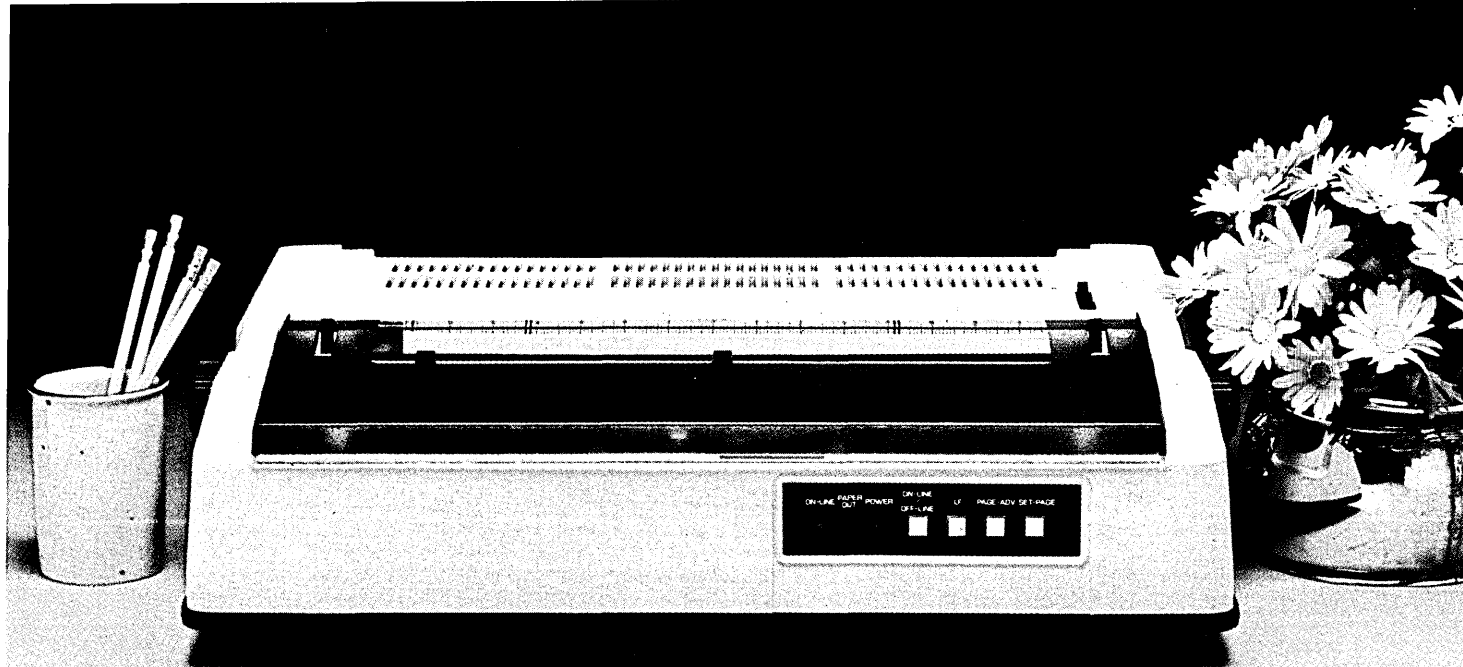
MAY

Computer Aided Quality, May 11-14, Baltimore.

This conference and expo is dedicated to the application of mini, micro, and mainframe computers as well as microprocessors and programmable controllers to improved manufacturing quality. Contact Robert Waterbury, CAM-I Inc., 611 Ryan Plaza Dr., Suite 1007, Arlington, TX 76011, (817) 265-5328.

Graphics Interface '82, May 17-21, Toronto, Ontario.

The National Computer Graphics Association and the Canadian Man-Computer Communications Society cosponsor this conference and exhibition. Contact Rich MacKay, DataPlotting Services, Inc., 160 Duncan Mills Rd., Don Mills, Ontario, Canada M3B 1Z5, (416) 447-8518.



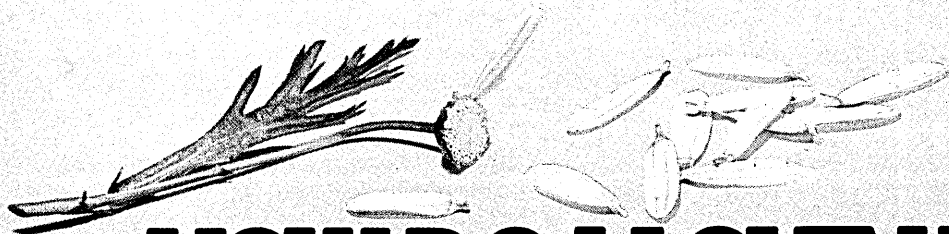
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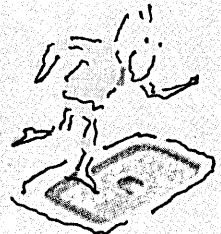
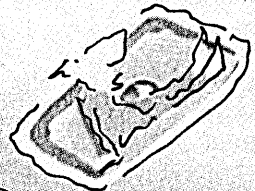
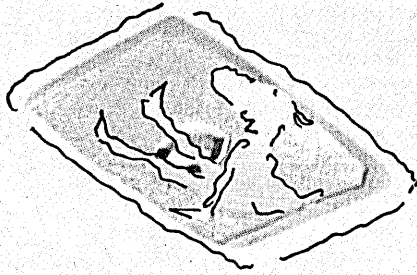
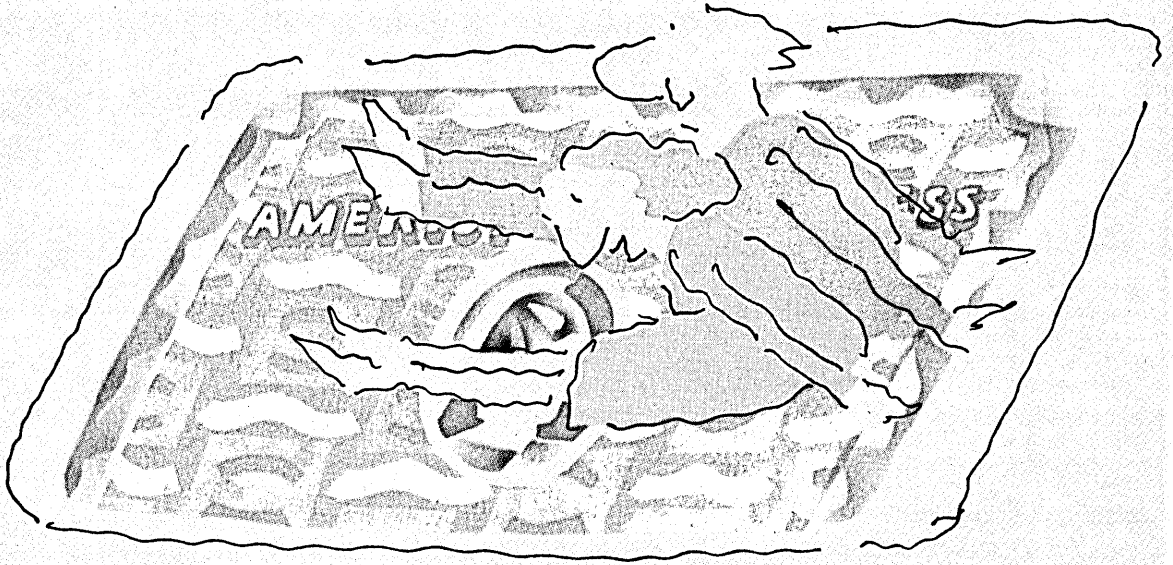
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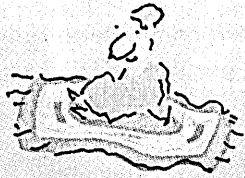
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With TRIPS, American Express travel counselors can plan detailed itineraries for their clients. That's because the IBM Series/1 is so flexible it can support the computer applications of practically every form of travel industry supplier, including airlines, hotels, tour operators... even American Express' Consumer Financial Services Group. Instantly, it brings a world of information to the agent's display screen, and prints clients' itineraries and travel documents in seconds.

Series/1 is so flexible because it's modular. Meaning you can use its components as building blocks, to custom tailor a solution to many different requirements, ranging from distributed data processing to energy management to industrial automation.

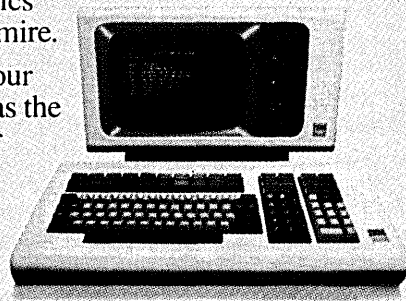
The end result of this flexibility is higher productivity.

"Our productivity is up significantly," reports Glenn Santmire, Senior Vice President of American Express Travel Division. "In this business a fast, assured response to our client is what counts. With that we are giving our customers better service. And that's the key to differentiating ourselves from competition."

But flexibility and productivity wouldn't be worth a dime without reliability. And although we could quote you pages of statistics about IBM reliability, we'd rather quote Mr. Santmire.

"The reliability of the Series/1 is way beyond our expectations. It's for that reason that we chose it as the backbone of the communications network for our Travel Offices."

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If you're in a start-up mode, the perfect way to begin building your system is with the Prime 250-II. If you need more power, you'll find the solution in the Prime 550-II or the Prime 750. And if you're looking for maximum performance, the Prime 850 is the most powerful mini available today.

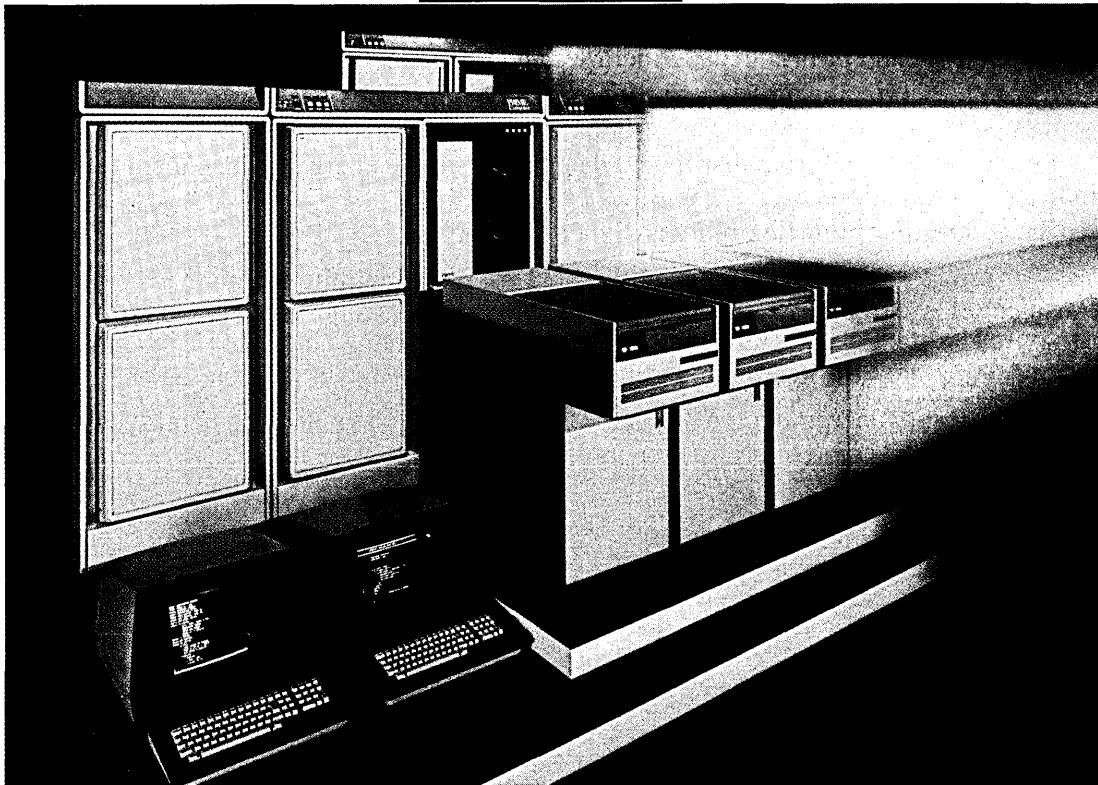
You should know too that any 50 Series system can be networked with any other. They can also communicate directly with mainframes. And all Prime systems support a broad band of industry-standard languages.

The economy of compatibility. The Prime 50 Series is designed around a single operating system, which makes all systems compatible with each other. So you can easily and economically move up to a larger system, or expand to any number of small, remote systems. And you'll have nothing new to learn because the same software goes with you.

A spectrum of solutions. The 50 Series was designed to provide a broad spectrum of solutions for just about any application you might have, including manufacturing, financial, education, utilities, engineering, energy, automated office, you name it.

Consider Prime first. Today, more than ever before, you need the compatibility and the spectrum of solutions that only Prime can offer. For more information, write to us at Prime Park, MS 15-60, Natick, Massachusetts 01760. In Europe, write Prime Europe, 6 Lampton Rd., Hounslow, Middlesex, TW3 1JL, England. Telephone: 01-570-8555.

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LETTERS

ROUTE 128 REVISITED

My compliments on your choice of cover illustration for the November issue!

The artist, Richard Egielski, did a fine job of portraying the dynamic growth (and then some) of high technology firms in the route 128 area. The article itself, "Route 128: Hotbed of Technology," was great; several comments on geography and related issues:

Harvard is generally referred to as "the small liberal arts school upriver" from MIT. You've shown them reversed on the Charles River Basin.

I believe the helicopter (shown atop Nixdorf Computer facility) belongs on DEC's rooftop helipad. Statistically, since they've got one of the largest corporate fleets of fixed and rotary wing craft in New England, that seems more likely.

I assume your treetop firm on the story's first page is "Sanders" as in "—Associates."

R.W. MANN JR.
Manager, Marketing Planning
American Airlines
Dallas/Fort Worth Airport, Texas

The plane on the Nixdorf roof was the one sent by the governor of Massachusetts to pick up Heinz N. and take him to his meeting with Entrex execs (p. 116).—Ed.

ETHICS AND THE CONSULTING BUSINESS

As president of the Independent Computer Consultants Association (ICCA), a national, not-for-profit, professional organization, I feel a reply is in order to the article "So You Want To Be a Consultant" (November).

To begin with, the article seems very slanted to men in data processing. Since our field is one of the most open in the country (there are a large number of very successful consulting organizations headed by women), the chauvinistic bent of the article was inappropriate.

More importantly, I want to reply to

two elements in the "Notes from a Consultant" section of the article. In one, the author suggests that "any time you are on site, take all the manuals you think you are going to need for the next year." This sounds like stealing to me. It is in direct conflict with the ICCA Code of Ethics. A member consultant found doing that would be expelled from our organization. Professional consultants are able to obtain the research and reference materials they require through standard business channels.

The second element indicated to "get the business first, worry about doing it later." This again is contrary to our Code of Ethics. If a member finds an opportunity that is outside of his or her expertise, it is common practice to establish joint ventures with other firms having the necessary background. This arrangement is made prior to obtaining the business.

Successful consulting requires a professional attitude. As an association, we are building a reputation for our segment of the industry. The attitude of the article is not consistent with this goal.

STEVEN A. EFNER
President
Independent Computer Consultants Assn.
St. Louis, Missouri

Although I certainly enjoyed the article, I suspect that the consultants interviewed were not as deliberate in their career development as they recommended.

I worked for several years as a consultant in computer and noncomputer businesses until I finally realized it was too late for me to have an honest trade, but by then I had become a consultant!

ROBERT WACHTEL
Occidental, California

ASK BEGS THE QUESTION

"Beefing up the Business" (Look Ahead, November) reported that Conserv Corp. had a 40% share of the manufacturing systems software market. We believe this to be a gross overstatement. In fact, ASK Com-

puter Systems Inc. is the leading supplier of packaged software for manufacturing companies. Our 1980 manufacturing software revenues were some 40% higher than Conserv's, while, according to a recent study, the *total market share* of the top five suppliers of manufacturing software amounts to less than 25%.

GARY S. YOST
Director of Marketing Communications
ASK Computer Systems
Los Altos, California

LOOK IT UP

At a time of increasing interest in dictionaries as office automation tools, for hyphenation and spelling checks, I have observed an odd anomaly in hyphenation as decreed by Webster's (Merriam) dictionaries. It is this:

- All words ending in TIONARY are hyphenated as TION-ARY, except DICTIO-NARY.
- All words ending in NATION are hyphenated as NA-TION, except HYPHEN-ATION.

Now I am aware of the horrible inconsistency of hyphenation as it is practiced, but there seems to be very long odds against this combination. Do any DATAMATION readers know the reason?

BOB BEMER
Phoenix, Arizona

... AND MERRIAM RESPONDS

In the division of both *dictionary* and *hyphenation*, the etymology, or word history, is relevant. A division is shown after the *n* in *hyphenation* because the word is formed from the English word *hyphen* plus the suffix *ation*. Similar divisions can be found in our dictionaries for *alienation*, *margination*, *oxygenation*, and *pollenation*. On the other hand, *dictionary* is not formed from the English word *diction* plus *ary*; it comes from the Latin *dictionary* which is itself formed from *dictio* "speaking, style" plus an *o* (found in many Latin nouns ending in *io* when a suffix or inflection is added) plus the noun suffix *arium*.

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LETTERS

Thus we feel that our division of the entry *dic·tion·ary* reflects its Latin origin more clearly than would a division after the *n* and it also adheres to the rather complicated set of principles we apply to the entire vocabulary of our current dictionaries. It is cases like these, by the way, which make it difficult to teach a computer to divide words both consistently and sensibly.

JOHN K. BOLLARD
G.&C. Merriam Co.
Springfield, Massachusetts

MORE ON UNIX

Donald A. Norman's article "The Trouble with UNIX" (November) is inadequate because it treats versions of the system that were superseded more than a year ago and because it omits comparison with other interactive systems. Some of his criticism was invalid even for the old UNIX (version 6). In my experience with UNIX since 1976, the editor (ed) has always warned the user against quitting before making working text permanent.

At the University of California, Berkeley, computer users have several choices for their work. Not only is UNIX the most popular system for general use, but it is frequently chosen as front end (via local network) into computers with special resources. For example, experimental data may be input via UNIX editor for analysis by SAS on an IBM 4341 and results reported with the help of UNIX document formatting. In fact, UNIX is favored because it combines, with little compromise, the scope of large systems and the friendliness of small systems.

Norman says his secretaries persist with UNIX only because he insists. Why insist? Why not suggest something better for secretaries and all who do word processing? There are simpler word processors, but their simplicity characterizes not just user interface but range of abilities as well. At Berkeley, the popularity of UNIX persists

despite official preference for IBM CMS. Let Professor Norman introduce the secretaries to CMS to show them a true "disaster for the casual user."

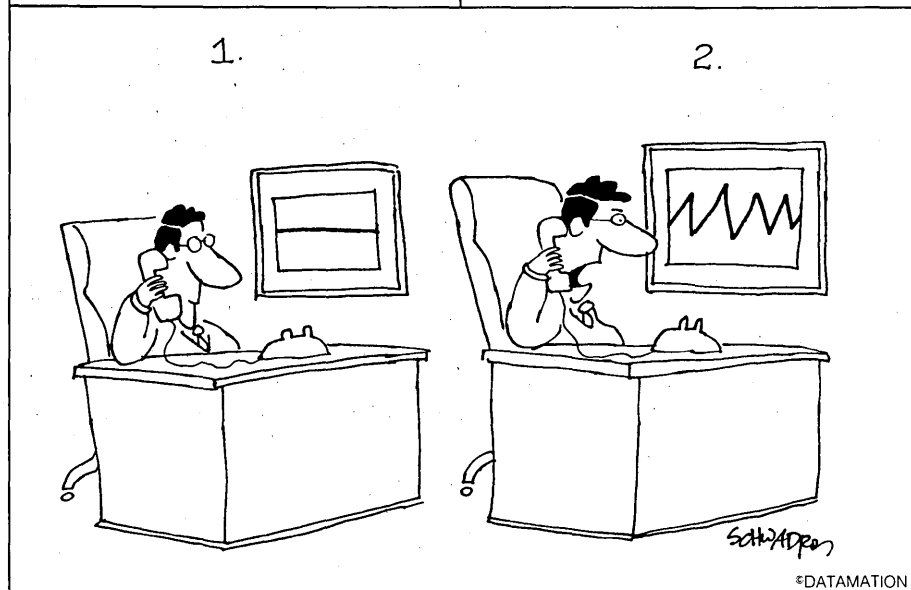
GENJI SCHMEDER
Senior Programmer
University of California
Berkeley, California

I find it ironic and somewhat astounding that the first time that UNIX gets other than casual editorial attention in DATAMATION, it is in the form of carping criticism. The editors obviously were embarrassed about this since they felt the need for apologetic and explanatory sidebar stories. Ah well, publicity is publicity. ("I don't care what they say about me as long as they spell my name right.")

In the past 20 years, I too have used and written a number of operating systems. Professor Norman seems to have some misconceptions as to the methods by which operating systems are developed. In particular, he seems to assume that they are fabricated instantaneously out of whole cloth after long and deliberate consideration. In fact, they evolve over time to meet the needs and pressures of the moment. UNIX is a mature operating system. Like anyone (or indeed anything) in this world that has survived long enough to attain maturity, it bears the imprint (nay, the scars) of its past encounters. Further, we can anticipate that as it continues to age, it will (like all of us) stumble forward to eventual obsolescence or senescence as the weight of its perceived defects gradually become more than its benefits can bear.

With regard to his design concepts taken from "Cognitive Engineering" I would like to make the following points:

1. Rigorous consistency is not found or favored by any ongoing human activity. In fact, such consistency is often termed cold, sterile, or monolithic. (Witness the reaction to public buildings or



CARTOON BY H.L. SCHWADRON

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March 3, Financial Management's Use of Computer Graphics, New York City, Halloran House
March 3, Electronic Communications, New York City, The Harvard Club
March 4-5, DP Fundamentals for Management and Users, New York City, The Harvard Club
March 4-5, Improving Your Leadership and Management Skills, Cambridge, MA, Faculty Club
March 4-5, Data Communications: Regulation, Analysis, Design, San Francisco, Hilton Hotel & Tower
March 8-9, Integrating Word Processing, Atlanta, Southern Conference Center
March 8-9, Demonstrating DP Department Performance to Non-DP Management, Cambridge, MA, Faculty Club
March 9, Business Graphics, New York City, Halloran House
March 9, Management's Use of Computer Graphics, New York City, The Harvard Club
March 11-12, Improving DP Center Performance and Productivity, San Francisco, Hyatt Regency
March 11-12, Slashing Telecommunication Costs and Improving Service, Atlanta, Southern Conference Center
March 12, Decision Support Systems, New York City, The Harvard Club
March 15, Digital Image Processing, New York City, The Harvard Club
March 15-16, DP Project Management, San Francisco, Hilton Hotel & Tower
March 15-16, Computer Graphics, Atlanta, Southern Conference Center
March 15-16, Selecting Your First Computer, New York City, Halloran House
March 15-16, Project Management, New York City, The Harvard Club
March 16, Data Base Management for Geographic Information Systems, New York City, The Harvard Club

March 18-19, The CAD/CAM Revolution, Atlanta, Southern Conference Center
March 18-19, Distributed Systems, Technology, and Design, Chicago, Sheraton-Plaza
March 22-23, Data Communications: Concepts and Overview, Atlanta, Southern Conference Center
March 22-23, Systems Analysis, New York City, The Harvard Club
March 24-25, Distributed Systems: Concepts and Management Overview, Atlanta, Southern Conference Center
March 24-25, The DP Executive As Manager, San Francisco, Hilton Hotel & Tower
March 24-25, Systems Design, New York City, The Harvard Club
March 25-26, Improving Your Leadership and Management Skills, Denver, The Fairmont
March 29-30, Writing Skills for DP Professionals, San Francisco, Hyatt Regency
March 29-30, Strategic Planning for Information Systems, New York City, The Harvard Club

APRIL

April 5, Financial Management's Use of Computer Graphics, Cambridge, MA, Faculty Club
April 5-6, Word Processing, Atlanta, Southern Conference Center
April 5-6, Project Management, Houston, Hotel Meridien
April 12-13, Office Automation, San Francisco, Hyatt Regency
April 12-13, Computer Graphics, Cambridge, MA, Faculty Club
April 12-13, Management of Software Engineering, New York City, The Harvard Club
April 14, Electronic Communications, San Francisco, Hyatt Regency
April 15-16, DP Fundamentals for Management and Users, San Francisco, Hyatt Regency
April 15-16, The CAD/CAM Revolution, Cambridge, MA, Faculty Club

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LETTERS

"planned" capital cities.)

2. I agree completely that people develop their own mental models of systems they use. It is not necessary, however, that these models correspond to the models used by the creators of the system. The question of "correctness" is moot; as long as a model is functional within the context of its user, it is relevant. Along with better knowledge of the system will come a functionally more adequate model. From these "wrong" models, however, evolve new approaches to using a system that might never have been anticipated by its creators.

3. Mnemonicity is in the mind of the mnemonicist. Once one understands the concepts behind it, "cat" is very mnemonic. (By the way, "cat" is short for "caterinate." The "con" on "concatenate" is redundant. Look it up!) Furthermore, by choosing a more restricted mnemonic designator, the wider possibilities for use of the command may be obscured for novice users and they might form the "wrong" model of its use.

I have used UNIX seriously in the last year and a half only, and I admit a certain culture shock upon my initial encounter. But one does not go to a foreign country and expect to understand the language and the people without some study and effort. UNIX is strong precisely because it does not contain many of the hidden values and assumptions of the traditional operating system culture. And like any other culture, it too has its weaknesses.

I think I perceive within Professor Norman's comments another, more constructive article, perhaps entitled "UNIX Pitfalls of Which To Be Aware and Considerations When Designing and Naming New Commands." But then the editors of DATAMATION would probably not consider that article of interest to their general audience. Or would they?

DAVID A. BRIDGER
St. Louis, Missouri

You seem to think we have a bias against UNIX. Not true.—Ed.

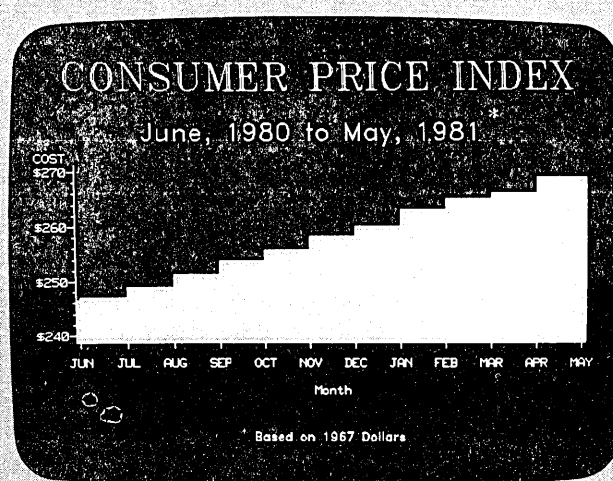
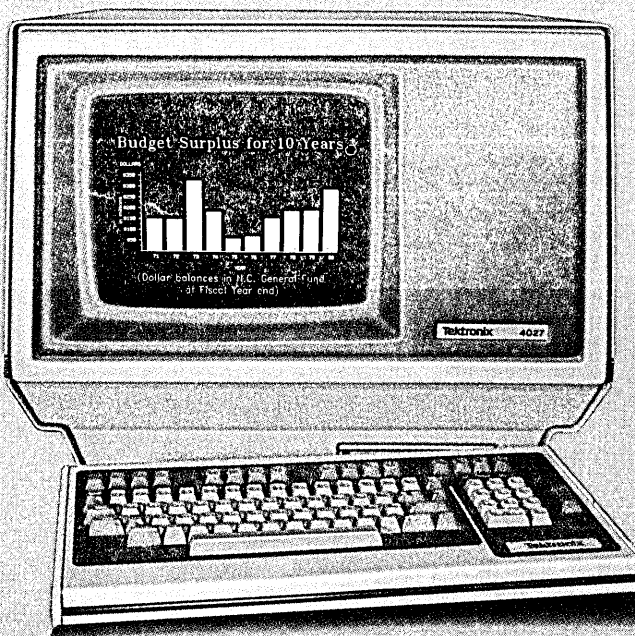
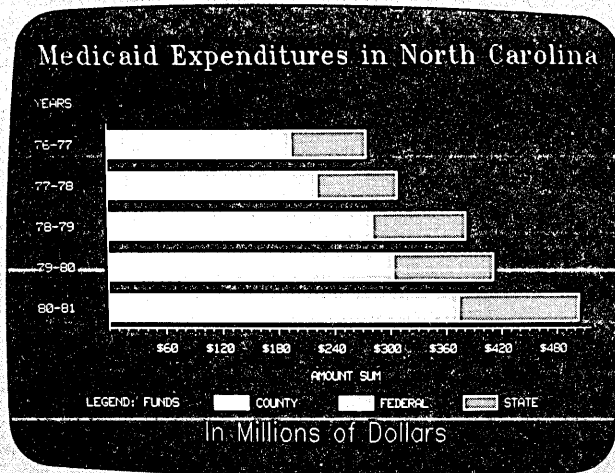
THE GOOD OLD DAYS

I wish to comment on "Software Parts Nostalgia" (Readers' Forum, November) by Robert L. Glass.

Glass's contribution to the Reader's Forum properly points out the great advantages of a software parts technology. His nostalgic view of the good old days suffers from the usual problem: we remember things as being much better than they really were. It took a major effort to establish the SHARE program exchange and two major efforts to improve upon the SHARE library operation which failed. SHARE could not solve the central problem with software parts—quality control.

True, there were some great programs in the SHARE library, but there was also a lot of junk. I will not enumerate all

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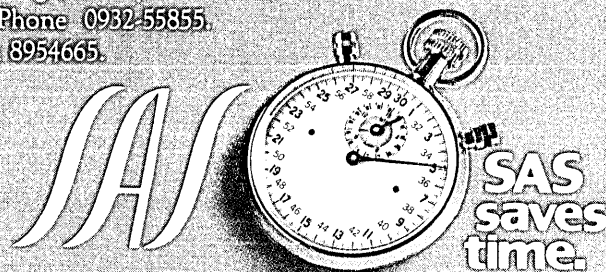
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LETTERS

the ways software parts can fail to work, but most of us have experienced them firsthand. Suffice it to say that programmers in the 1950s knew even less about how to make software usable than programmers know in the 1980s. And even now, most programmers are inept in this respect; it is really hard to produce good software parts. A software library with a modest percentage of junk (say 25%) will not be used. Programmers, like cats, will not return to something once they have been burned; anyway, their natural inclination is to do it all themselves.

Yes, it would be great if the 1980s could be like Glass remembers the 1950s. The big difference is that it is possible now; it wasn't in the '50s.

JOHN R. RICE
Professor of Mathematics &
Computer Science
Purdue University
West Lafayette, Indiana

SHAPE UP OR SHIP OUT

Regarding your editorial (Editor's Readout, October), when will the cry from dpcers, "Let's have an efficient operating sys-

tem," be sounded? No one wants to "renovate dinosaurs," so let's do as nature has done. Let them fall to the wayside and encourage growth in a new generation of clean operating systems.

Unless we want to carry three to four generations of dinosaurs and get lousy mileage, let's encourage our vendors to clean up their acts!

ROBERT J. GAY
Vice President, Data Processing
Hot Line, Inc.
Fort Dodge, Iowa

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LET'S HEAR IT FOR HEURISTICS

In his article "Synchronizing Data with Reality" (November), Jim Highsmith accuses us proponents of heuristic development of "design bypass." He uses the often mentioned analogy of a builder constructing the structure before the architect has finished his detailed design.

Were it only that simple. Architects have it easy when compared to the systems designer. An architect has a reserved piece of geography onto which he will build his edifice; the systems designer has no such privilege. All sorts of other people are building system structures in the same space, and our systems designer must be able to interact well with all of them, even those not foreseen when the design was conceived.

Likewise, the architect has some physically proven engineering laws with which to work. True, the art applied is significant, but, I submit, software design has a much greater proportion of art than engineering. The "laws" of systems design are still too wrapped up in the evolving sciences of psychology, sociology, and organizational theory to allow for definitive engineering precision.

Lastly, the architect and his clients are both specific persons who can negotiate with each other as concepts and needs change or conflict. In most large systems neither the designer nor the user are that well defined. Everyone seems to have a say in construction, use, and, therefore, in the success of the systems. A "pure" design is simply not possible in an organizational environment except, I suppose, if developed independent of day-to-day practical considerations.

Systems are living facets of modern organizational life. Until (if ever) we know enough to predict the complexities of multi-system interaction along with economic and social considerations, the use of prototypes and heuristic development provides a rational way of forming a consensus between the designers and users in order to achieve a successful, profitable, useful system.

JOE PODOLSKY
Controller
Hewlett-Packard
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San Jose, California

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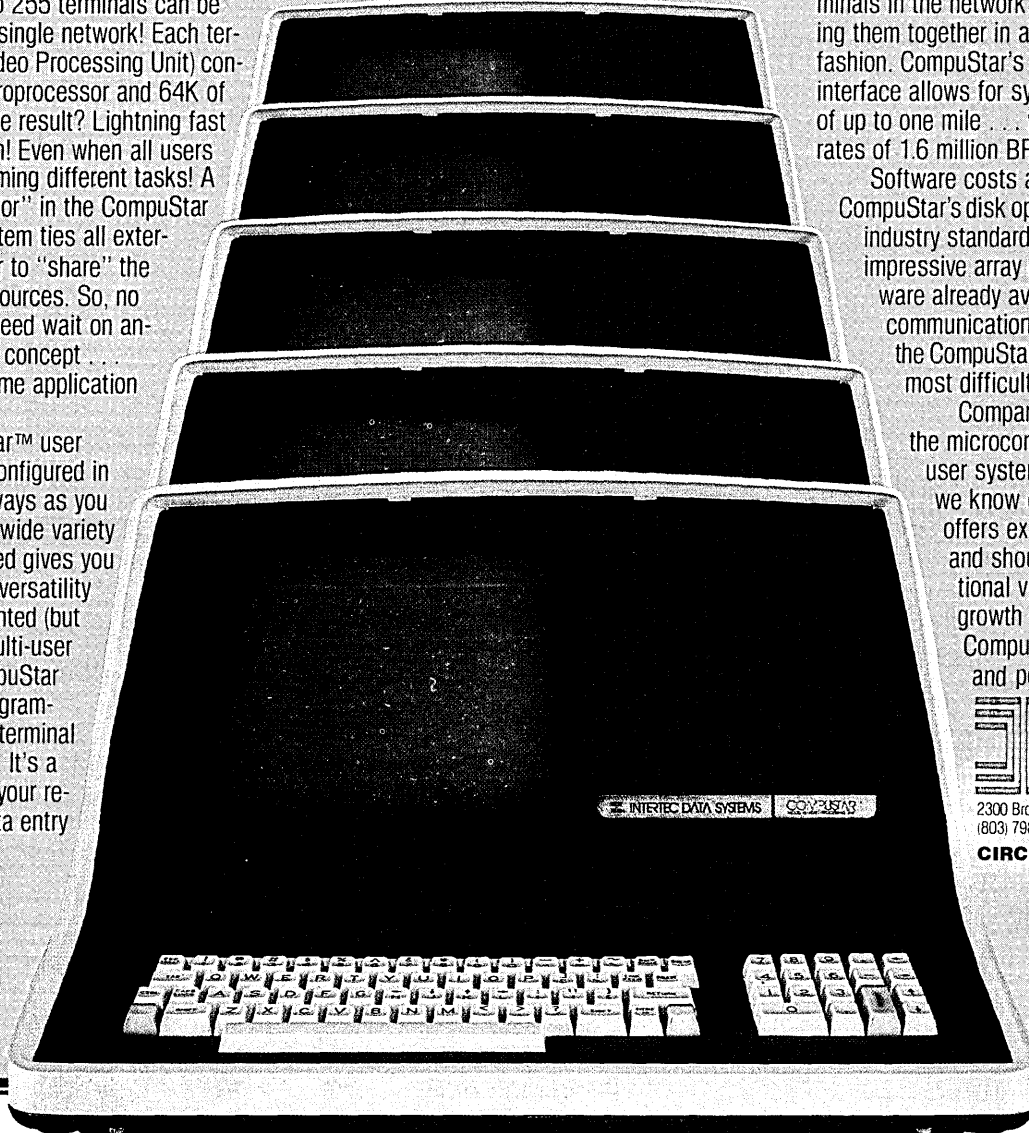
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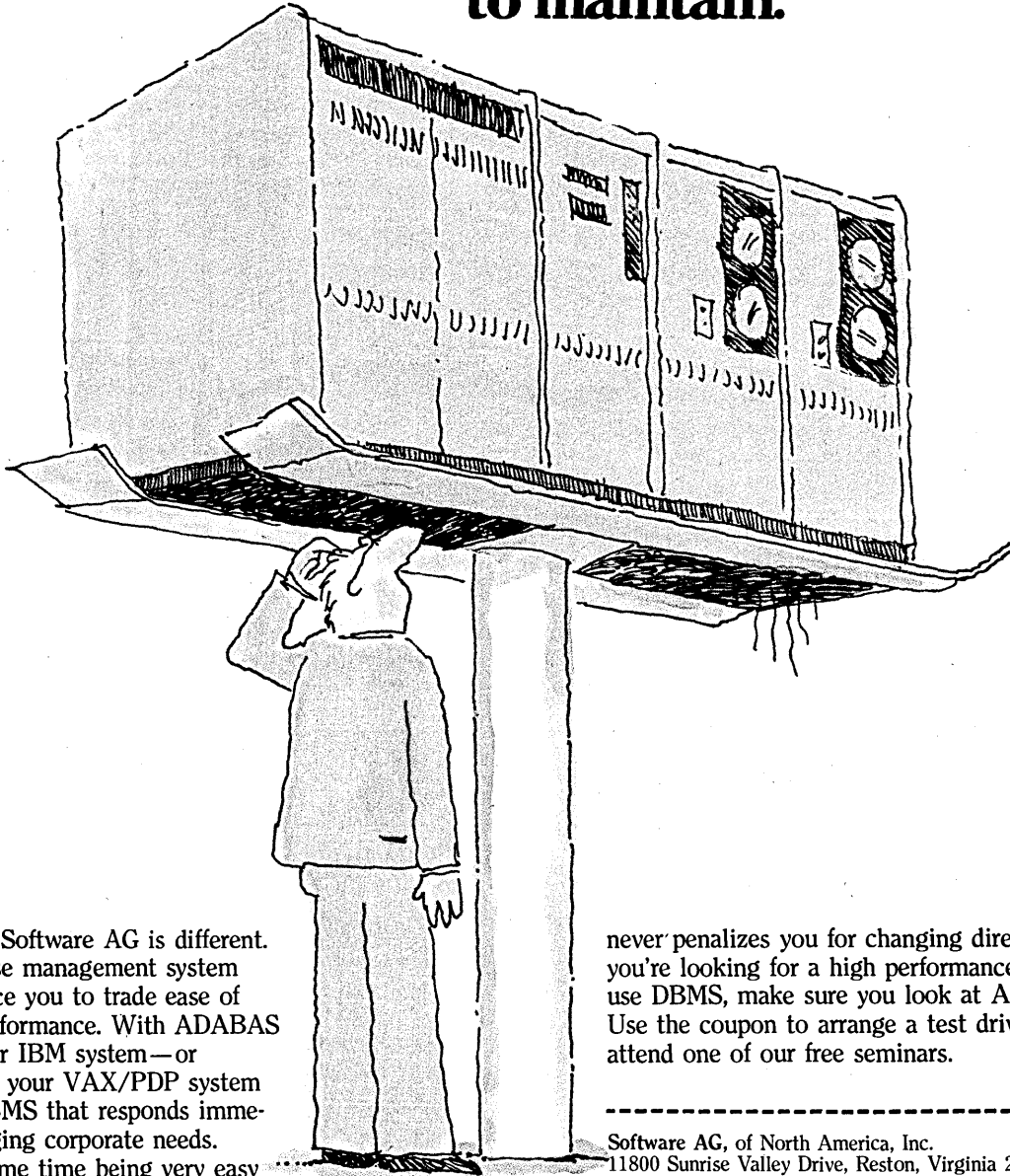
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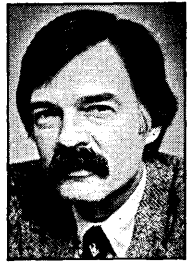
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CIRCLE 26 ON READER CARD

EDITOR'S READOUT



BACKING INTO THE FUTURE

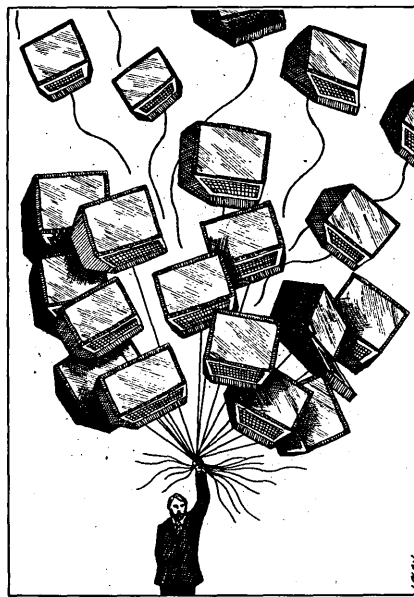
With the long overdue dismissal of the IBM trial and with AT&T's moves into the unregulated marketplace, the ever-changing computer industry has made another major readjustment.

That's why, when we heard the comment, "What we need is another national study committee," we didn't turn pale and make for for the nearest exit. Normally we would greet such a statement with the same enthusiasm we reserve for root canals. But the national committee proposed by lawyers Harlan Blake and Milton Wessel is another matter entirely.

We chatted with Milt Wessel about the proposal in his Fifth Avenue law office not too long ago and found him as feisty and articulate as ever. One of his many activities is acting as legal counsel to ADAPSO; Milt was also a DATAMATION advisor some years back.

Right now, he says, major decisions are being made and massive amounts of money are being committed to computer-based information systems that will profoundly change the nation's and the world's economic structure. The whole fabric of our society will be impacted. Yet there has been no public debate; in fact, there is no real, clear understanding of how computers and communications are changing our lives.

Banks, oil companies, retail stores, brokerage houses, publishing



firms . . . hordes of cash-rich enterprises are feverishly competing to gain the upper hand in the information age. All this frenetic activity, which is restructuring the economics of the '80s, will impact long into the 21st century on how we live and work.

At present there is no structure and no coherent direction. Our government does not have a unified information policy, and we have yet to do the basics: the work of gathering information about the complex relationships involved in computers, communications, society, and the economy. We do not have the data we need to make informed decisions about this country's future.

So, Wessel and Blake are proposing a committee patterned on the TNEC—Temporary National Economic Committee established by Congress in the 1930s. The overriding issue of that day was the growing concentration of economic power. The committee,

composed of the top economic thinkers of the time, gathered and analyzed economic information and made recommendations. It identified economic consensus where it existed. It was a repository for information, a focal point for decision-making data gathering by government, business, and industry, and it wielded enormous influence.

This is the type of body they would like to see created today. They propose private rather than government financing and they stress that the committee must operate with no strings attached.

We endorse the idea of this committee. Although there is no shortage of people and institutions addressing these issues—agencies like the Office of Technology Assessment and individuals like Tony Oettinger at Harvard—there is no one unbiased focal point for the many divergent views and opinions.

Primary funding ought to come from those businesses that have the highest stakes in the new information age—the banks, retail stores, publishers, and the like.

Even if the committee's efforts are only marginally effective, they will be better than the babble we have today.

As Blake and Wessel said in a recent article in the Columbia Law School alumni newspaper, "We are dealing with extremely complex economic and technological forces. No one claims that there are easy answers, or that the proposed TNEC-type study will produce a new and dramatic national consensus. To permit developments to just happen, however, is an abdication of our responsibility as a society to do the best we can." *

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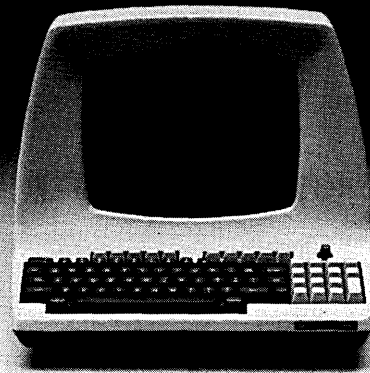


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CIRCLE 30 ON READER CARD

IN FOCUS

WASTE NOT, WANT NOT

by Merrill Cherlin

Prophet of doom or protagonist for survival? Whichever, Jeremy Rifkin is a man with a mission.

A bottle of vitamin C with rosehips sits atop a scratched-up filing cabinet. A moth-eaten sofa with a sprung spring provides seating of immense discomfort for visitors. Two dim lightbulbs illuminate the dustballs in the corners of the linoleum-floored room.

The man behind the desk appears as tired as his office. He has dark circles under his eyes and looks as if he hasn't seen the sun for days. He is a man with a mission.

After having spent 10 years as a political activist involved in everything from civil rights to VISTA to anti-Vietnam War work, Jeremy Rifkin has a new cause. He feels that unless we smarten up and drastically change our patterns of consumption, there will be nothing left to consume.

He has written a book called *Entropy* to point out the error of our ways, and to any thinking person it rings with the awful sound of truth.

First, an explanation of the concept of entropy. To quote from the book: "The Entropy Law is the second law of thermodynamics. The first law states that all matter and energy in the universe is constant, that it cannot be created or destroyed. Only its form can change but never its essence. The second law, the Entropy Law, states that matter and energy can only be changed in one direction—from usable to unusable, or from available to unavailable, or from ordered to disordered.

"In essence, the second law says that everything in the entire universe began with structure and value and is irrevocably moving in the direction of random chaos and waste. Entropy is a measure of the extent to which available energy in any subsystem of the universe is transformed into an unavailable form. According to the Entropy Law, whenever a semblance of order is created anywhere on earth or in the universe, it is done at the expense of causing an even greater disorder in the surrounding environment."

Or, as Rifkin said recently in an interview, "It's the overriding law of nature. Like it or not, everything has a beginning and an end, and when you've used something up, you've used it up. We like to believe that there's always some technol-

ogy or some gimmick that's going to allow us to create something out of nothing, or find a way to harness things that have already been used. It's our world view: there's a substitute or an alternative or a replacement for anything that we've experienced or consumed. The Entropy Law tells us no. The problem is that we don't want to come to grips with limits."

In accordance with his views, the 36-year-old Rifkin lives a very simple life. He rents a tiny apartment in a run-down section of Washington, D.C., and possesses only one suit, one sportscoat, and assorted jeans and shirts. He has never married, feeling that commitment to his work comes first, and is too consuming to allow room for family responsibilities. He is, however, rethinking this position.

Rifkin spoke to us in his office at the People's Business Commission, formally known as the Foundation of Economic Trends, of which he is a director. He lectures extensively and writes prolifically. *Entropy* is the fourth in a series of six books Rifkin is writing in an attempt "to try and outline some major conceptual changes that we're going to be facing over the next 20 years." One of these is the depletion of abundant resources.

According to Rifkin, "What's happening is that if you talk to people who do analysis of fossil fuels, there's a general recognition that we have reached the top of the bell curve, if you will, for the age of fossil fuels and stored sun. We're not saying that there's nothing left, or how long it's going to take to use up the rest of the supply, but there's general agreement that the cheap days of really inexpensive, free ener-

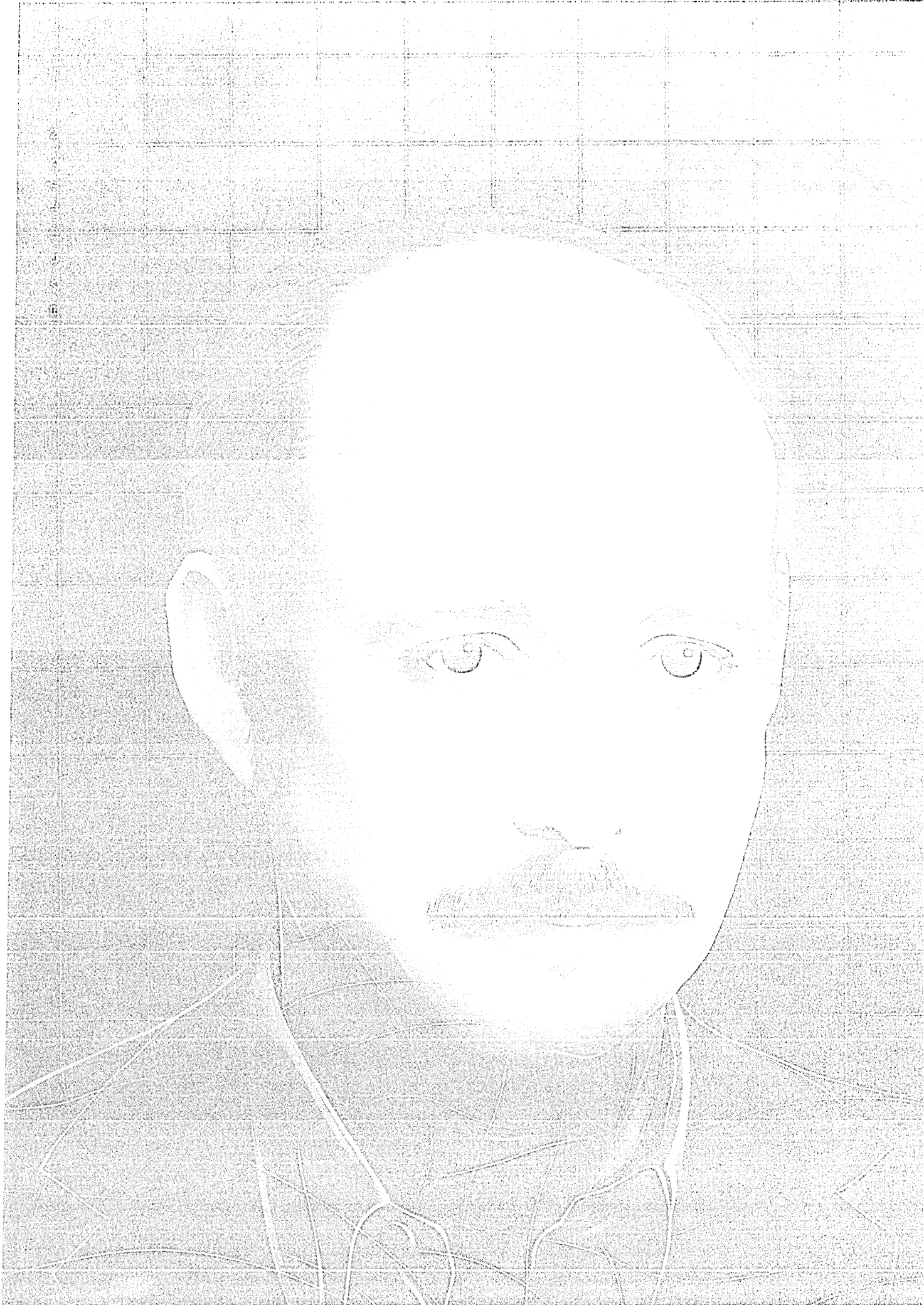
"The Entropy Law states that matter and energy can only be changed in one direction—from usable to unusable, or from available to unavailable."

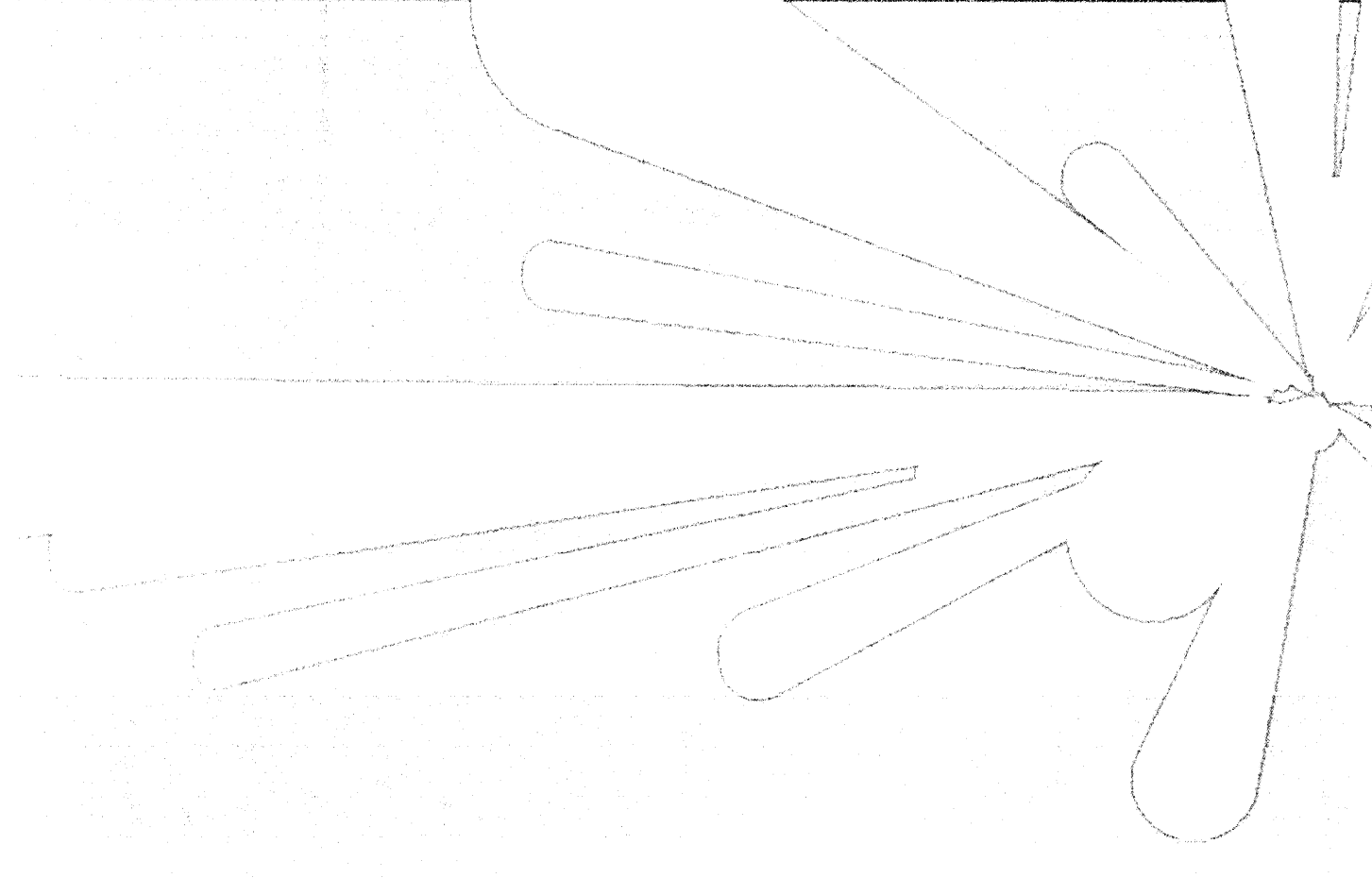
gy peaked in the early '70s. There might be short-term gluts on the market, but in the long term, not only fossil fuels but some basic metals are moving toward the down side of that bell curve.

"Now the industrial age is really just a metaphor for the use of stored sun. In other words, in this particular period of history, the past 300 years, what we did was take all that stored sun and basic metals and metallic ore underneath the ground and turned it into utilities—factories, clothes, machinery. So that all the accoutrements of the industrial age are really made by, propelled by, and maintained by a resource that is now becoming scarce—fossil fuels and metals. And that's forcing us to make a transition into a new resource base, which would be biological.

"Now the problem that Reagan and the socialist and capitalist countries are having is this: They want to increase supply.

ILLUSTRATION BY DICKRAN PALULIAN

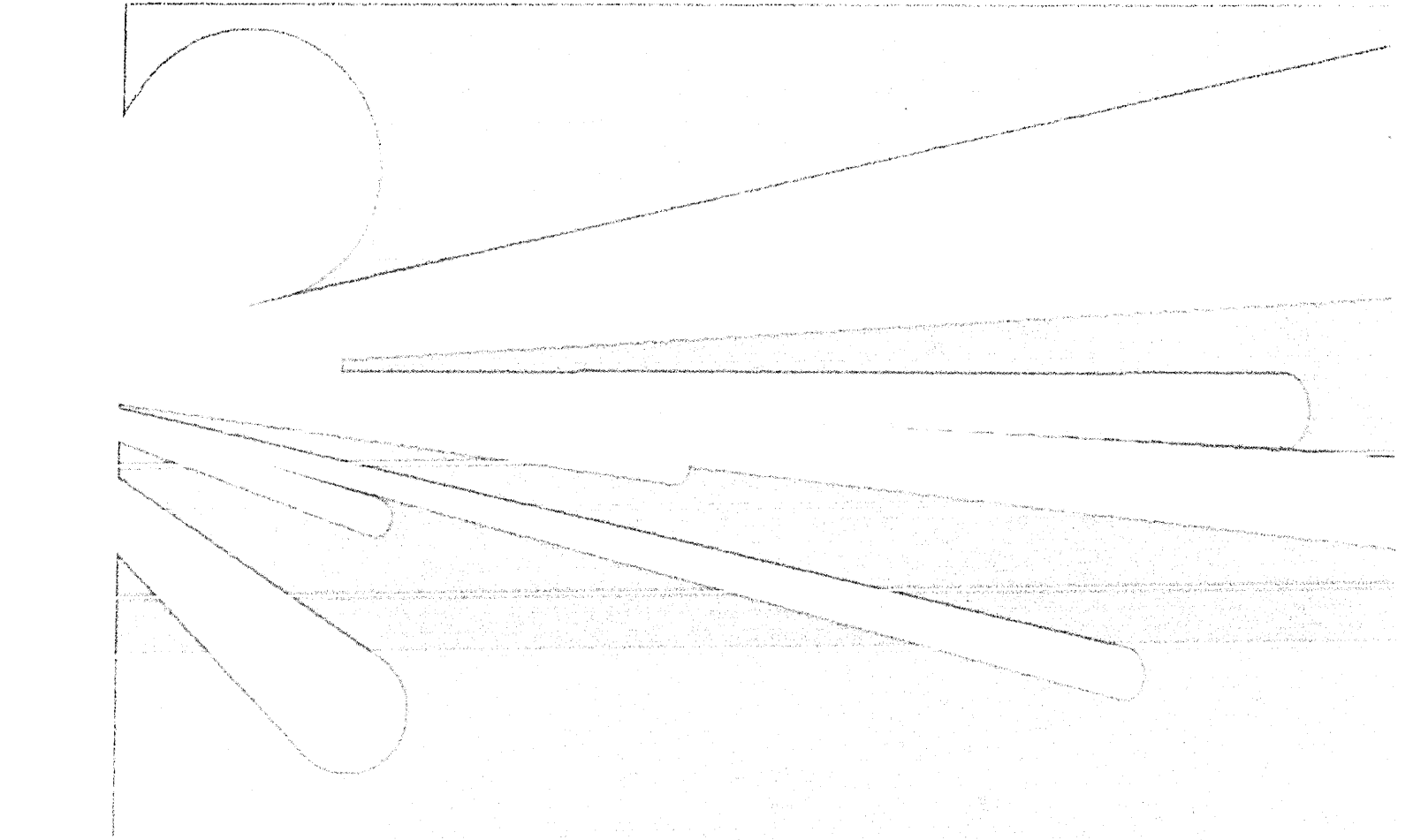




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IN FOCUS

Well, they're increasing supply or production of the very thing that's becoming scarce, which has to increase its cost, has to continue to escalate the inflationary cycle. It has to make it more difficult to locate or process the remaining resources. If you increase the production of the thing you're running out of, it takes you to the wall faster. At the same time, and this is what the entropy concept tells us, economics is a flow line. You start with resources from nature at the beginning of that line, and then move into utilities, through technology and labor. Then, at the end of the economic line, all of the goodies become entropy, unavailable energy, waste, some of which is recyclable, some of which is not. Much of that unavailable energy or waste is pollution, and no civilization can live for very long in the accumulation of its own waste, because it pays the social cost in terms of disease patterns, disruption, etc.

"What's happening now in the United States and the U.K. and Germany and the Soviet Union is that we have not paid the bill for all the past economic activity that's built up in terms of waste. It's now reaching the point where Japan, I believe, is paying something like 7% of its GNP for pollution control. It's pretty enormous. I don't know what it is here, but it's getting larger and larger, so that it's becoming more and more costly to absorb all the waste from past economic activity—in terms of safety guidelines and pollution controls dealing with everything from acid rain to chemical waste dumps to health problems.

"At the same time it's becoming more costly to locate and process a deplet-

"The problem is that we don't want to come to grips with limits."

ing resource base. It's becoming more and more expensive on both ends of the flow line—the resource side and the dump side. And there's absolutely no way to lessen that problem by increasing production, because you're not only depleting your base faster, but you're accumulating waste in a shorter and more tense period of time. It can't be absorbed by the ecosystem. We're going to get in more and more trouble because we have a smaller resource base with which to work. Eventually, whatever administration comes in will have to see the need to change its resource base from non-renewables to renewables, and then ask the question of how we want to organize renewables. The closest parallel is the transition made about 500 years ago, when the agricultural resource base of the medieval era came to an end.

"The whole base of medieval Europe was trees, wood. Wood was the energy source for everything. When they finally denuded the forests and ran out of wood,

and prices were doubling and tripling, they went to coal. When they went from wood to coal, there was a very, very big break. They moved from rural to urban, from an agrarian to an industrial labor force, from landlords to merchants and industrial capitalists. There was a tremendous upheaval, and I think that's what's happening right now as we move from the age of fossil fuels to the age of biology. It's such a difficult transition."

What does he mean by the age of biology? "Well, everything that's alive. Everything in the gene pool is a potential source of economic utility. Let me give you an example. Up until 30 years ago, all of our fabrics and fibers and basic packaging were made out of living things—burlap bags, for example. The shirts you wore were made out of cotton or wool. Those were all from living things. Then we moved to petrochemicals. Du Pont and others developed artificial fibers made of chemicals. Then we got leisure suits. It was called progress. All of our packaging now is synthetic-based, from nylon to rayon to plastics. What we're talking about now is whether we will choose an ecological approach to renewables or genetic engineering. That's really what's on the horizon right now—whether we're going to engineer living resources to create new utilities that have never existed, or whether we're going to take a more traditional ecological approach to living resources.

"A problem is getting people to think about this before the crisis comes. If we want to make a human, rational kind of transition, instead of experiencing the barbarism of a collapse, we have to start looking at these things now.

"One interesting note, by the way: since *Entropy* has been out in the past year, I've received some good feedback from the business and engineering communities, at least by some of the forward-thinking people. And there's a real attempt to start rethinking all of economic theory. I don't say it's a big group, but there is an attempt.

"Speaking more specifically to your audience, one of the things we've learned from the information sciences is that you can't secure a new piece of information unless you expend energy. And you do so at the expense of some increase of entropy in the surrounding environment. On one level, you see, there's a misunderstanding about the computer saving energy. A lot of people say we're moving into the computer revolution, and that's going to save us energy because we can let our computers do the walking for us. They're saying how computing's getting cheaper and cheaper and we can select from smaller and smaller units, and therefore we're really saving energy. But this ignores the broader picture.

"Computers are like our eyes and ears; they're sensory apparatuses. Their job

is to seek out information. The computer is an information device for society at large. The computer's job is to secure more and more information. Now it doesn't secure information just for the sake of securing information. It secures information in order to increase the consumption of resources. That's the basis of all economic activity. So the more we rely on an intensification of computers and the more sophisticated searching apparatus or informational apparatus, the more resources we're going to convert, not less. That is, unless all of civilization's history has been wrong, because we'd had all sorts of informational devices throughout history.

"One of the things we've learned from the information sciences is that you can't secure a new piece of information unless you expend energy."

"When we used only the spoken word, that was a source of information where the hunters would communicate with each other to locate the prey and then catch it. But when we moved to the written word as an information device, it allowed us to keep accounts of trading and exchanges between groups, to increase our base of operation over wider territories. When we moved to the printing press and telecommunications, it brought an expanded area of resource exploitation—to all across the globe. Now that we're moving to the computer, it's again intended as a communications device to use information in order to secure greater resource consumption. If I'm wrong, all I can say is it will be the first time that we know of, since the beginning of history, that a new communications technology was used across the board to seek out and consume less rather than more."

This will be especially apparent, Rifkin points out, when consumers turn on their home terminals to do comparison shopping—a "benefit" that's promised us in the near future. "You're saving time and space," Rifkin says. "You're overcoming all the distances and you're saving a lot of the time that would be required to seek out, exploit, consume, and then discard more and more resources. Otherwise, what would be the benefit of this as an economic tool?"

We already have the technology, however. Is Rifkin proposing that we simply chuck it out the window? His reply: "It's a question of technology being compatible with the metabolic flow of nature itself, including all living things in nature. What that means is this: Nature has its own rhythm. The sun comes up and goes down; the seasons come and go; life develops, matures, and dies—human life, plant life, animal life, even our landscape. There is a rhythm and flow to it, and we need to have

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technologies that can transform nature into utilities commensurate with nature's own speed. When civilizations attempt to consume faster than nature can reproduce, then they use up their base faster and end up collapsing. So the ultimate balance of budget is between society and nature. Never consume faster than nature reproduces. If we develop technologies that are so efficient that they speed up the conversion of nature into utilities faster than nature can reproduce them, then we're in trouble. If we're talking about coal and metals, obviously that's replaced very slowly, if at all.

"Let's take something simple like land, which is supposedly renewable. Every farmer knows that if you take a piece of land and you overcultivate it and overuse it,

"Why would anything be important, sacred, or inviolable if there's an alternative or substitute for it?"

you demineralize that soil and turn it into a desert. It takes 100 to 400 years to reclaim one inch of topsoil, so if you're talking about 10 or 15 inches of topsoil that you lose, that's a couple thousand years needed to reclaim it. It's not a short period of time. That 2,000 years to reclaim topsoil is equivalent to the time between Christ's days and today. What with machinery and chemicals and pesticides, we've lost one-third of our topsoil in the last 30 years. The Agriculture

Department came out with a massive study last year saying that at the current erosion rate, through pollution, entropy, waste, and mechanical farming, we might not have enough farmland to feed our own population by the year 2000. That's catastrophic. We must develop technologies that transform or use up nature only as fast as nature can reclaim itself.

"Judging from history, that's probably not going to happen. But one thing that's new is we are now coming to realize that we are on a spaceship, as they say, a closed system. It was a pretty bizarre experience to look at those first satellite pictures taken in outer space, to see the globe from outside. We have now reached a point, a consciousness, where we are starting to understand the fixed nature of this teeny, delicate, little globe that we inhabit. That's different from everything in our history, and it is possible to make a transition to learning to live within the confines of a self-generating recycling system. You'd have to be real hopeful to believe it's going to happen, given past experience, but I think it is possible. Possible isn't saying it's going to happen, possible is just saying it's possible."

Isn't it more likely that people are going to say we'll soon have the technology to create topsoil, and then everything will be okay? "That's what the genetic revolution will attempt to say," Rifkin contends, "that we're going to create new life forms. Again, that's why the Entropy Law

is so devastating.

"There are two types of people that come across the Entropy Law and read a book like mine or others on the subject—those who love it and those who absolutely would like to throw up afterwards. It's almost a philosophical approach to life as much as it is a metaphysical or scientific law. There are a lot of people who believe there's always a substitute or alternative for everything. Once you believe that, there's no reason to respect anything because if everything has a substitute then there's no longer anything that's sacred. Why would anything be important, sacred, or inviolable if there's an alternative or substitute for it? Once you're into that mentality, there's absolutely no way to maintain any reverence or respect for anything within living or non-living systems.

"All of us seem to have gotten to the point where we tend to look at most things as profane or as just utilities. It's something I grew up with, and it's even hard for me to deal with it. I tend to look at everything in the world as having been put there as pure utility, without any sacred value. Until we can come to grips with that misconception, we're going to continue to look for bigger technologies, thinking that we're creating our own second nature.

"We believe that technology somehow is creating something. All it's doing is using up our endowment faster. It isn't creating a damn thing. Growth only means using up what we have available to us faster, in a shorter period of time, meaning there will be less available for future generations. I have not met an economist who could show me that we have ever created anything from nothing. The first law of thermodynamics says it's impossible. You never create anything from nothing, and I've never

"We should be no more pessimistic about entropy than we are about gravity."

found an economist who could say that we've created permanent wealth. Even the pyramids are on their way to becoming dust in the wind.

"A lot of the misconception started way back with John Locke, who said everything in nature is waste because it's being unused. And it only becomes purposeful, Locke told us, when you add human labor to it, creating something of value. In other words, the faster you take human labor and technology and harness all that's in nature, the more permanent goodies you can create. Entropy says it's the exact opposite. Everything in nature is value—concentrated, available energy capable of doing work. When we add human labor to it, or technology, we're just transforming it into a temporary utility and it becomes waste. Instead of things going from waste to permanent value, they go from value in nature to utility



"I chose for my book report 'Excited States in Quantum Chemistry: Theoretical and Experimental Aspects of the Electronic Structure and Properties of the Excited States in Atoms, Molecules, and Solids.' Edited by Nicolaidis and Beck. I didn't understand a word of it."

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in society, and back to waste in nature. Your Gross National Product is not a measure of your permanent wealth. It's an indication of this planet's resources that we've used up in a given 12-month period."

Depressed, dear readers? Well, Rifkin will tell you, "I haven't said anything that you haven't already said to yourself. People who have read my book said that they could have written it if they'd known about the Entropy Law. I'm not saying anything that isn't commonsensical, and that all of us, especially in the under-40 age group, haven't thought about. Are you depressed about gravity? Gravity is a physical law. Entropy is a physical law. It's really a question of how we come to grips with it. All it does is tell us the rules by which a ball game has to be played. How we adjust to it philosophically is whether we're optimistic or pessimistic, but we should be no more pessimistic about entropy than we are about gravity."

But Rifkin admits that his theory, right now, "is about the last thing anyone wants to hear. We don't want to face it because to face it means we'd have to do a lot of things. Like we'd have to start sharing resources with each other. We'd have to have a more equitable approach to how we divvy up all the endowment here that's been left to us. It would mean changing our whole hubris about human beings being the

measure of all things. It's hard.

"If we were able to turn it around and start to look at developing a balance with nature's own rhythms, we could have life on this planet for eons into the future because the system has its own natural recycling ability if it's left pretty much to its own state. I'm not saying go back to the Stone Age. We're sophisticated enough now to develop appropriate technological, political, and social patterns to live com-

"It will be the first time we know of that a new communications technology [computer technology] was used across the board to seek out and consume less rather than more."

mensurate with nature in a way that's also compatible with a decent, healthy life. Not a life that's full of all the unnecessary waste and luxury, but a life that's healthy and prosperous.

"Have you ever been to the Pennsylvania Dutch country? It is amazing how well those Amish farmers' families live. They have good food on the table; they have beautiful homes. These people don't use any modern technology. They're not living in the Stone Age. I'm not saying we could

all live like that, but certainly they're an interesting example to the rest of us. It depends on what we want for ourselves. Do we want 5,000 tv channels, and Beta-maxes? Why should I have to choose between 200 channels when there's enough crap on 10? It's just one thing after another, just more and more stimulation, and we find, after a while, that we get burned out by it. We all have a point we can't go beyond, where we're so bombarded by stimuli through all of the various information and communication outlets that we want to just scream or collapse because we cannot even screen out all the stuff after a while, all the messages that are coming to us, all of the possibilities.

"We did a survey on A&P, one of the food chains. People are walking into these big grocery stores and walking out again without buying anything and going down to the local corner grocery. You know why? They're too overwhelmed. There're too many things in the store to pick from, too many items to understand, too much knowledge to absorb, so they go down to the local grocery store and buy their basics. I get overwhelmed sometimes. You go into those big grocery stores and you get disoriented, you don't know where to start. Magnify that to a whole society."

He shakes his head in disgust. "It's absolutely insane." *

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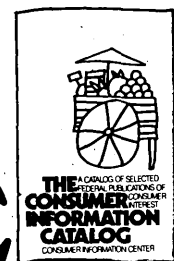
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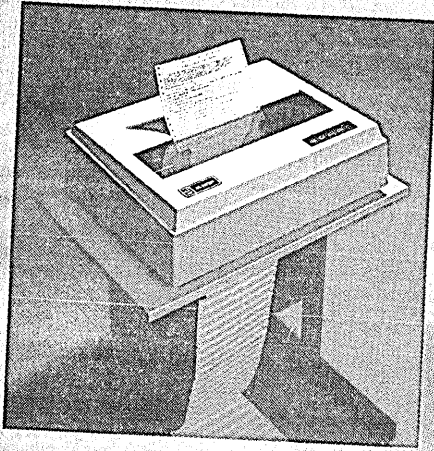


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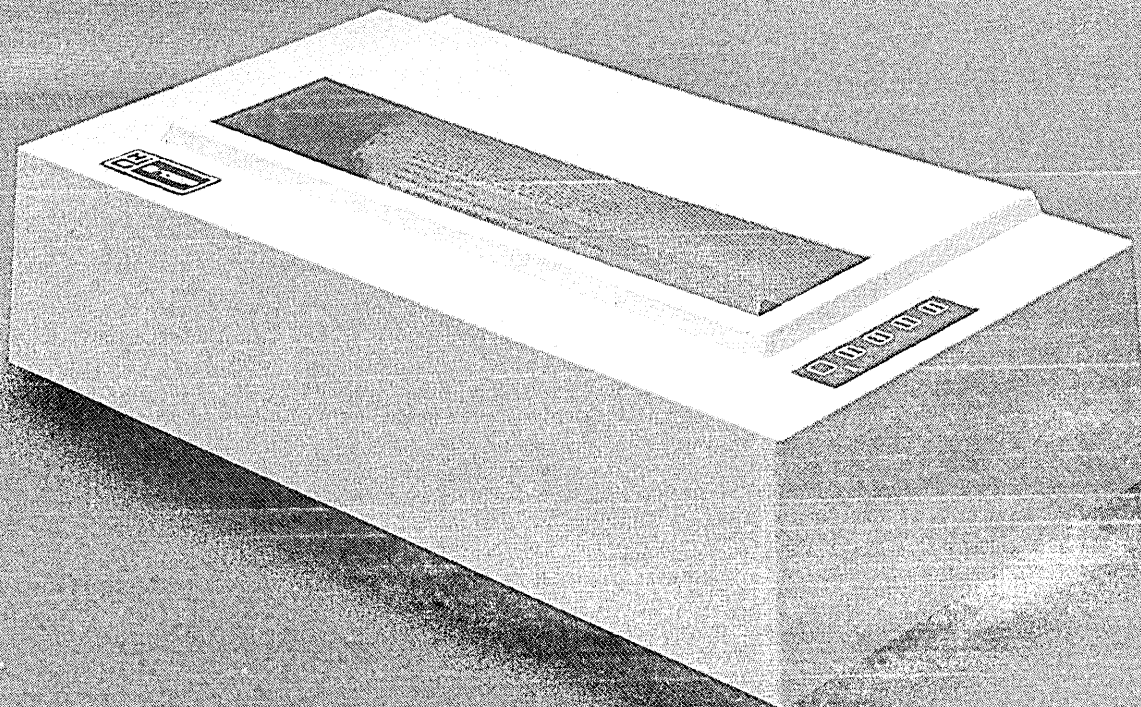
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The longest antitrust suit in history was "without merit."

Finally it is over. With little more than a handshake, 13 long years of government antitrust action against IBM have ended. The fat, happy computer giant has emerged intact and, more than a little self-righteously, declared itself "totally vindicated." During the course of the meandering case, the firm has seen its annual revenues more than triple, its two-thirds market share remain unmarred, and quite a few big competitors fall by the wayside. And while the industry may no longer be as much IBM's show as it once was, the company is still the biggest and most powerful computer vendor in the world.

The dismissal of the IBM suit has set the stage for what many say will be a battle of unprecedented scale. Unshackled by legal and political restraints, IBM can now move even more aggressively into new markets while keeping competitors, new and old, under continuing if not growing pressure. Even before the glimmer of a possible dismissal appeared, IBM had grown increasingly hungry for business, flexing its marketing and manufacturing muscle with new sales tactics, aggressive pricing, and enormous capital expenditures for R&D, product development, and, most notably, plant construction. A decade of government and private antitrust action, close to 20 suits filed in all, has left IBM bigger than ever.

Moreover, the industry has changed dramatically since the firm was first sued by the Justice Department. Mainframes are only one piece, albeit a large one, of the action. Small computers, communications, computing services, and, most significantly, software have grown in importance as new technology, economic factors, and foreign competition have entered the fray. Thus, as IBM sheds what little constraints it felt from its lengthy antitrust era, it finds itself faced with a vastly different industry in which to operate.

AT&T, coincidentally or not, has also been released from previous restraints and is now free to compete head-on with IBM in all areas of the business. The Japanese are gathering their forces to assault the U.S. market, particularly at the small systems level where high-volume, low-priced systems are required. Computing services, from which IBM has been absent domesti-

cally for more than a decade, offer a great growth potential for the company. Software, once given away with the sale of mainframes, is now the obvious area in which IBM's size and domination will have the most effect. Indeed, some suggest that future antitrust action could easily center on software rather than hardware issues, given the emphasis the industry will place on selling high-profit-margin programs.

It has been obvious to most observers that IBM long ago counted on getting at most a slap on the wrist from the government and that it had little to fear in the way of being broken up, as the original suit had asked. No doubt the firm was cautious in its public statements and conduct within the market, but it very obviously maintained its dominance in traditional markets and gained strength in new ones, such as small systems and communications.

Those watching the trial differed in their opinions of its final outcome. The only general consensus was that the case had long outlived its relevance, having been filed at a time when "computers" meant multimillion-dollar mainframes, not microprocessor-based systems that could be stamped out like cookies.

"It seemed to me something of an albatross when I was head of the division," said Donald Baker, former Assistant Attorney General for Antitrust under the Carter Administration. "I have the general feeling that the time ran out on the government years ago in the sense that the huge growth in computation capability [sic] had made the mainframe monopoly a less dominant factor."

Baker, who now is associated with the law firm of Jones, Day, Reavis & Pogue in Washington, added that big antitrust cases run into problems "if you allow a

Unshackled by legal and political restraints, IBM can now move even more aggressively into new markets while keeping competitors under pressure.

long time to elapse between the alleged violations and the relief stage. And you've got those problems in geometric proportion when you have an industry that is growing as fast and changing as much as the computer industry."

"Maybe in one sense it was brilliant trial work by IBM, that they just managed to turn it into an endless war," Baker stated.

Others were more indignant. Phil Dorn, a New York computer consultant, said the dismissal of the IBM suit was a "non-event. It simply shows that the government didn't have a case, never did have a case. It was a terrible waste of time, of management attention and energy, and of taxpayer money. The only result is that IBM will get even more aggressive."

One longtime industry observer, asking for anonymity, suggested that the dismissal of IBM's suit and the agreement between AT&T and the government would eventually result in a huge clash between the two massive corporations. "While the elephants are out there doing battle, a lot of little animals will get trampled. It's a fearful thing to unleash those two."

"As always, the Democrats bring the suits and the Republicans settle them," the source added.

Politics had always been an issue surrounding the case, ever since it was filed dramatically on the last business day of the Johnson Administration by then-Attorney General Ramsey Clark. Was the suit purely a political act with no legal merit, as IBM chief trial lawyer Thomas Barr charged in comments to reporters after the hearing in January at which the suit was dismissed?

No, said Ramsey Clark himself in a telephone interview soon after. "I was never a politician. If the White House knew

"As always, the Democrats bring the suits and the Republicans settle them."

about the suit, it never mentioned that to me. Mr. Barr has indicted himself or at least the system of justice if it takes 13 years to dispose of a case without legal merit."

Clark, who now practices law in New York City, commented that the suit had "a long, sad history that at best reflects negligence on the part of the government. Thirteen years was outrageously excessive duration for a case if there is to be relevance between the market at the time of the filing and the ultimate remedy." He pinned blame on the Nixon Administration, which during its first term did little to prosecute the suit. Clark added, however, that the final dismissal of the suit after so many years of inaction shows "the enormous difficulty of applying legal procedures to complex technologies and changing markets."

"There was an ebbing and flowing in commitment to the case due to political vagaries," he said. "The dormancy of the suit was not good for rule of law, the economy, or justice."

Clark said he disagrees with Assistant Attorney General William Baxter that "bigness isn't necessarily bad." "That requires a lot more analysis," the former Attorney General said. "IBM had a market share of more than two-thirds and nobody had even 10% of that. When you're in the ring with a bruiser like that, you're terribly handicapped. There comes a time when market principles won't work. It's one of the anomalies of corporate socialism. Bigness is economically bad under many circumstances."

Ray Carlson, an attorney who was chief government prosecutor on the IBM case from 1972 to 1977, said, "What Jus-

tice is saying is that IBM can put anybody out of business if it wants to."

"I thought if Baxter got in, the case would be killed," Carlson said. "The trial staff is very bitter. Every Assistant Attorney General [for Antitrust] did his best to become acquainted with the case. Baxter said things totally unsolicited. He took a shot at the lawyering, which wasn't necessary to achieve the results he wanted. You don't take low blows at people who bled their guts out and did the best job they could."

"If the result Baxter achieved came about because he honestly believed the case was without merit, then that's his prerogative," the former government attorney said. "I think it was a mistake to dismiss it. But after 1970 it became difficult to prove what had to be proved—that IBM set below-cost prices to drive people out of business. What they really did was set prices at the death-knell level. That's why they won all those cases at the district and appellate levels."

Ted Withington, an Arthur D. Little computer industry analyst and onetime witness at the IBM trial, said, "I thought IBM would win, but not without making at least some concession, however minor, just so the Justice Department could save face. IBM had already been behaving as if it had won anyway." Withington saw several ramifi-



Somewhere among the 80,000 pages of transcript recorded in the U.S. v. IBM antitrust trial by the end of 1978, Judge David Edelstein interjected a bit of levity that in hindsight summarizes all the antitrust actions IBM has fought over the past two decades: "Just to add a little humor to this pedagogy, I am always reminded of the very young Senator who was being harassed by the senior Senator, and one day, in utter frustration, he said: 'I may be wrong but I'm never in doubt.'"

cations of the dismissal, including the possibility of an "acquisitions binge" by IBM as it moves swiftly into new markets requiring technology it can't cost-effectively develop on its own.

"The pace of capital investment had been slowing down," the analyst said. "Now IBM's in a great position to go after small, innovative companies, or perhaps even large, established companies."

He noted also that in looking back over the history of the case, the successful growth of the plug-compatible cpu market,

"Perhaps we owe this more to Gene Amdahl than to anybody else."

led by former IBM computer architect Gene Amdahl, was clearly a "thorn in the side of Justice." Arguments that IBM was a monopolist held in every discussion until Amdahl's success was raised, Withington recalled. "Perhaps we owe this more to Gene Amdahl than to anybody else," he suggested. "The Amdahl mainframe was something Justice just couldn't deal with."

The dismissal of IBM's suit, however, may help the firm cast a longer and darker shadow across the PCM landscape, owing to the greater potential for IBM to change directions in its large systems design.

As one large dp shop manager said, "There are so many PCMs out there and they offer so little value-added. In general, you don't risk your neck—at least I don't—for a few percentage points' improvement in price/performance. IBM's newfound freedom may frighten away those users who were considering an alternative to Big Blue."

In the past, Withington agreed, users may have taken it for granted that IBM would spare PCMs because of antitrust implications. Now, with IBM free to take any direction it wants, users may think it will aggressively wipe out that competitive segment of the business.

European reaction to the dismissal of the IBM case was a mixture of shock and polite interest. IBM's European competitors said they were following events closely, but had no specific comment to make immediately.

Politically inclined observers said they were shocked at the apparent about-face of the Justice Department. "I thought it had the reputation of being tough," said one French source, referring to the department. Most observers agreed that the change was a symptom of President Reagan's pro-business policies. Some even called the dismissal an international trade offensive, "like the current U.S. attack on European steelmakers."

Those close to the action in the ongoing antitrust dispute between the European Commission and IBM felt the U.S. action

NEWS IN PERSPECTIVE

was predictable in the present political climate, but they also said the decision would free the hands of the commission rather than prejudice its own findings and conclusions. "With two similar cases going on, there was a conflict. Now there is none," said one European legal expert.

The European Commission case, however, has no legal connection with the U.S. suit and is different in direction. The commission has objected to IBM's behavior,

Some European observers called the dismissal an international trade offensive.

not its structure, and is unlikely to abandon its action in light of the U.S. dismissal. Because the commission acted only on complaints from PCM vendors, it would risk legal action from them as plaintiffs if the case were dropped. In mid-January the commission was still waiting for an oral hearing on the IBM suit. IBM already had delivered written replies to the commission's statement of objections.

In general, European observers said they thought the AT&T and IBM decisions could strengthen the U.S. position in international trade. AT&T is already planning to acquire 45% of an Irish telephone equipment manufacturer, Telectron, which exports to some 65 countries. That would give the U.S. firm a good jumping off point for European and other markets.

CIT-Alcatel, the French telecommunications equipment maker, said it expected the divestiture of AT&T's local operating companies would open up a market for foreign firms to sell telephone equipment to the U.S. market. Canadian Northern Telecom, already selling digital PBX equipment to U.S. operating companies, stands to gain much from the divestiture.

As for AT&T selling into foreign markets, some think the U.S. giant may have cut off its nose to spite its own face. AT&T has avoided adopting international equipment standards and may find itself handicapped by not having standard equipment to sell in foreign markets, it is thought.

The expected clash between IBM and AT&T will probably be in the area of computing services. IBM is now free to enter that market and is expected to do so in the next few months. AT&T, which had been testing the waters with experiments in videotex and electronic publishing of news and yellow pages information, would be free under its new consent decree with the government to forge ahead into those and other new areas. Delivery of all sorts of information, for businesses and individuals, is projected to be a high-growth area in coming years and is sure to draw the sights of the two Titans, among many others.

Ulric Weil, computer industry analyst at Morgan Stanley, said, "IBM might

now think the time is right to take over its SBS [Satellite Business Systems] affiliate completely by buying out its two partners [Aetna Life and Comsat]. And it could even bring over its PBX development from Europe."

IBM and AT&T have already competed against each other in the crt terminal market where IBM's 3270 has been under growing attack by Bell's Dataspeed 40 machine, built and marketed by Teletype, an arm of Western Electric. Following a court decision and FCC ruling, the Dataspeed has been gradually upgraded to include some data processing features. Whether or not the two firms would compete head-on in the computer business is hard to predict, although each firm would seem likely to have its eye on small computer devices, such as home information terminals.

Whatever happens in the future with IBM, the need for a restructuring will become more pressing because of the firm's size, many analysts believe. Even if the government couldn't force a splitting up of the firm, the leaders in Armonk may take the task into their own hands.

In response to that growth, other mainframe companies and perhaps small computer makers will feel pressure to consolidate and sign cooperative agreements, thinks Wall Street analyst Weil. "They [competitors] will either be driven out of the industry or they'll merge, just to survive," he said. Many of the deals will probably be international in character and will provide means for foreign companies to enter the U.S. market.

IBM has not been the only computer maker hit with antitrust suits. Data General,

"IBM might now think the time is right to take over its SBS affiliate completely by buying out its two partners [Aetna Life and Comsat]."

the Westboro, Mass., minicomputer vendor, has had its share of troubles in that area, and its president, Edson de Castro, said he hoped the Justice Department's dropping of the IBM suit signaled a new era. He said he hopes government will help, rather than hinder, the effectiveness of the computer industry, particularly in relation to the Japanese, who are eyeing the U.S. market hungrily. "The contrast is striking," he said. "The government here has pursued antitrust litigation against IBM, while the government in Japan has actively assisted that nation's computer industry."

Indeed, the IBM case, by far the longest on record in the U.S., will be studied for years in business schools. Its dismissal may be seen by future historians as a major turning point in the relationship between the so-called information industry and the government.

—John W. Verity

HOLD THE PHONE

In return for a measure of freedom, AT&T agreed to break up the Bell System.

And in the second month of the eighth year, it ended. Not with a whimper, but a bang.

"Justice and AT&T worked out a very remarkable and very beneficial resolution," said Philip Verveer, former chief of the Federal Communications Commission's Common Carrier Bureau. "The extent of a settlement like this in antitrust law is almost unheard of. The Standard Oil case in 1911 is the only one I can think of that's even close. It's absolutely amazing."

The settlement, technically a "dismissal by stipulation" of the government's antitrust case and an abrogation and modification of the 1956 Consent Decree which had prevented AT&T from competing in unregulated services, insures that it will be neither as simple nor as cheap to "reach out and touch someone."

Each party gave a little to get a little—or perhaps a lot, depending upon one's vantage point. AT&T surrendered its 22 basic operating companies (BOCs) in return for the government's promise not to pursue the antitrust case. Bell kept Western Electric, Bell Labs, and Long Lines, both intra- and interstate. The company is no longer prohibited from offering unregulated services, allowing it to enter the dp and information services markets, where, as one source chuckled, "AT&T and IBM will go for each other's throat." The newly orphaned BOCs must share their facilities equally with all long-distance telephone companies and cannot discriminate against AT&T competitors in buying equipment and planning new facilities. "I presume this is what MCI and everyone else has been after," AT&T chairman Charles Brown noted wryly. "This ought to satisfy them." Finally, this metamorphosis of the world's largest company must be completed within 18 months of the effective date of the modification of the consent decree.

"I feel wonderful," crowed Herb Jasper, executive vice president of the Ad Hoc Committee for Competitive Telecommunications (ACCT). "We're positively vindicated. I'm really surprised they [AT&T] took it. They must have assumed Justice would be 100% successful or that [U.S. District Court] Judge [Harold] Greene would go beyond what Justice wanted. But I think this is the worst possible outcome AT&T could have suffered under Greene."

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Much to the parties' distress, both may yet discover what the outcome could be under Greene's jurisdiction. The judge, who had responded to AT&T's request last September to dismiss the case by telling the company that the government's exhibits "demonstrate that the Bell System has violated the antitrust laws in a number of ways over a lengthy period of time and the burden is on the defendants to refute the factual showings," was sorely displeased last month at what he perceived to be the parties' attempt to circumvent the requirements of the Tunney Act.

Counsel for both parties were surprised at U.S. District Court Judge Vincent Biunno's quick acceptance of the divestiture plan. It had been filed there first because that court retained jurisdiction of the 1956 Consent Decree. But the New Jersey jurist's decision created the conflict which caused Judge Greene's Jan. 12 hearing.

"I'm not going to deny it's a little peculiar," Justice lead attorney Gerald Connell confessed to Greene. "It's not the road we had mapped out."

Judge Greene immediately set a new course. "I cannot and will not permit this case to be dismissed without the scrutiny of an act passed by Congress only seven years ago," Greene told Connell and AT&T head counsel George Saunders at the hearing. "This case is too important to have it

concluded in a haphazard manner without following the procedures mandated by the Congress."

Passed in 1974, the Antitrust Procedures and Penalties Act (APPA), more commonly known as the Tunney Act in honor of the former Senator from California, mandates that certain actions be followed in any civil antitrust suits settled by the government. There must be 1) a filing with the court and publication in the *Federal Register* of a competitive impact, which must

AT&T surrendered its 22 basic operating companies in return for the government's promise not to pursue the antitrust case.

contain an explanation of the proposed settlement, any unusual circumstances giving rise to it, and the anticipated effects on competition; and 2) a 60-day period prior to dismissal, during which time the government "shall receive and consider any written comments relating to the proposal." It is unclear whether the act's requirements apply to modifications of existing consent decrees, which is how the pact between Justice and AT&T was actually accomplished. Both parties insisted they wanted to follow the letter and spirit of the Tunney Act even if it didn't technically apply, although

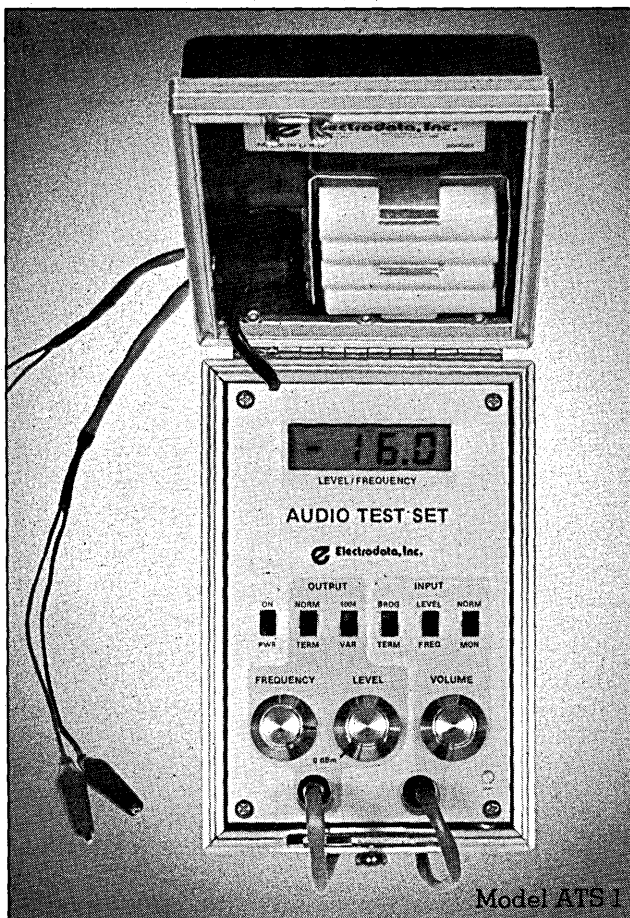
Saunders contended the modification of the consent decree "had nothing to do with what was going on in this court" and the Tunney Act was therefore inapplicable.

"If this case was about the 1956 Consent Decree, what were we doing here for 11 months?" Judge Greene asked. "There's no question the Tunney Act applies. This judgment could not be entered here without following those procedures. This court must make certain the Tunney Act is applied."

The court will. Greene refused to dismiss the antitrust case, leaving the trial in recess, and gave Justice and AT&T until Jan. 18 to devise a procedure for complying with the Tunney Act. He also ordered pertinent settlement documents transferred to his court from the New Jersey court by Jan. 18. "The parties created this problem. It's up to them to solve it," Greene argued.

They made their first move by convincing Biunno to transfer the documents to Greene. Accompanied by Biunno's handwritten note, the papers arrived on Jan. 15.

"This pretty much takes care of our problem," Justice spokesman Mark Sheehan said. "While the scenario is not just as the department proposed, the result for all intents and purposes is identical. We've been ready all along to follow the Tunney Act. It's our view that Judge Greene can now conduct a full-scale Tunney Act re-



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view of the agreement.”

(Exact plans for proceeding with that review were unclear at press time. Both parties beat Greene's deadline by filing statements late on Jan. 18. Greene took those offerings under advisement while pondering his next move. The status of groups such as MCI, Northern Telecom, and the Computer & Communications Industry Association was also murky. They had requested to intervene as third parties. Prior to the transfer of documents to Greene, the judge had indicated he might allow them to file friend-of-the-court briefs on the applicability of the Tunney Act.)

Once Greene indicated in September which way his wind was blowing, AT&T chose settlement over running the risk of a harsher decision from the judge. During the

“This is the worst possible outcome AT&T could have suffered under [Judge] Greene.”

last week in December and the first week in January, Bell determined that losing a part would not be fatal to the whole.

“I feel that we accomplished what we set out to do, essentially,” a Justice lawyer on the AT&T trial team said. Justice originally had wanted Western Electric as part of its booty.

“While it didn't happen the way I always thought it would,” the Justice attorney admitted, “we got what we asked for. This was one of our relief options.

“What we were looking for was a change in AT&T's structure. And it was our feeling that you could take away the operating companies and change the structure because by doing that you would destroy the captive market that Western Electric had.”

“There's no doubt Justice has won,” Verveer contended. “Eight years ago AT&T would never have conceded this was a good idea. I think many forces—increased competition, a changing marketplace, and technological advances—came together and compelled AT&T to think settlement was the better way. It had to be an extremely painful tradeoff, if for no other reason than that it was coerced activity.”

True, in the sense that AT&T for years treated divestiture as if it were equivalent to taking hemlock. But also false, because leaving its fate to a supportive Senate but hostile House could have resulted in much more stifling restrictions.

“I am confident we have chosen the right course, although it is most assuredly not the outcome which we have so conscientiously sought,” Brown acknowledged. Free at last from what it viewed as the strangling impact of the 1956 Consent Decree, AT&T is no longer an anomaly in the busi-

ness world.

“I think the government really got the kind of relief that it should have wanted had it won the lawsuit,” said Donald Baker, Assistant Attorney General for Antitrust in 1976-77. “What AT&T won was the ability to compete in a far wider range of activities than it certainly had under the 1956 Consent Decree and maybe than it would have had under the FCC's Computer Inquiry II decision, and probably what it would

“[Charlie Brown] was able to step outside the mindset and the entire cultural milieu that permeated Bell.”

have had under the proposed legislation. What it gave up was being this gigantic empire.”

“This is the end of the Vail era,” proclaimed Manley Irwin, author of Computer Inquiry I, in charge of the FCC's Bell investigation in 1972-74 and now a professor of economics at the University of New Hampshire. Theodore Vail, who originated Bell's monopoly in the early 1900s, had promised efficient phone service for all Americans in return for protection of the monopoly and a guaranteed profit rate.

“That era lasted almost 100 years, but the string finally ran out,” Irwin said. “John deButts [the former AT&T chairman



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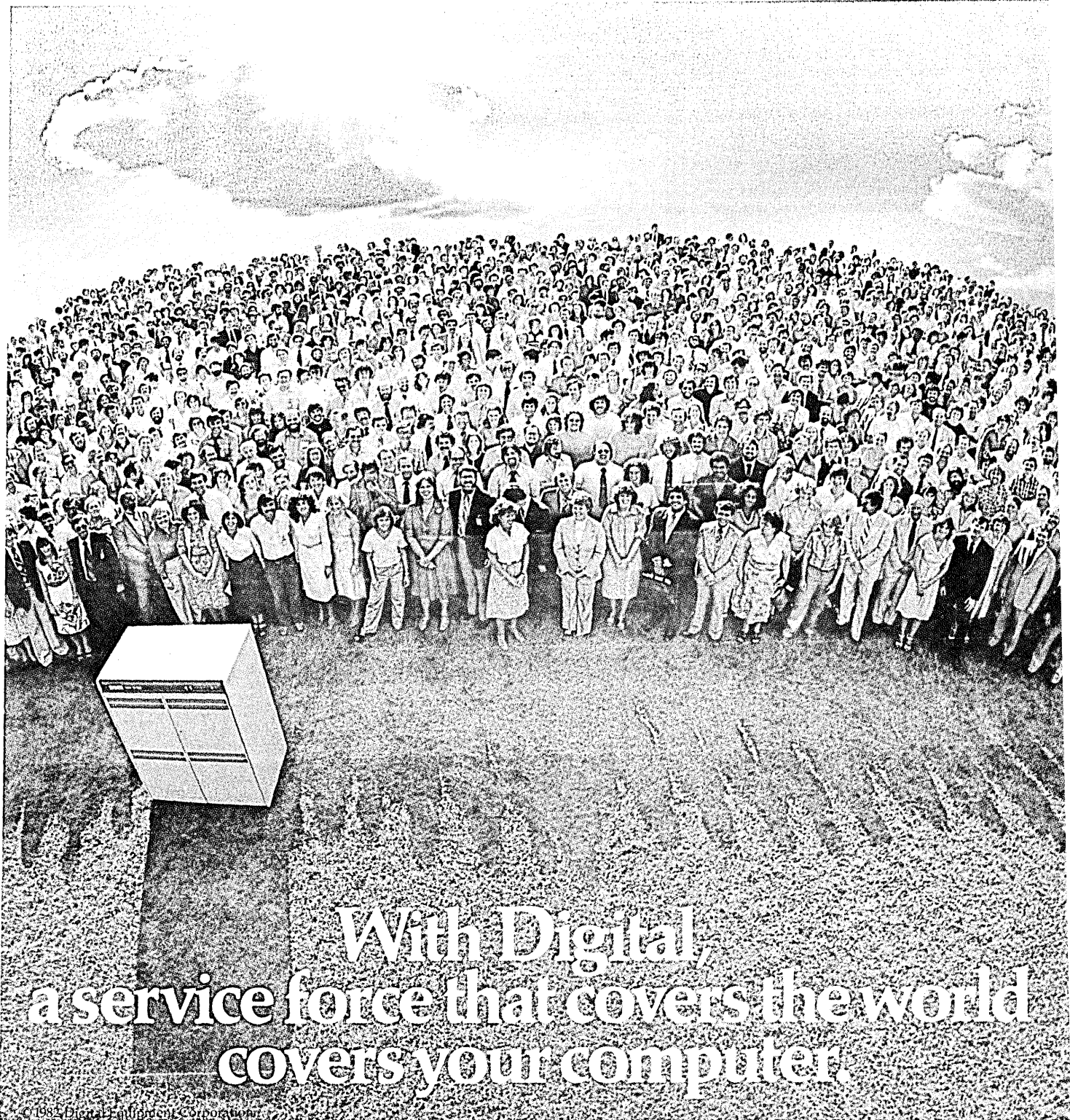
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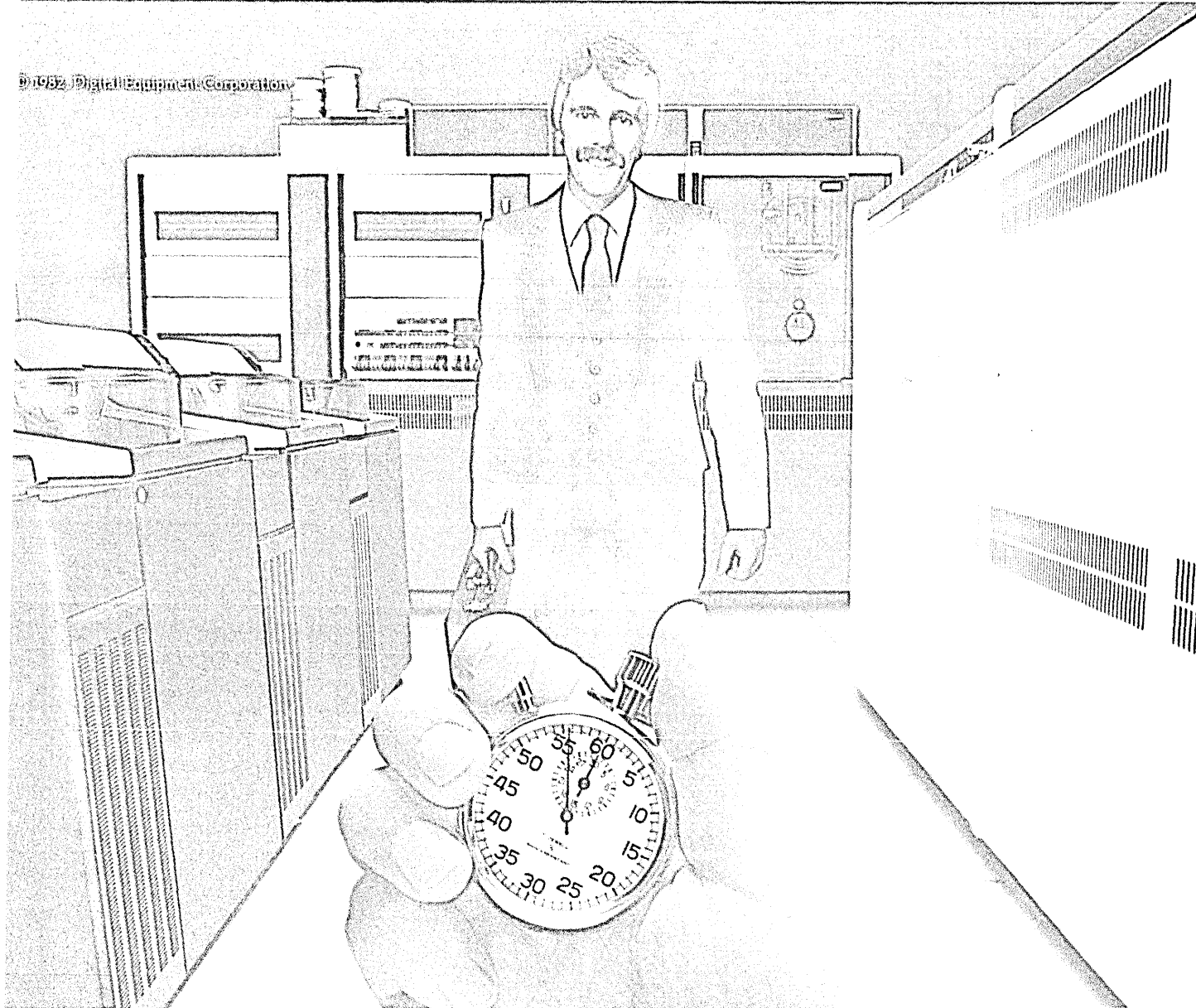
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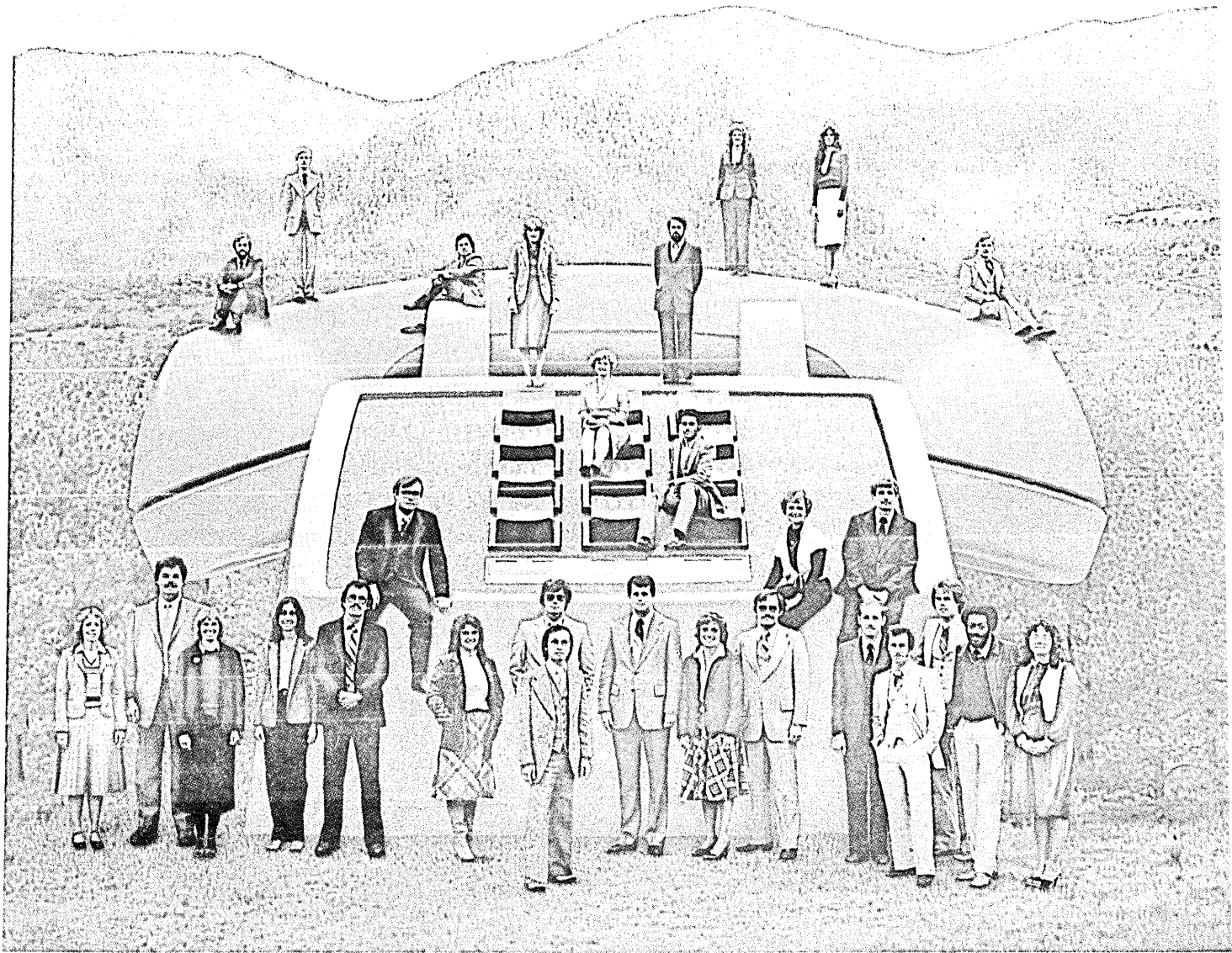
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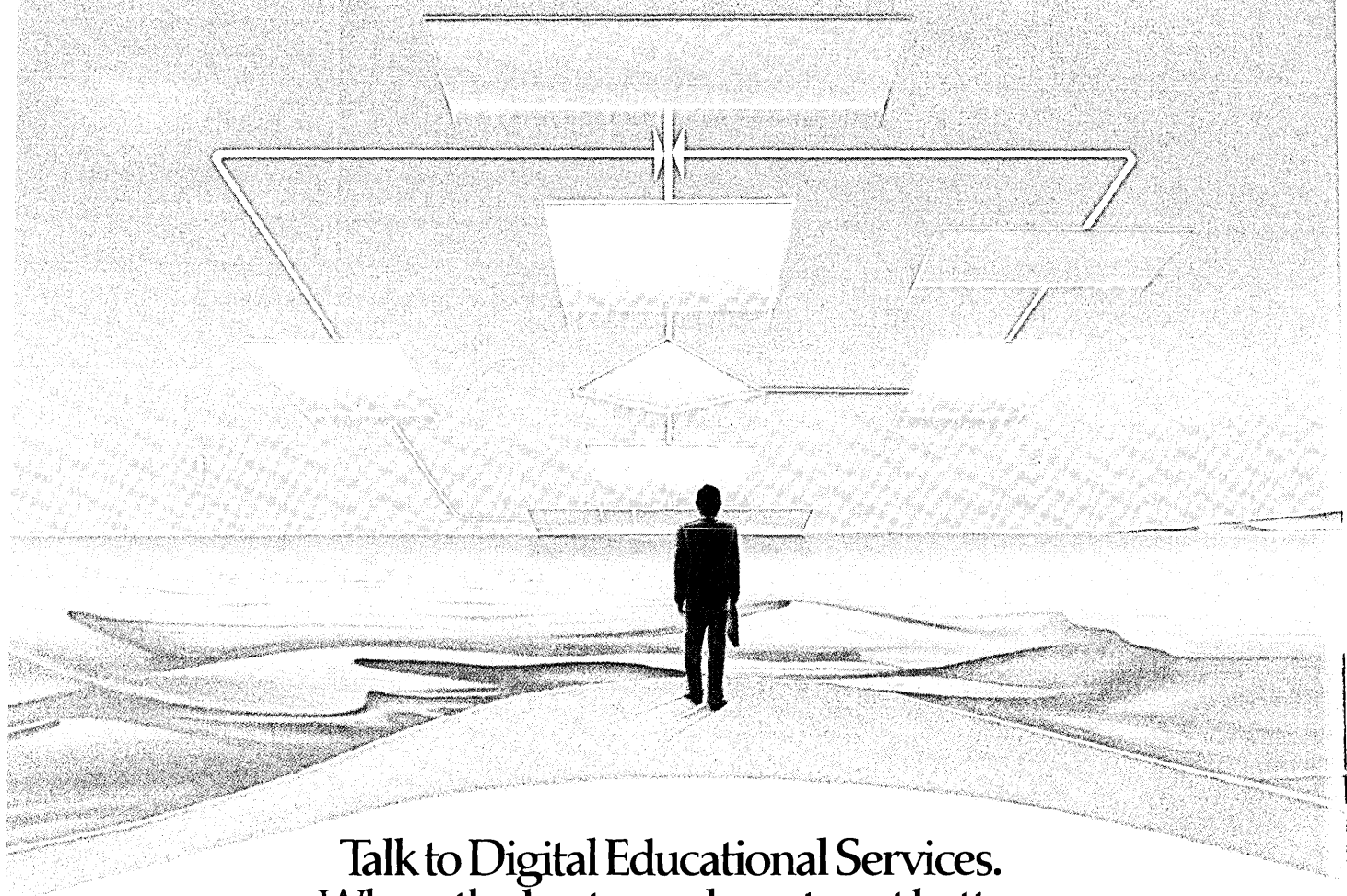
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NEWS IN PERSPECTIVE

whose vocabulary did not include "divestiture"] is bleeding inside. He did a phenomenal job of trying to turn the clock back, but evidence was accumulating to those who knew that the game was changing inexorably. The competition was blindsiding AT&T. It was happening to every component of the company. They were in culture shock.

"That makes Charlie Brown a pretty phenomenal guy. He's a product of the Bell System who knows the catechism and dogma by heart. It's unbelievable that a guy who's been there 30 years and come up through the trenches can turn around and [dump] on all that. There's got to be civil war there. Brown probably needs armed guards."

"It was the most public and dramatic decision by a chief executive officer in this century," Verveer claimed. "Brown had to overcome tremendous resistance. He was able to step outside the mindset and the entire cultural milieu that permeated Bell. Most of us never have to do something like this in our lives."

But Brown's work in the outside has only just begun. The battle on Capitol Hill, equally intense but less lengthy and costly than that waged before Judge Greene, will be joined anew. S.898, which passed the Senate by a 90-4 vote after a lobbying campaign so intense that it even drew complaints from a number of Senators, and H.R.5158, the House of Representatives' "procompetitive" answer, will have to suffer the slings and arrows of the legislative gamut.

S.898 currently resides in the House telecommunications subcommittee, which was scheduled to hear testimony on Jan. 26 from Brown and Assistant Attorney General for Antitrust William Baxter regarding the AT&T settlement. The subcommittee, chaired by Rep. Tim Wirth (D-Colo.), planned to hear from ratepayers, public util-

The battle on Capitol Hill will be joined anew.

ity commissions, and small users on Feb. 2, and from FCC chairman Mark Fowler, former FCC commissioners, and big users on Feb. 4. Both Wirth and Sen. Robert Packwood (R-Ore.), chairman of the Commerce Committee and author of S.898, insist that further legislation is imperative.

"If you want to continue subsidizing rural and residential rates," Packwood said, "you'll have to have legislation. I want to continue the subsidy." But he may not be able to continue the present legislation, which, since it does not deal with divestiture, "may negate the consent decree," according to Packwood.

"There's an even greater need for legislation than we've ever had before," Wirth said. After extensive hearings, a 700-page report by the majority staff on the status of the telecommunications industry, and



JUDGE HAROLD GREENE: "I cannot and will not permit this case to be dismissed without the scrutiny of an act passed by Congress only seven years ago."

excellent politicking, Wirth had achieved a fairly strong consensus on his subcommittee. That may dissolve before the forces who will struggle over access rights and costs and the possibility that the new AT&T will have the power to cross-subsidize its competitive efforts. The urgency of the issues has compelled Wirth to advance his targeted date of passage from July 4 to Memorial Day.

"The structural sections of the bill will clearly have to be rewritten," a Wirth staff member admitted. "But the need for legislation is imperative. The settlement is very limited. Baxter saying no legislation is necessary is ridiculous. Ratepayer concerns, integrity of the network, and competition still need to be addressed. The biggest disagreement was over AT&T's structure, and that's essentially settled. But how are you going to prevent Long Lines from subsidizing information processing?"

Perhaps not even Congress knows for sure. Before it arrives at an answer, there is certain to be lobbying as passionate, though not as broad, as that which went on last year. But the conditions may have changed to the smaller competitors' benefit. That vast quantity of AT&T opponents may find the enemy fragmented and possibly less formidable.

"By divesting the BOCs, they've given up a tremendous amount of political and social muscle and power," Verveer said. "Their most effective lobbying always came from the local companies. They won't be able to control their environment in 10 years nearly as well as they can now."

And what of the BOCs, bereft of their parent and provider? Can they survive on their own, without the traditional Long Lines subsidy? Current financial analysis holds that AT&T kept the attractive pieces

and dumped the plain ones, even though the BOCs represent two-thirds of AT&T's assets.

Local rates will go up, up, and away. The company line is that this was bound to happen anyway, and has nothing to do with the settlement. Whether long distance rates will decline remains to be seen.

"Bell sold out the operating companies and gave them to the states so it could embrace the future," Irwin said. "You handle this obsolete, undepreciated asset," the company told them."

"The theory that they got rid of the local operating companies because they were albatrosses is a bunch of crap," ACCT's Jasper contended. "I don't buy that for one second. They may not have been as lucrative as Long Lines, but I agree with Brown that 'they aren't dogs.' They're very important to the company."

"The biggest issue for many operating companies is the emerging concern over the access charges that long distance providers will have to pay," Northwestern Bell vice president Thomas Madison said. "We expect the long distance companies, such as MCI, to get together with AT&T and work out some kind of access charge. We expect to see this issue hashed over in Washington."

The latest recipe will have many ingredients, including one that no one wanted—further proceedings before Judge Greene. But even the remote chance of a

"On the surface, AT&T appeared to give away the store. But a second, more studied look indicates that they really gained the store."

trial on the merits wouldn't alter the coming of a brave new world for "the phone company" of the past.

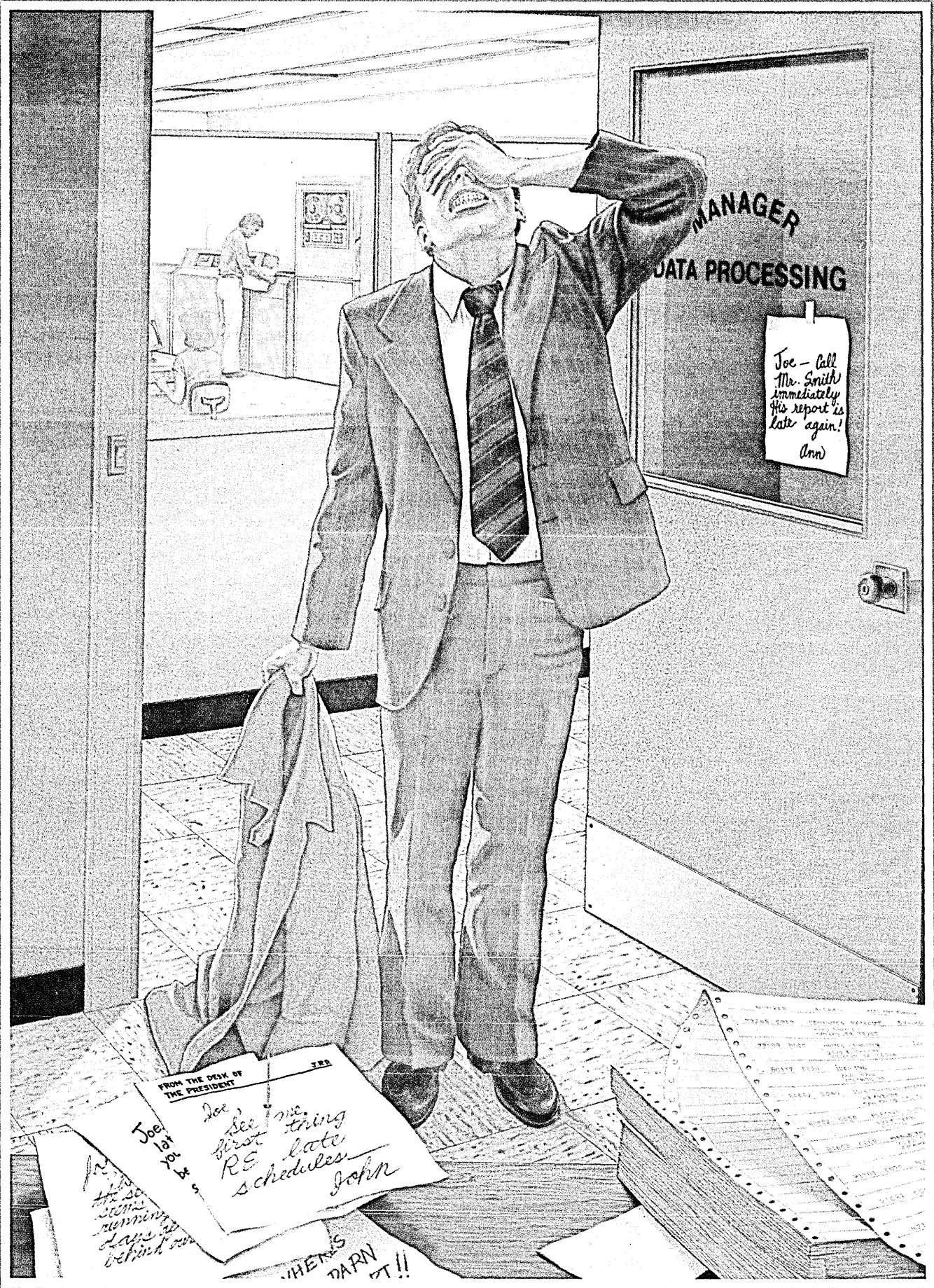
"When you look at it from the management side of AT&T, it is really a breathtaking choice," former Assistant Attorney General Baker mused. "Here is an enterprise that has been built on having everything together under one tent. And they're willing to spin off a majority of what's under the tent because management wants to gamble on the company's ability to compete in more open markets."

"On the surface, AT&T appeared to give away the store," Arthur D. Little exec Frederic G. Withington suggested. "But a second, more studied look indicates that they really gained the store. In fact, you might ask if AT&T lost any power at all."

"They lost the right to special consideration by the little old lady in Dubuque. But now the company has freedoms it has never had before. It can enter new businesses, it can charge what it likes. Indeed," he quipped, "it can really become a monopolist now."

Not so loud. Judge Greene might be listening.

—Willie Schatz



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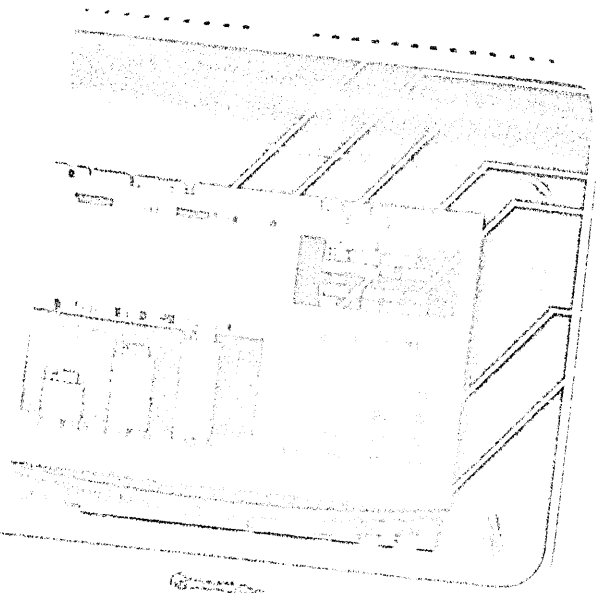
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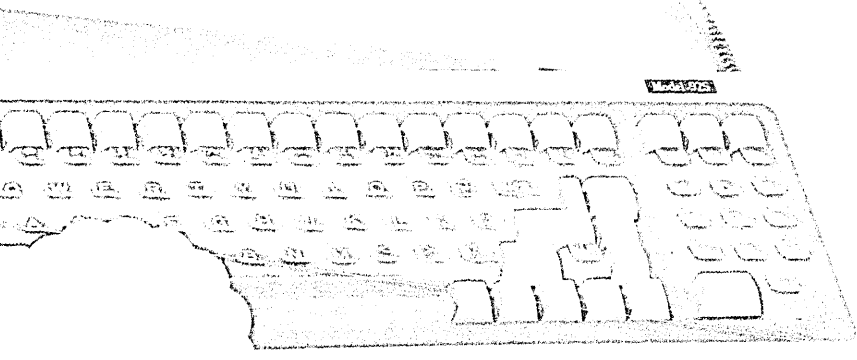
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NEWS IN PERSPECTIVE

MAINFRAMES

MAKING IT IN AN IBM WORLD

Honeywell has made a lot of changes to stay competitive in IBM's marketplace.

Honeywell knows it has problems. Too many of its users are beginning to drift toward other vendors. Though the specific reasons are as varied as the customer base—"too hard to find trained Honeywell systems people," "better deal elsewhere on prices,"—one complaint keeps coming up with alarming regularity. Users say Honeywell cannot compete with IBM when it comes to applications software or third party software sources.

While Michael Keliher, vice president of the U.S. Marketing and Services Group, disagrees that the lack of third party software alone would drive a user away, he acknowledges that the issue is "very important." Stephen Jerritts, president of Hon-

eywell Information Systems, admits that Honeywell is experiencing some "change-over," but he maintains that gains balance out losses. "In large systems," he said, "there have been virtually no losses. We might not be winning all the new contracts, but we aren't being displaced either." He insists that incidences of Honeywell gear being taken out are rare.

But a random survey of 10 Honeywell users turned up one of those rare incidences at Josten's Inc., a Minneapolis-based ring manufacturer. After a decade with Honeywell, Josten's is moving out its Honeywell 2070 this month to make room for IBM's 4300. The lack of third party software was said to be a key factor in the decision. "For most of our applications we have been looking at third party software because of the lack of people," said Jim Payne, vice president, management information systems for Josten's. Beside, added Payne, "we already had one IBM and decided we could not afford to support two vendors. You don't have any backup if one goes down." One had to go; the loser was Honeywell.

In Tacoma, Wash., Weyerhaeuser Co., a major account of 15 years, is laying plans for a slow migration away from Honeywell. Again, the lack of specific software was cited, but this time there were overtones of a much broader, far-reaching prob-



STEPHEN JERRITTS: "We might not be winning all the new contracts, but we aren't being displaced either."

lem: Honeywell's future in an IBM-dominated world. "Since the Japanese have come in at the large end, hardware has evolved into a commodity based around IBM architecture," is the observation of John Parady, director of information systems for Weyerhaeuser. As mainframes get

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more and more alike, the asset of the future is software, and Honeywell just doesn't have the software base. The bottom line, agreed several IBM managers, is to opt for the route that offers the most choices. Why be locked into anything less?

General Electric, one of Honeywell's oldest and largest customers, reflects much the same sentiment. Like a growing number of computer users, GE has adopted a new corporate strategy that calls for seeking out the computer vendor with the best solution—thanks to new advances in communications links, such as Network Systems' Hyperchannel, that help interlock computers and thereby unlock computer centers from dependence on one vendor. The day of the loyal, one-vendor shop is dead. Now, the competitive edge often comes down to the question of who has the best software at the best price. Acting on its new corporate philosophy, GE is introducing IBM machines at several centers. It's being done "slowly on a very small scale," said a GE source, who stressed that the move in no way embodied the idea of conversion. At this time, GE has every intention of keeping its Honeywell systems.

Single-vendor sites is not a sore point at Honeywell. Management calmly refers to it as a reflection of the changed times, something that has been happening over the past 10 years. And the change af-

fects everyone, even IBM. "Often what you have is an IBM operating system, but plug-compatible processors and disk drives. Often there is not a single piece of hardware that is IBM's, only the operating system," claims Jerritts.

To counter the creeping giant, Honeywell has a survival strategy that, in part, revolves around front-end communications processors. "You take a DPS 6 product, and develop an SNA front-end capability to that. That machine and its set of systems looks and acts to an IBM mainframe like an IBM system, permitting the customer to go in and manipulate files. More complex," said Jerritts, "is to take a [Honeywell] mainframe and fit it into a multivendor environ-

Users say Honeywell cannot compete with IBM when it comes to applications software or third party software sources.

ment, not just with an IBM processor but with others, where the customer wants to share databases, share files, access processors of different vendors. That's more difficult, but we feel incumbent to make that happen to the degree necessary to be competitive in an IBM field."

The idea behind Honeywell's own networking architecture, DSA (Distributed

Systems Architecture), is an "open communications environment adaptable to a variety of customer needs, while not talking as specifically to one vendor as SNA does," added Keliher.

A quick look at Honeywell's reorganization reflects the company's commitment to developing networking and communications capabilities. Reporting to James Berrett, vice president of the Systems Group, formerly vice president of corporate development, is Jerome Meyer, vice president of the newly created Networking Management Systems Division. Meyer shares equal status with James Pompa, vice president of the Small Systems and Terminals Division, and Deward Manzer, vice president of the Large Information Systems Division, who have also been pulled under Berrett's umbrella, instead of reporting directly to Jerritts. The networking division has responsibility for Honeywell's DSA development program, Action Communication Systems, the SESA-Honeywell Communications Inc. joint venture, and other communications development programs.

As a result of this reorganization, and because the company obtained a smaller number of orders than it had expected, Honeywell has laid off 1,150 people in its U.S. information division.

Not everyone inside Honeywell has been satisfied with the level of attention



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communications development has been getting. This past summer Honeywell lost one of its moving forces behind DSA, Charlie Bachman, who was also responsible for Honeywell's database manager, IDMS. Bachman is now at Cullinane working on database managers and methods for connecting together multivendor systems. Although Bachman said he believes the concepts behind DSA are sound, rumor has it he was not satisfied with the level of funding the communications program was getting, and consequently the rate at which follow-on products were able to come out. Since Bachman's departure, Keliher said, there has been a "steady growth in the application of budget money to communications development."

One Honeywell user, with a rather bleak outlook on Honeywell's prospects for competing in an IBM world, suggested that the company consider a joint venture with the Japanese. "It's the only chance it's got," concluded the MIS manager, who asked not to be named.

The idea was entertained at one point and the company has worked with the Japanese before, but the plan was voted down. "We have quite a bit on our plate; there is no reason to bite off any more," replied Jerritts. Honeywell had an 18-year contract with Nippon Electric, which expired two years ago and was not renewed.

WHAT ABOUT CII-HB?

Now that the Mitterrand régime reigns in France, there's been much speculation that Cii-HB just might be nationalized. Saying that Honeywell is in a "good bargaining position," Stephen Jerritts, president of Honeywell Information Systems, added that he does not know when to expect a resolution of the Cii-Honeywell Bull issue. "We saw the likelihood of this coming a long time ago and have been making arrangements for it." If the company is nationalized, Jerritts said, such a resolution could mean that \$250 million to \$350 million would be owed to Honeywell, that the 43 marketing affiliates of Cii-HB would stay with Cii-HB, and that the DPS 7 line would be

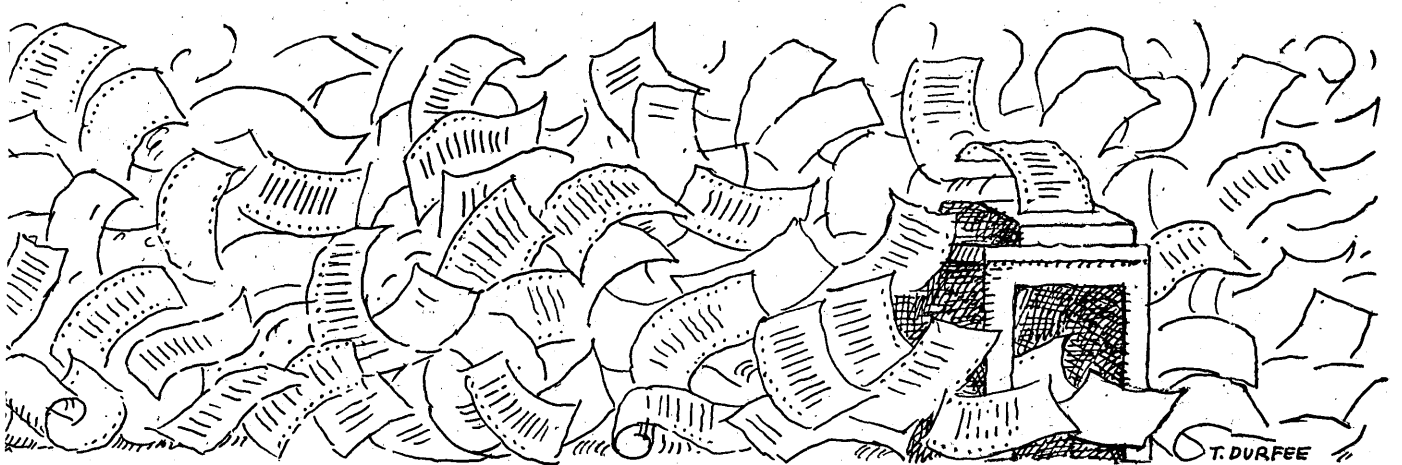
protected. Although Cii-HB has full responsibility for hardware and software for the DPS 7 line, if Cii-HB is nationalized, existing contracts give Honeywell access to the product line over the next five years, after which the arrangement expires. Also, Honeywell has a license to the technology—both hardware and software, "so that we could do it ourselves," Jerritts commented. "But the important criteria is—and there is clear recognition of this by Cii-HB and the French government—that the industry is too broad for a unique 100% French computer industry." There must be links to either Japanese or American technology.

—J.J.

"They were our licensee, as was Toshiba," said Jerritts. While Nippon continues to pay royalties for another two years, all technology exchange has ceased. As for becoming an IBM plug-compatible, Jerritts was adamant that that was not the route for his company. Instead, he prefers to watch the outcome of the joint venture between England's ICL and Fujitsu. The deal calls for ICL to market its own operating system and the IBM-compatible one of Fujitsu in exchange for rights to Fujitsu chip technology. It's understood that ICL will be implementing the Fujitsu chips in its 2900 system while preserving ICL's operating system. "That is

going to be tough to pull off," speculated Jerritts. "How do you direct the field sales force? You almost have to create two and have them competing against each other. I think it will be extremely difficult to pull off, and very interesting to watch."

Another MIS manager suggested Honeywell look at combining its controls and computer business into a product for the automated factory market as a fallback, should it lose its battle to IBM. Honeywell has been twisting around that possibility but the project is an independent effort, not some sort of fallback program. "We have within Honeywell all the pieces," agreed



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Jerritts, "but we are not sure the industry has evolved to that point yet." Besides, he added, there are problems in mixing information handling with real-time controls. "No one has really done that yet. The fellows who are involved on the controls side don't want to take the risk that some spurious piece of data comes running down the data path and screws up the whole refinery operation or nuclear energy control." One possible route around the mixed information problem would be an "access method" that would go in and pull out the data for the information handling side. The two Honeywell groups are talking about that concept and are working on a joint program with a few major customers, Jerritts revealed.

Even if the developments in progress—those that would allow HIS to coexist in the IBM world—are successful, there remains the software issue. "It could take 10 years, depending on how fast users become dissatisfied when they can't get a new functionality, but Honeywell is headed for a slow death," said one of the more pessimistic large system users.

It's hard to fight back. Barriers are everywhere. People trained on IBM systems are easier to find. Alternate equipment suppliers—the IBM plug-compatible market—abound, offering higher performance at cheaper prices. And there is a seemingly endless supply of alternative sources of IBM

software. Nevertheless, Honeywell still thinks it has a chance.

Attacking the software problem head on, Honeywell has boosted budgets, moved in more manpower, and started several new programs. "Typically, when someone puts up an application, it's put up on IBM. That's logical since IBM controls about 60% of the market," acknowledged Jerritts. But that leaves non-IBM vendors without a fan club, unless, of course, they go out and encourage recruits.

Well, that's just what Honeywell is doing. It is hitting the streets with a bag full

Honeywell has a survival strategy that in part revolves around front-end communications processors.

of "encouragements"—front-end payments, licensing agreements, joint marketing arrangements—to attract the attention of third party vendors. Resource commitment to this program has tripled in the past two years, said Keliher, and, more recently, a new organization was created to encourage third party activity. Called HELP, the organization was formed last September and now has a five-person staff responsible for locating third party software, certifying suitable packages for inclusion in Honeywell's referral library, and communicat-

ing this information to users and Honeywell salespeople. Work is under way. Between Oct. 16 and Dec. 16, HELP certified over 350 software packages from 100 independent suppliers for its referral library listing. The certification process continues at the same rate, said a HELP staff member.

Also in place is a WATS line call-in service for users searching for third party solutions. Last year, said a Honeywell spokesman, there were 2,300 such inquiries. This year the company is expecting far more, especially since HELP is charged with keeping the sales force up-to-date on the referral library offerings. In the past, communication to users and salespeople about alternative software offerings has been a weak point.

As a result of this past year's attention to the third party market there has been an "order of magnitude" more conversions of application packages among third party suppliers in 1981 "than at any time in history," said Keliher. He expects that trend to continue in '82 and '83. Among the packages listed in Honeywell's third party library are MSA's general accounting packages; Decision Sciences Corp.'s order processing and inventory control application, TOPICS; Stockholder Systems Inc.'s ALAS package, an automated lease accounting system; TSI International's program control package, Project Monitor; Altantic Software Inc.'s systems development methodology package; M. Bryce and Assoc. Inc.'s Pride-ASDN, a package for applications development; and Cyborg Systems's payroll personnel systems.

On the other side of Honeywell's house—the DPS 6 mini line—the third party software situation is not nearly as troublesome. "There you are dealing with significant volume," said Jerritts, "more than 10,000 units installed, and that is attractive on its own. Lots of third parties are writing for the DPS 6 without encouragement."

Another aspect of Honeywell's strategy for mending its software deficiencies focuses on internal software development and external software acquisitions. Over the past two years, HIS has tripled its support of internal and external software development and, since last year, has expanded the internal software staff by 75%, said Keliher. With all these resources at hand, the critical decision then becomes a question of how best to spend the resources. What software should be developed, bought, acquired, or encouraged? "When a user wants a particular application and we don't have it, that's a critical issue," Jerritts agreed. But there are limits to how far a company can go to meet the demands of its users.

"If you have a significant user and he wants a unique application, one that does not fit your business or market objectives, you have to reconcile yourself to the fact that he will then put that new application up

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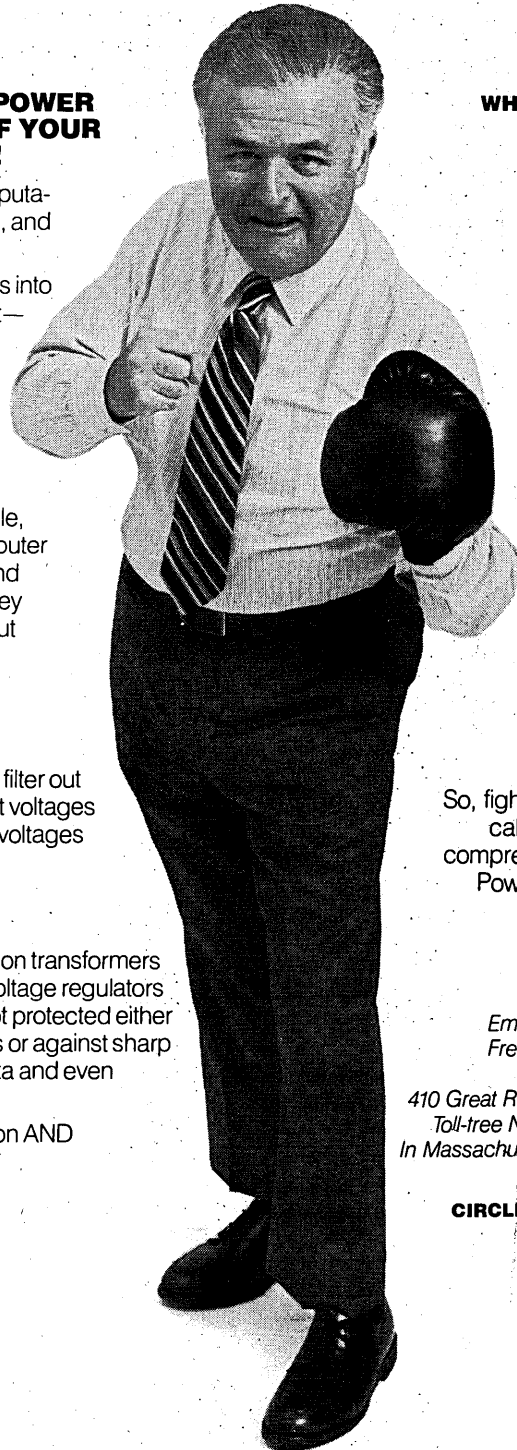
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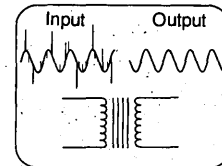
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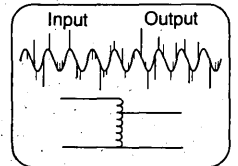
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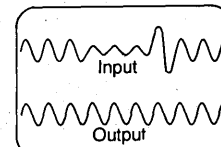


Line-to-load isolation shields computer from sharp, destructive voltage spikes.

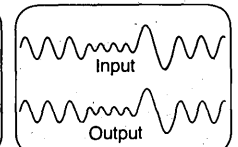


Without isolation computer is exposed to spikes even when power is supplied by voltage regulator.

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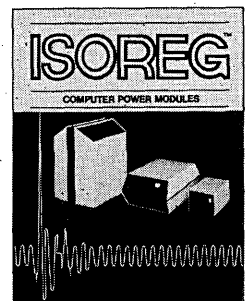
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on someone else's mainframe. You win some and you lose some, but when you get to a situation like that you know you are going to lose," he acknowledged.

Among the areas that Honeywell has singled out for attention are systems, manufacturing, CAD/CAM, user-friendly languages, health, banking, transportation, and office automation. Office automation represents the largest single application ef-

A quick look at Honeywell's reorganization reflects the company's commitment to developing networking and communications capabilities.

fort within HIS today, and, according to some industry observers, Honeywell could be a potentially successful competitor in that market. The company's shortcomings have more to do with its market profile—more specifically, the lack of it—than with its product offering, said Amy Wohl, an office automation consultant with Advanced Office Concepts. "The applications that run on the DPS 6, I think, are actually pretty good. For a computer company offering, it is clearly above average," said Wohl. "They need to do some work, but mostly in terms of profile, not product. Frankly, I think the product could compete well with others in the market."

Honeywell agrees, and that's what it intends to do this year—make an all-out effort to grab a position in the office automation market. Both staff and corporate budget have been doubled since last year, while the advertising budget has been quadrupled, said Jerritts. The company is building up its customer training force, and a special sales and marketing team has been formed to handle the office automation line. "We are doing a lot more than others to integrate word processing, data processing, and electronic mail, claimed Jerritts, revealing plans to move the integrated database capabilities on the MOD 600 operating system down to the MOD 400 operating system that typically runs on the DPS 6.

Don't expect, however, to see Honeywell join the dash to the desktop market, at least not anytime soon. It doesn't have a desktop computer in development and probably never will, said Jerritts, who prefers that his company continue as a systems house. The retail-merchandising chase is not for HIS. "If we would do it, we would probably acquire one [a desktop] instead of develop it ourselves. But that's a merchandising game and we are a systems house. Our emphasis is the top 1,000 U.S. companies and selling large systems, networking, the range of DPS 6 minis, and office automation, which includes the InfoWriter that prices out at about \$9,000. But we are not

out selling it one by one. At this time we don't plan to open any stores or sell through Computerland, Sears, or Penneys. We will remain a full system organization."

Honeywell has made a lot of changes to stay competitive in IBM's marketplace and to take advantage of its own potential strengths. But corporate strategy can only go so far; corporate structure also has a big influence. Recalled Jerritts, "there were times when we got too damned confused about who had the ball. This [reorganization] is a move to tighten up, to make clear who is responsible for what."

Market planning and software application development were two particularly murky areas; both were scattered among several marketing directors. Now, market planning is consolidated under one manager, Fred Snow, vice president of market planning and research, while all application development activities are under Suzanne Peck, director of applications development. Peck and Snow are part of Robert Donaldson's group. Donaldson, vice president of marketing and planning, is one of four line vice presidents reporting directly to Keliher. The others are Frank Jakubik, vice president, information systems division; Ron Cuneo, vice president federal systems division; and Sy Kraut, vice president customer services division.

"This [reorganization] emphasizes three things," pointed out Keliher, "an increase in market research, more attention to merchandising, advertising, and image in the marketplace, and an emphasis on development of applications systems." A closer look at how Donaldson's group is organized shows more clearly where the emphasis

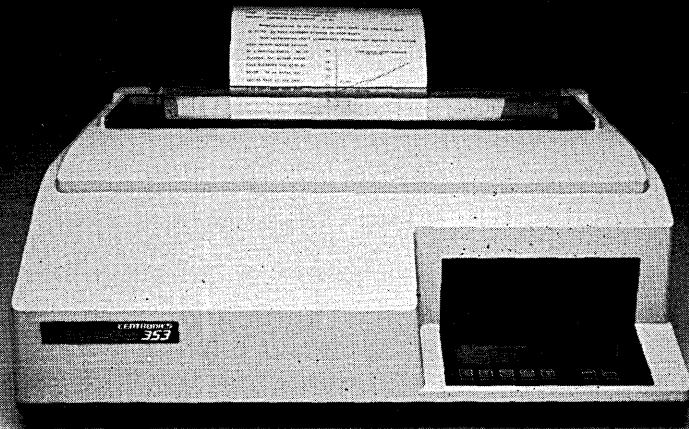
Don't expect to see Honeywell join the dash to the desktop market, at least not anytime soon.

lies. Reporting to Donaldson are six areas: market planning and research operations (responsible for all market planning in addition to acquisition and licensing of outside software and the third party HELP program), marketing support operation, application development (responsible for internal software development activities), office automation, contract administration, and education services.

The shift signals a significant change in management strategy—from management by product line to management by function.

Honeywell's sales organization also underwent a major restructuring. Ironically, the result mirrors the changes in IBM's organization. A mere coincidence, assures Jerritts. Reporting to Frank Jakubik, vice president of Information Systems Division, is the Distribution Sales Operations, the home of the special marketing groups selling DPS 6 and office automation products to

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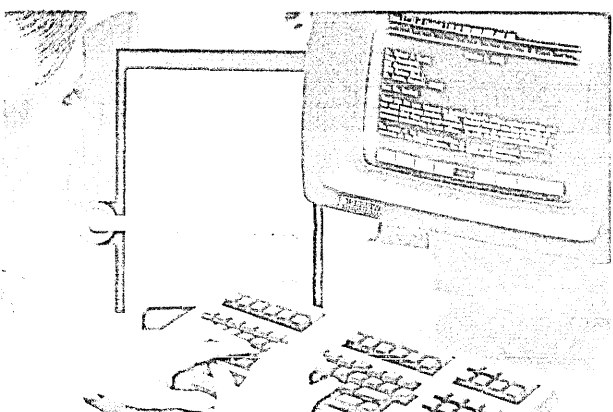
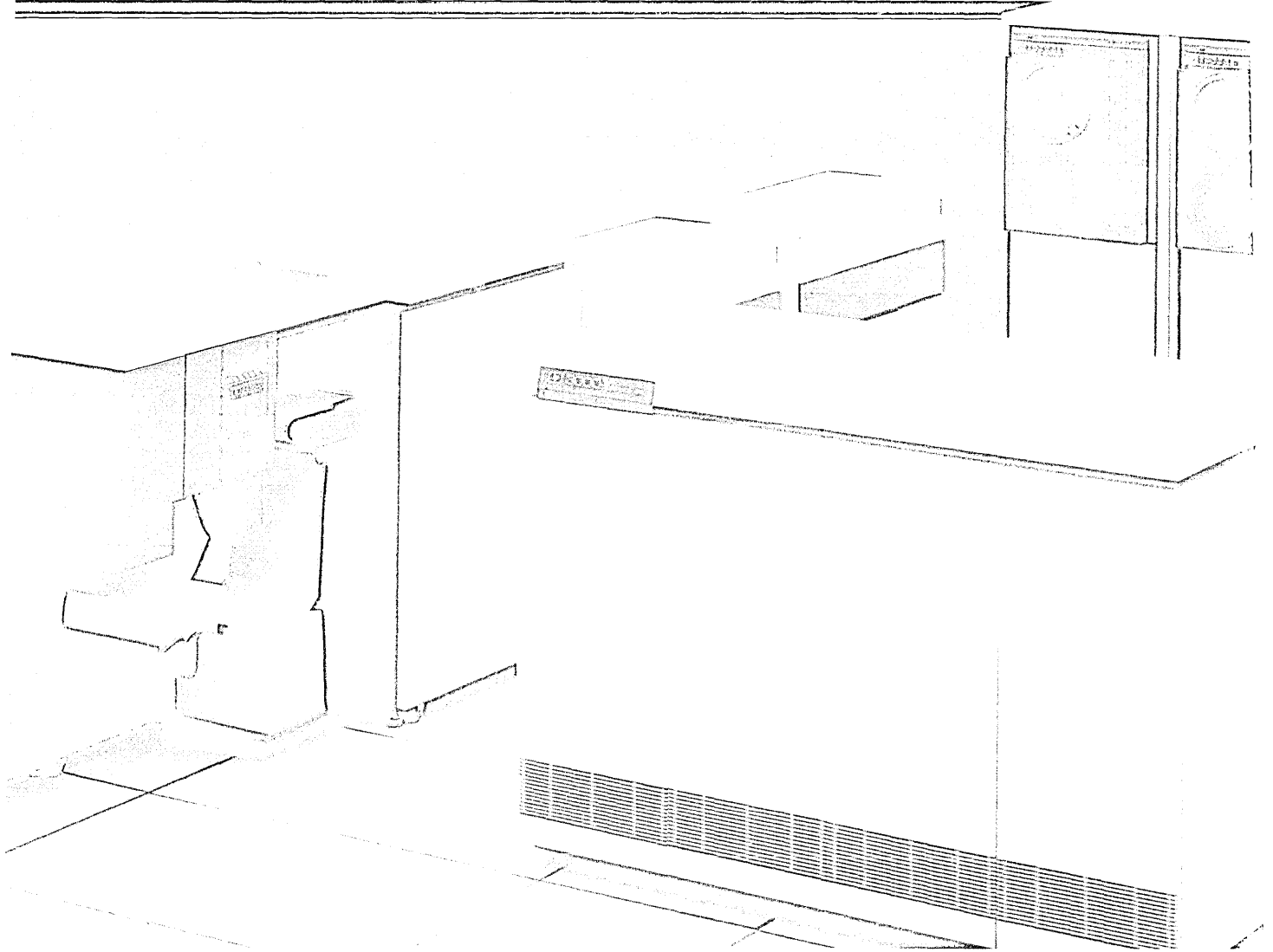
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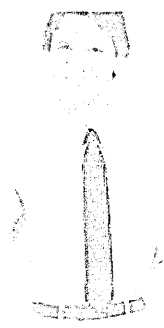
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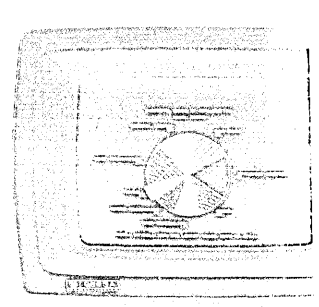
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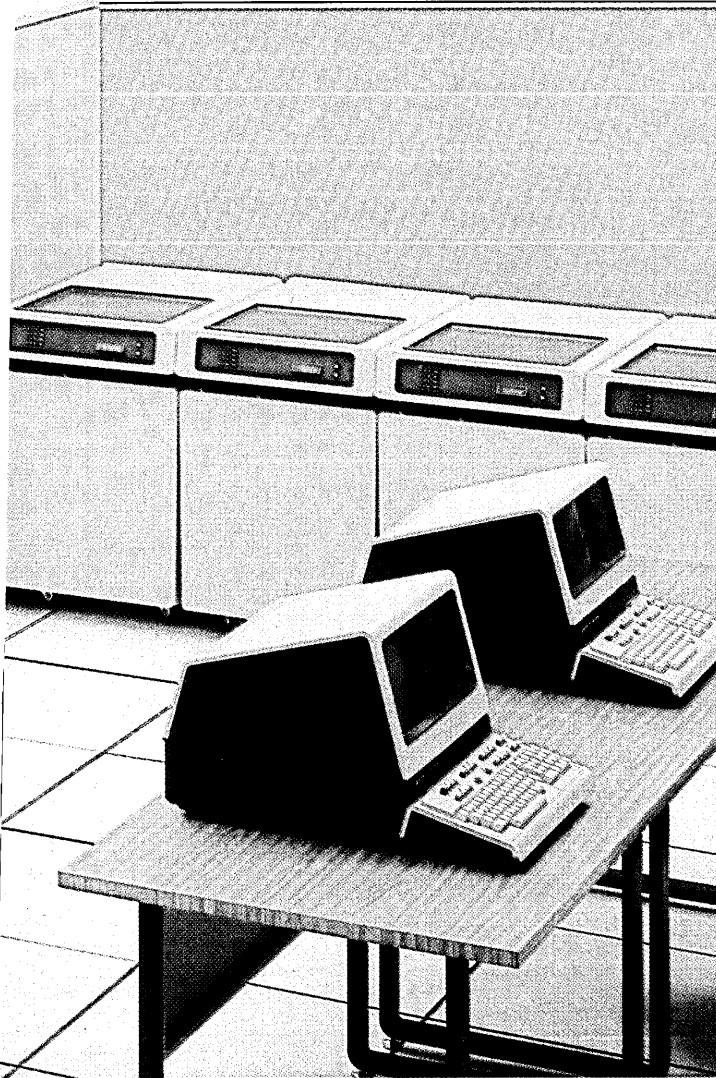


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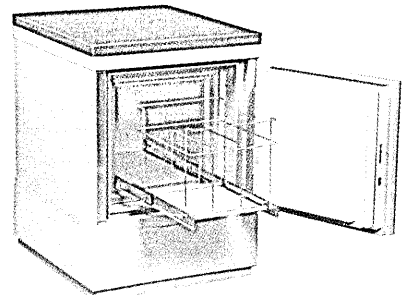
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customers outside Honeywell's installed base. The group also manages the reseller business. The other three areas are the national industry operation, responsible for sales to all large, national accounts; the field marketing operation, geographically located sales offices that handle all other sales and, upon request by the national group, make calls to the branch offices of the national accounts; and the field technical support that takes care of all post-sales activities.

Since IBM and Honeywell are subject to the same market influences—primarily the high cost of operating a sales organization—it is not surprising that they both end up with the same organization structure. The major thrust of both companies was to cut operating costs, gain tighter control over expenses, and ensure more flexibility in allocating their people resources. In Honeywell's case, it also included a re-ordering of its house to reflect some significant changes in corporate strategy. "It was a major change and we don't expect to have this thing pulled together before April," said Jerritts.

But will it work?

Will Honeywell's stepped-up software development efforts, new marketing directions, and developments in multivendor communication networks prove adequate over the long term? Or will the bleak predictions of Honeywell users, some of whom have already made their exit, prevail?

There are a lot of beefed-up budgets involved, and something has to suffer. As one user said, the answer should be evident by the end of the '80s.

—Jan Johnson

PCMS

SOFT KEY TO IBM'S KINGDOM?

While many say now is not the time for a new PCM challenger to emerge, that's just what Nixdorf Computer is doing this month.

With its service bureau now imminent—sources say early spring—and with insider talk of a new 4300 family descending to desktop level, IBM is certainly going to maintain the impression that it is wedded to the 4300.

As discussed in these columns (August, p. 38; September, p. 46), the new service bureau setup in Tampa, Fla., de-

pends heavily on this machine.

It is IBM's aggressive hardware pricing on this same 4300 family that has nearly crippled the medium-scale plug-compatible market, pushing those PCM companies into mergers and/or scrambling for new solutions—or into oblivion.

One would think, then, that *now* certainly isn't the time for a new PCM challenger to emerge, especially one selling 4300-compatible solutions. When that company isn't even American, has little visibility here in the States, and is new to the mainframe arena, things look even more grim for the "upstart."

Yet that is exactly what is happening this month. The company in question is the ambitious West German minimaker, Nixdorf Computer.

The first response from many IBM users will probably be "Who?" The second might go along the lines of "Are they crazy?" There are several 4300-type PCMs (Magnuson, IPL, Formation, Four-Phase, etc.) who will tell you privately that you can no longer make any money selling small mainframe hardware against IBM. Said one, "They [IBM] keep dropping their prices and we have to virtually give our hardware away to compete. While we get squeezed, IBM simply makes up its revenues on software."

One top IBM analyst at Wall Street's

Morgan Stanley in New York adds that there is still a business for large-scale PCMs like Amdahl and the newcomer Trilogy, because price differences between their machines and IBM's can still be quite large. But, says Ulric Weil, "When machine prices dip below \$100,000, the user questions the wisdom of abandoning his IBM system for a few thousand dollars."

Adds Weil: "If the new machines are from an unknown and—in the case of Nixdorf—an unproven newcomer, the user might see such a move as folly." Weil and

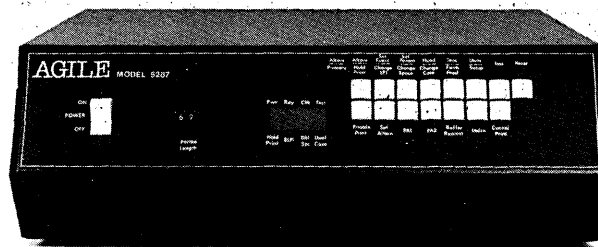
Nixdorf is taking a big chance embracing a new and complex mainframe line that is so different from its traditional products.

other experts also suggest that Nixdorf is taking a big chance embracing a new and complex mainframe line that is so different from its traditional products.

Yankee Group research director Dale Kutnick points out that though Nixdorf's three new 8890 machines are new to the U.S., they have been given an airing in Europe over the past year. One forecast in Nixdorf's home market of West Germany is that the 8890 family could capture upwards of 20% of the medium-scale PCM business. Comments Kutnick, "They'd need a major

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miracle to do those kinds of numbers over here—even 5%—but they must think they have the right strategy.”

Nixdorf, naturally, is confident that it does have the right approach, and further, that it is the first of a new breed of both hardware- and software-compatible alternatives to IBM.

“We are the first company to depart from the traditional PCM posture of selling only hardware,” says Carl Janzen, president of Nixdorf’s U.S. subsidiary. “We offer our own operating system, software, peripherals, and support—the works, the total system.”

“Now when IBM slashes its hardware prices and makes up its margins with software, we’ll be able to do the same,” he claims.

According to Mike Backler, the U.S. subsidiary’s director of product planning and marketing, the “logic” of this approach hasn’t escaped the attention of U.S. PCMs. “The need to produce total systems is the motivating force behind the recent Storage Technology/Magnuson and Motorola/Four-Phase melds,” he explains. Backler points out that these new combo companies are scrambling to find the right operating system and software, “while we’ve been refining ours for nearly three years.”

The West German multinational, now closing on \$1 billion a year in sales, is believed by sources to have sunk some \$40 million to date into the preparation of its IBM challenge. The cornerstone for this buildup was laid in 1979 when Nixdorf acquired The Computer Software Company, Richmond, Va.; and, more to the point, the extended DOS (EDOS/VSE) operating system and the base of 750 U.S. users that went with it.

Nixdorf has been encouraged by the EDOS user base response to pilot versions of its new 8890 family: “Since they have enough motivation to buy EDOS [now extended and enhanced as NIDOS/VSE] from us rather than getting a free OS from IBM for their 360s and 370s, we’re very hopeful that we can get them to take the next step on to our own hardware,” says Janzen.

According to some estimates, there could be as many as 30,000 DOS users worldwide, some 20,000 of them in the U.S. Many of these got their machines from used-computer dealers; many still use 360s.

“The one thing that these users tend to share is a sense of being ‘all alone’ out there, and the growing feeling that IBM doesn’t care that much about them,” says Backler. Part of the reason for this, he claims, is that their immediate needs are not state of the art. “Many of them are still looking for an improved batch environment with the promise of distributed function.”

Backler says the key to NIDOS and the three new 8890 machines (which range in price from below \$90,000 up to

\$800,000) is to give the DOS user the improved batch functions he wants now, and then to develop a virtual machine (VM) capability latent within the operating system.

Immediate DOS improvements will come from giving users the better scheduling and resource management features of MVS, a built-in service processor for better support, and all-round greater ease of use.

“We’re not so naïve as to believe that the state of the art in operating systems won’t be VM in 18 months,” says Backler. “When our users say they want such a capability, we’ll make the necessary changes in the NIDOS superset and give them a DOS running under VM—without disrupting their batch environment.”

Backler revealed that the VM capability would be unveiled one year from now. Its first form will be as a CMS time-sharing capability. But he would not comment on one source’s claim that second and third forms of VM/370 will be developed. One, we understand, will be based on UNIX and will spearhead a push by Nixdorf into the U.S. mini business in a big way.

For the third form, an extended (but miniaturized) VM, Nixdorf is believed to

“Now when IBM slashes its hardware prices and makes up its margins with software, we’ll be able to do the same.”

have opened talks with Spartacus Computer, Lexington, Mass., which is developing such an operating system—currently on Formation hardware (August, p. 38). Spartacus president George McQuilken was traveling at press time and could not be reached for comment.

Experts are quick to point out that such strategic thinking has not been a big feature of Nixdorf’s business in the past, despite its size and potential.

“There was a time when they seemed to have the unfortunate knack of snatching defeat from the jaws of victory,” muses Yankee Group’s Kutnick. “But this time they seem to be on the right track and have the beginnings of a strategy.”

This improvement comes in no small measure from the input of the U.S. subsidiary, sources point out. Nixdorf U.S. president Janzen confirmed that the influence of his subsidiary was growing, and that last September it had helped bring about the formation of four new corporate task groups within product planning in Germany.

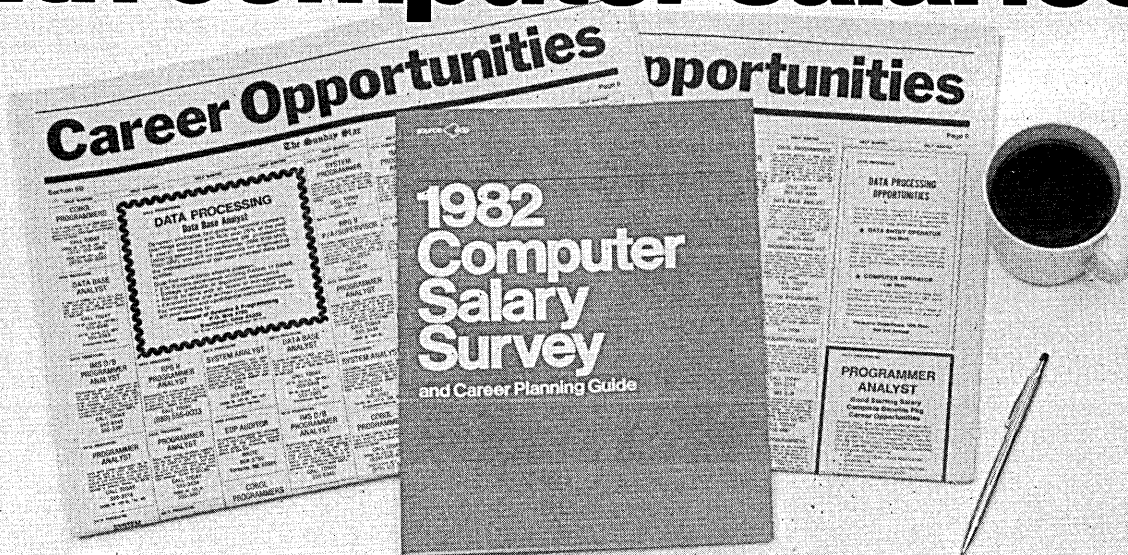
Nixdorf also believes that it could be gaining momentum in forward planning at a time when IBM—for once—seems to lack clear direction. “The picture for IBM’s 4300 users is very, very confused, with developments coming thick and fast and seemingly without coordination by IBM management,” says Janzen, himself a former IBMer like many Nixdorf U.S. staff.

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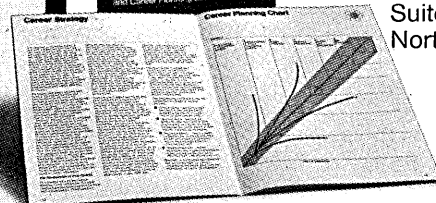
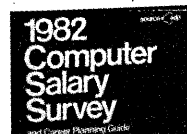
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NEWS IN PERSPECTIVE

"IBM users are bewildered and uncertain, and in the short term," Backler claims, "there can only be more of the same because of its reorganization." He reflected on the fact that it took IBM two years to get back to "business as usual" after its 1968 unbundling.

At times like this, IBM tends to resort to its most potent weapon, points out Morgan Stanley's Weil—the rumor. Talk will soon emerge of internal developments such as the Olympia and the GL series families, which will extend the 4300 both upwards and downwards. There is already a rumor that IBM is working with Motorola to develop a desktop 370 around the semiconductor company's popular 68000 microengine. This, says one source, would constitute the bottom end of the GL series. But the same source takes pains to point out that

At times like this, IBM tends to resort to its most potent weapon—the rumor.

IBM probably isn't too wild about the idea of working cooperatively with a company that is potentially its PCM competitor—namely, Motorola/Four-Phase.

Said one observer, "When IBM isn't sure what it wants to do, it leaks information about new machines which resemble the 'Shmoo' in the L'il Abner comic strip. In other words, these Shmoos can do anything and everything—which, of course, from a user's point of view, is like saying nothing at all."

The best intelligence available is that parts of the Shmoo could be announced at the end of this year, sources point out. "It is very difficult to make sense out of the middle of IBM's business, the medium-scale users," says IBM-watcher Weil.

"What has emerged are two completely incompatible streams, one around the 4300 and the other around the System/38. Whatever plans IBM may have for the System/38, its 370-type users' needs are more immediately centered around improving the 4300," the Wall Street analyst explains.

As sources point out, the service bureau will soon be "real" enough. "When the bureau and the Olympia/GL rumors begin to seep into the users' minds, they can only reinforce the concept that IBM is wedded to the 4300—whatever IBM's real future intentions are," Weil says.

Weil and other experts feel that this state of affairs will continue for the next two or three years and will hurt the credibility of Nixdorf and other "total system" alternatives that may emerge as challengers to IBM. "So right now, all the speculation about the 4300s suits IBM just fine," says Yankee Group's Kutnick.

Since announcing plans for its structural reorganization—a move that is supposed to clarify the mainframer's intent in

the middle of its business—IBM has remained tight-lipped about its true plans for the System/38. Information is beginning to leak from IBM about the vast marketing opportunities Big Blue sees among new and end users for a relational database workstation with color graphics, word processing, voice and image functions, and so on.

"IBM will use the System/38 for these opportunities," says Backler, "but in the meantime the company will be pressed to develop a more intermediate 4300-type workstation for, say, 50 users. This is why we are keeping our options open and developing both streams—and we suspect others will do likewise."

Like its Italian counterpart, the Olivetti Corp., Nixdorf is a peripherals company trying to find a center to its business. Right now that center is on DOS—and so, to some extent, on the old order.

"The trick," says Kutnick, "will be to service this base while keeping the image of a forward-moving company that can eventually deliver a System/38 challenge."

Kutnick adds that if Nixdorf can attract the right people, it has a chance—despite the low visibility that Weil thinks could kill the company's bid in this market sector.

One thing is certain: Nixdorf must quickly project a memorable new face to stand the smallest chance of commencing the "affair" with IBM's user base. Right now there are not too many who would bet that it could ever become a "marriage breaker."

—Ralph Emmett

SOFTWARE

A HOUSE IS STILL A HOME

Changes in the way packages are merchandised are creating pressures on the one-product software company.

For the entrepreneurial programmer, the future looks very promising. The one- and two-man, one-product software company exists today in amazing numbers, providing comfortable sustenance if not obscene profits to the participants. Some are marketing their own packages, unable to afford much advertising but relying instead on word-of-mouth endorsement of their products. Some are licensing others to sell their packages while continuing to spend their time enhancing the software and consulting with a

growing user base.

But changes are also taking place. Systems companies like IBM, Xerox, and Wang, for example, are making a concerted effort to find packages that run on their machines, a recognition of the importance of software in the sale of hardware. In recent months, too, Hewlett-Packard has acquired a Colorado software developer, Information Resources Ltd., and also entered negotiations to buy Software Management Corp., a California company with strengths in CAD/CAM. And the traditional merchandiser, companies like Software Module Marketing of Sacramento, Calif., which represents about 10 software developers, has begun staffing up to produce its own packages. No more the sharp delineation—the hardware vendor in one corner, the software house in another. Some of the latter have even begun vending iron.

The really profitable companies are the one-man operations and the large, so-called software publishing companies like Personal Software, says that firm's director of merchandising and communications, Edward M. Esber Jr. He thinks the people in the middle are the ones struggling in this business "because there's a critical mass of various capabilities you have to build up, and you have to have a certain number of products and a certain level of sales to support those."

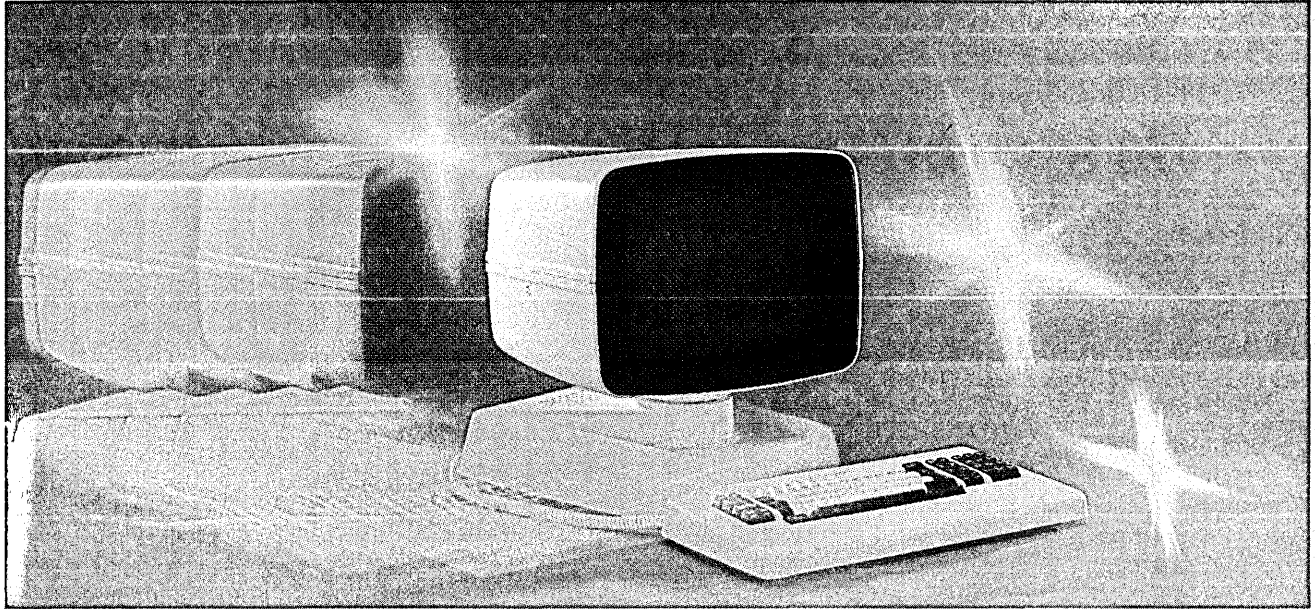
As with the entire industry, change is endemic. Not to change, not to grow is to be left behind. "You have to grow. It's either grow or die," says Jack Damm, who after 11 years of heading up his own software company is selling out.

The company he cofounded, the Palo Alto Group, started as a consulting company, but eight years ago it became a one-man, one-product company with a package called Dollar Flow, a financial planning and modeling program developed by Damm. For the last five years, Damm has doubled his company's business each year, chalking up sales last year of almost half a million dollars and installing his package on nearly 100 Hewlett-Packard computers. But late last year Damm agreed to be acquired by Quasar Systems Ltd. of Ontario, Canada, a software and consulting firm.

According to Damm, his company could have continued experiencing an annual doubling of sales for a few more years. It's just that he was beginning to believe that his company, based in Cupertino, Calif., had to have a larger impact on the marketplace in order to survive. Software companies not growing, he believes, are losing market share. "Ultimately they will lose all of their market share," he says, "because they won't have the really necessary mass to survive."

Damm, who received his master's in business administration from Stanford University in 1970, started the Palo Alto

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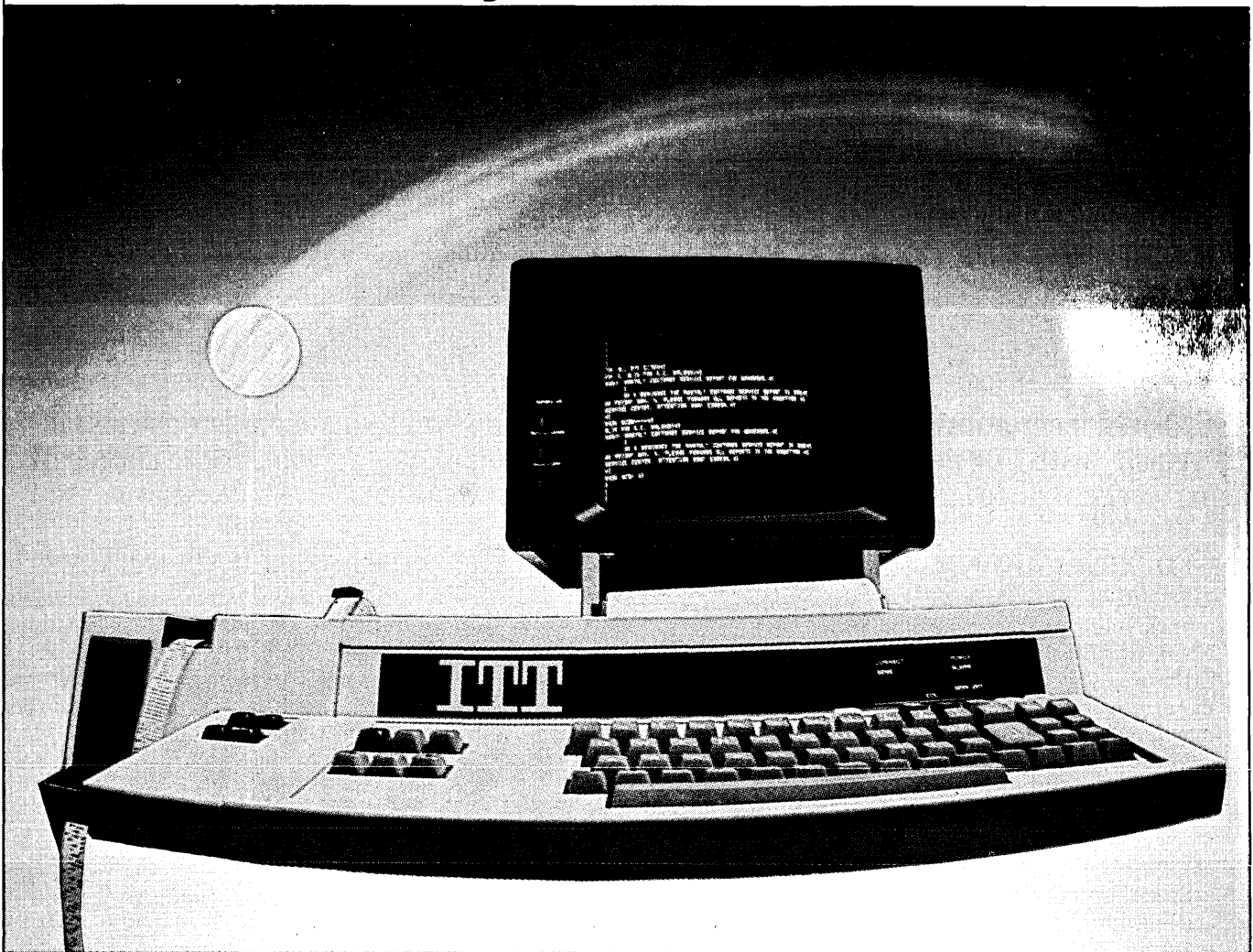
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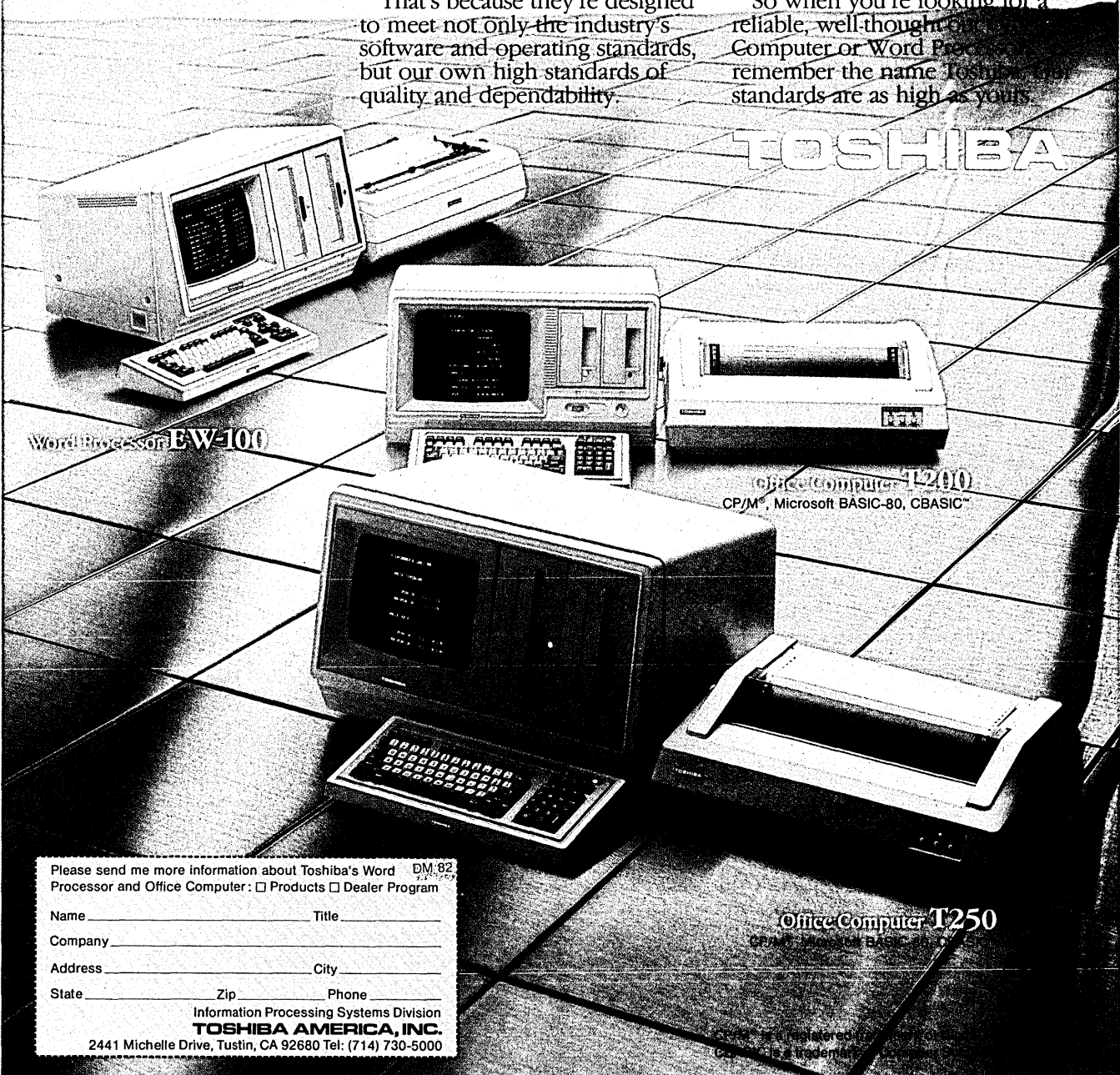
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NEWS IN PERSPECTIVE

Group with two other management consultants and developed what was to become Dollar Flow as a software tool for use in his consulting business. After about 30 months, Damm bought out his partners to go it alone as an independent software vendor. Less than three years ago, he hired his first full-time employee to handle sales.

"There's no way that people who design languages like this don't have a lot of ego wrapped up inside of them," he ex-

Software companies that are not growing are losing market share.

plains. "I am unwilling to accept that while we have the best package, we don't have leading market share. I felt the only way to achieve that was to have more muscle on the marketing side." But to do that would require money. So, when approached by Quasar Systems, he chose to rely on the larger company's sales organization and financing.

Of course, being acquired is not the only hope of salvation for a small software company. The Los Altos Research Center in California, despite the impressive name, was but a two-man office without a secretary, writing lots of proposals and manuals. Again out of sheer need, the two partners wrote a word processing program for themselves to run on an HP 3000. It did not take the people at HP very long to learn about this program and to mention it to a sales prospect, who averred that he would buy a 3000 system if the software came with it. That provided the impetus for the development of what came to be called Editor/Scribe. Alas, the buyer backed off from his promise, but HP became LARC's sales force for the package, since it sold hardware. And because there was no other word processing package that ran on a mini, this arrangement continued for three years. Some 130 installations in the U.S., Australia, and in Europe resulted before HP acquired the package from LARC, making it the first software package HP acquired on the outside.

But again it was a package developed without a sponsor. While the development was going on, the two supported themselves by doing contract programming and machine selection studies and the like. "That one package—you know, we were a two-man office with 130 customers—kept us pretty busy," says Jack C. Armstrong, who recently left to become an independent. For the first three years, before HP took over the package, the two partners put out a new release on the average of every three or four months; these consisted of new features requested by users, in addition to smoking out the bugs.

"My experience is that most packages are developed not as packages but rather in some user environment," says consultant David Ferris. Few packages are

developed from scratch as a general purpose utility or package. According to management consultant Karl A. Drexhage, "Those are in the minority." He explains that no one can sit down for months or even years to develop a package with the idea of someday selling it as a proprietary package. But Drexhage also cautions, "Taking a package from a single-user solution into a more generalized multisite, multi-user environment is really the big breakpoint in an awful lot of packages."

While Drexhage agrees that most packages have their origins in the user site, he says, "There are very few people who can take something that's specially designed for a particular environment and design it in such a way that it can be generalized in the second round. There are a great many packages that never make it beyond the initial user environment." It gets back to the modularity of the code, the foresight of the designers, many parameters that get into the gray scale of software design.

"A program is not a package," he adds. "There's a subtle distinction between the two that an awful lot of developers don't see."

Of course, the one-man software company has the additional problem of convincing prospects that the company will remain in business for a while. Jack Damm recalls the dp manager who said, "A year

from now, I don't really believe that you'll still be around." A year later, Damm went back to show that he was still in business—back to the same dp manager's office. "And, by golly, *he* had gone," Damm exclaims.

No less a problem for these people is that of pricing their product. Pricing, says David Ferris, "is a nightmare." Adds Drexhage, "It's probably the most misunderstood area in the whole industry." Says Jack Damm, "It's by guess and by golly." Damm noticed that packages for IBM 360s leased for \$1,000 a month and ran on machines priced at \$1 million and up. But he had a package that ran on the HP 3000, which had a purchase price of some \$125,000—one-tenth that of a 360. But Damm could not rent his new package for \$100 a month and survive. So he merely set a lower bound and an upper bound for his

"It is easier to raise your prices than to lower them."

price. He initially set his purchase price at \$25,000 and rented the package for \$525 a month. Now, after the merger, the price has dropped to \$15,000 but the rental fee has risen to \$900.

Jack Armstrong, late of the Los Altos Research Center, says people tend to look around and see what else is compara-

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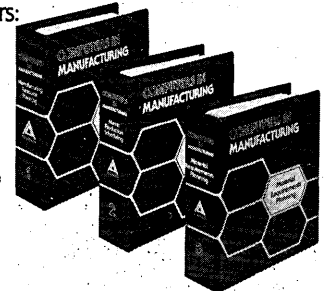
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NEWS IN PERSPECTIVE

ble to the software they wish to price. LARC did this and found nothing, so they looked for something of equivalent complexity. "The number [\$6,000] wasn't quite pulled out of a hat," he notes, "but almost." When the price was set, the package was successful in the marketplace. Not long after that, another word processing package came out, this one priced at \$10,000. That price soon rolled down to \$7,500 and ultimately settled down at \$6,000. This, according to Armstrong, was followed by other packages priced between \$5,000 and \$7,000. "Obviously they [the other software developers] had looked at what was out there, in this case us, and said okay, that looks like a good number."

David Ferris talks about the difficulty of selling a technically complex package like a database management system, of the need to hold the buyer's hand until the system is optimized for the installation. "And that means you have problems in pricing, as well," he explains. "Support is terribly expensive." If you must spend your time on long-distance phone conversations, "you can find that all the profit there was in a thousand-dollar package is not there."

Armstrong observes that there are three pricing structures: one for mainframes, one for minis, and one for micros. He talks of a user of the small HP 1000 minis who moved up to the 3000 and complained

about the \$6,000 price tag for his software. There was also a user to whom the package was mailed, followed by the bill. That purchaser called long distance to say there was a mistake on the invoice. He thought the correct price was \$60,000 and was prepared to send a check for that amount. It turned out he was from a large IBM shop, one that had recently acquired the HP system. He said he had never before bought a software package for less than \$90,000.

According to Drexhage, prices of micro software are inordinately low. "People are getting a free ride right now," he

The one-man software company has the problem of convincing prospects that the company will remain in business for a while.

says, emphasizing that prices today do not reflect the value of a package. "They are not going to get that free ride in the future." He adds that this is true of software for micros, less so with mini software, and less again of software for mainframes.

The pricing strategy recommended by David Ferris is to set an initial price that can be raised, not one that must be lowered. "It's easier to raise your prices than it is to lower them," he says. If you lower them, people who bought them earlier will feel

cheated. And those who know what you were charging earlier will think you lowered the price because the package doesn't sell. Conversely, if you are able to increase your price, sales people can use the impending price increase as a means of convincing a prospect that now is the time to buy. If you gradually raise the price, people will think the product must really be good because it's more expensive.

Following this strategy with obvious success is Personal Software, the San Jose, Calif., people who bring you VisiCalc, the spreadsheet program. It was introduced in June 1979 with a price tag of \$100; the following January the price was increased to \$150, and in March '81 an enhanced version came out at \$200. By the end of 1981, some 200,000 VisiCalc programs had been sold.

VisiCalc was conceived by a Harvard B-School student named Dan Bricklin. Bricklin approached his professor with the idea for the program, but he is said to have been unimpressed. To provide a second opinion, the prof called in an upper classman named Dan Fylstra, who thought it was a great idea.

Credit for the implementation goes to Bob Frankston, for sales and merchandising to Fylstra's company, Personal Software. When the company moved to California in mid-'79, there were five employees.

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including the two cotounders and their wives. Now there are more than 110. The company had revenues of less than \$4 million in 1980 and was expecting sales of between \$15 million and \$20 million in '81. Personal Software, too, has begun developing new products in-house, although it still works with outside contractors as well. But

Prices of micro software are inordinately low.

it does not entertain new packages that come in over the transom. "Today we do not consider ourselves a publisher. We are a software producer, a software manufacturer," says the company's Ed Esber.

No less successful is a similar firm, Digital Research Inc. of Pacific Grove, Calif. This company was started by Gary Kildall, a consultant to Intel Corp. who developed an operating system to run under the Intel 8080 microprocessor chip. When he attempted to get Intel interested in this product, they turned him down, so he decided to sell it himself to hobbyists. That product, CP/M, is now said to be running on 300,000 microcomputers. The company has some 80 employees and is anticipating revenues this fiscal year of \$20 million, three times that of the previous year. Last fall, Digital Research acquired Compiler Systems Inc. of Sierra Madre, Calif., and then

formed a division to develop and market microcomputer programming languages.

Another example of a company that was placed on the map because of one successful package is MicroPro International of San Rafael, Calif., makers of the WordStar word processing program for microcomputers. Unlike Personal Software and Digital Research, MicroPro is also into hardware, having recently formed a division to produce single- and multi-user micros for commercial applications. It has already signed agreements totaling \$6 million with six overseas firms to distribute the new PBM-1000 computer.

Long before that, however, ASK Computer Systems Inc. took a similar tack. This Los Altos, Calif., company that went public in 1981 was started by Sandra Kurtzig in 1972 to perform contract programming. Out of this activity came a manufacturing management software system called MANMAN that was licensed to run on the Tymshare remote processing system in '73. It was introduced as a package in '74, installed on the first minicomputer in '75, this an early HP 2100, then implemented on an HP 1000 in '76, and moved onto the HP 3000 in '78. The company in '80 shipped the 1,000th HP 3000-based system. But since 1975 the emphasis has been on turnkey systems, the company now being HP's largest 3000 systems house. The software is also

up on the company's own remote processing service system. At the end of last year, there were some 36 on-line customers, but an additional five or six of them had earlier switched to their own in-house turnkey system, since it's the same software.

Thus it seems that changes being recently witnessed in the software business are the same things seen in the distant past. They are examples of attempts to get the most mileage out of an existing product. Jack Damm of the Palo Alto Group, for example, acknowledges that although his Dollar Flow package currently runs only on the HP 3000, after his company's merger the

Hardware companies are increasingly getting into the software business.

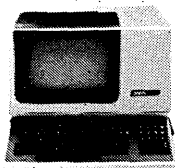
obvious potential is there to implement it on other hardware.

Noticeable, too, is a concurrent development. SSM Microcomputer Products of San Jose, Calif., a manufacturer of board-level products for the S-100 bus and Apple II computer, recently entered the software market with the so-called Transend communications software packages for the Apple II. Hardware companies, in short, are increasingly getting into the software biz. But that's another story.

—Edward K. Yasaki



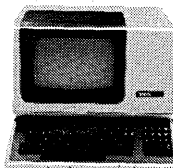
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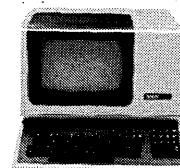
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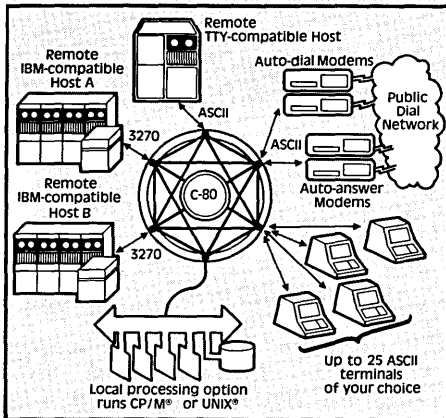
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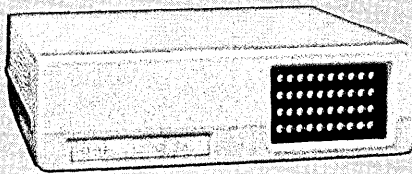


10 WAYS TO LOWER YOUR DATA TRANSMISSION COSTS

In addition to your hardware and software costs, you may be paying hundreds of dollars monthly to support your data system with leased lines and modems you may not even need. Even in intrafacility systems, you may be wasting dollars on unneeded lines and other equipment.

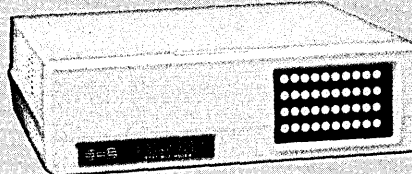
M/A-COM DCC, Inc. offers you 10 products to save you money and improve your data communications. These include statistical multiplexers which eliminate 75 percent or more of your phone lines and

CM9100 Statistical Multiplexer



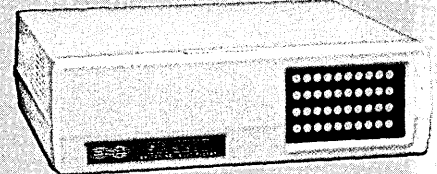
- ❑ Reduces phone line costs by 75% or more
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CM9100H and CM9100M Stat Mux/Modems

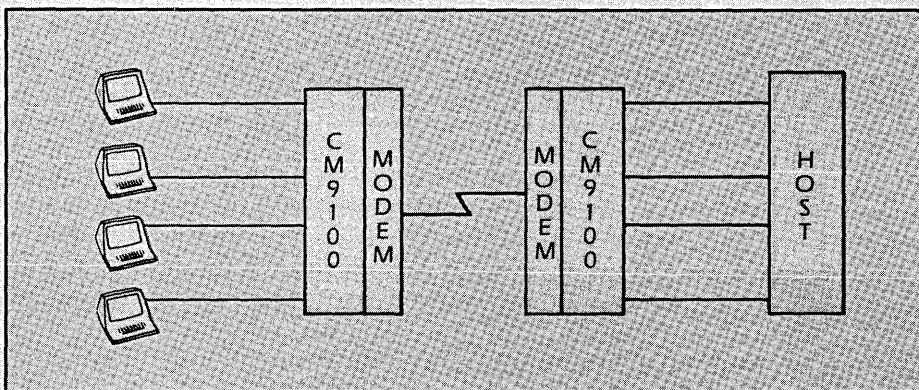


- ❑ Offers all the features of CM9100 Stat Mux plus contains an integral modem
- ❑ High performance modem features:
 - ❑ CM9100H—9.6 Kbps, V.29 compatible—Automatic Speed Fallback to 7.2 and 4.8 Kbps
 - ❑ CM9100M—4.8 Kbps, V.27 compatible—Automatic Speed Fallback to 2.4 Kbps
- ❑ Analog and digital local and remote modem loopback
- ❑ Full modem status indicators
- ❑ All digital automatic adaptive equalization

SM9200 Switching Multiplexer

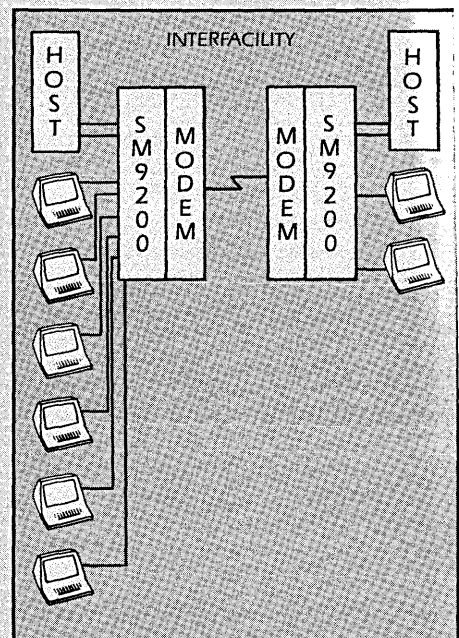


- ❑ The first stat mux that switches
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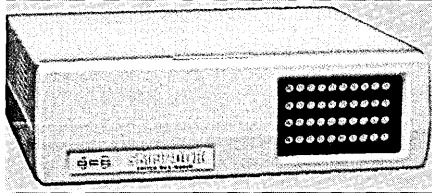
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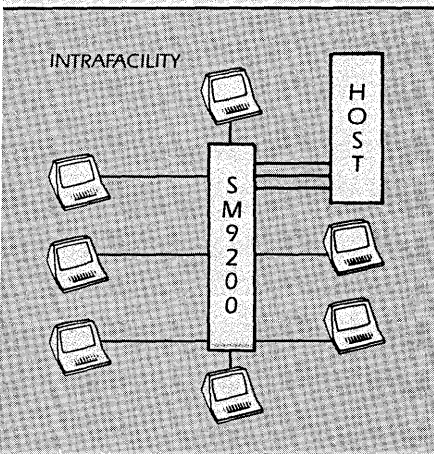


Leading the Way in Data Communications Technology

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 - SM9200M—4.8 Kbps, V.27 compatible
 - Automatic Speed Fallback to 2.4 Kbps
 - Analog and digital local and remote modem loopback
 - Full modem status indicators
 - All digital automatic adaptive equalization



Solve Your Internal Data Switching Problems

EC9400 Error Controller

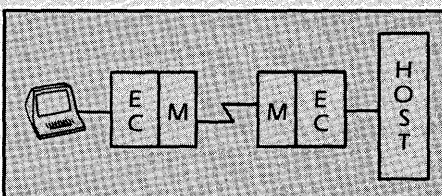


- Provides error-free transmission for any asynchronous device to a host computer
- Allows 9.6 Kbps asynchronous transmission over standard phone lines with synchronous modems
- Connects directly between phone line modem and attached device
- 16 selectable input speed/code levels from 50 to 9600 bps
- Dedicated or dial-up data link operation
- Extensive buffering up to 32 Kbytes

EC9400H and EC9400M Error Controller/Modems



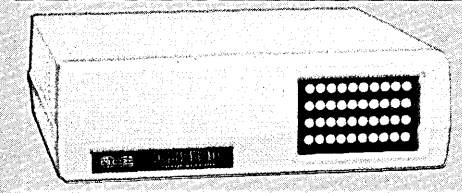
- Offers all features of EC9400 Error Controller plus modem for the price of a modem alone
- High performance modem features:
 - EC9400H—9.6 Kbps, V.29 compatible
 - Automatic Speed Fallback to 7.2 and 4.8 Kbps
 - EC9400M—4.8 Kbps, V.27 compatible
 - Automatic Speed Fallback to 2.4 Kbps
 - Analog and digital local and remote modem loopback
 - All digital automatic adaptive equalization



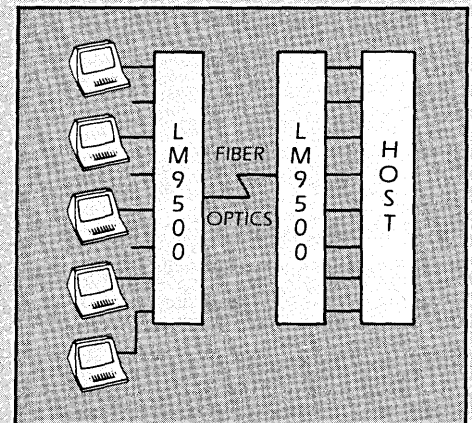
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LM9500 Lightwave Multiplexer

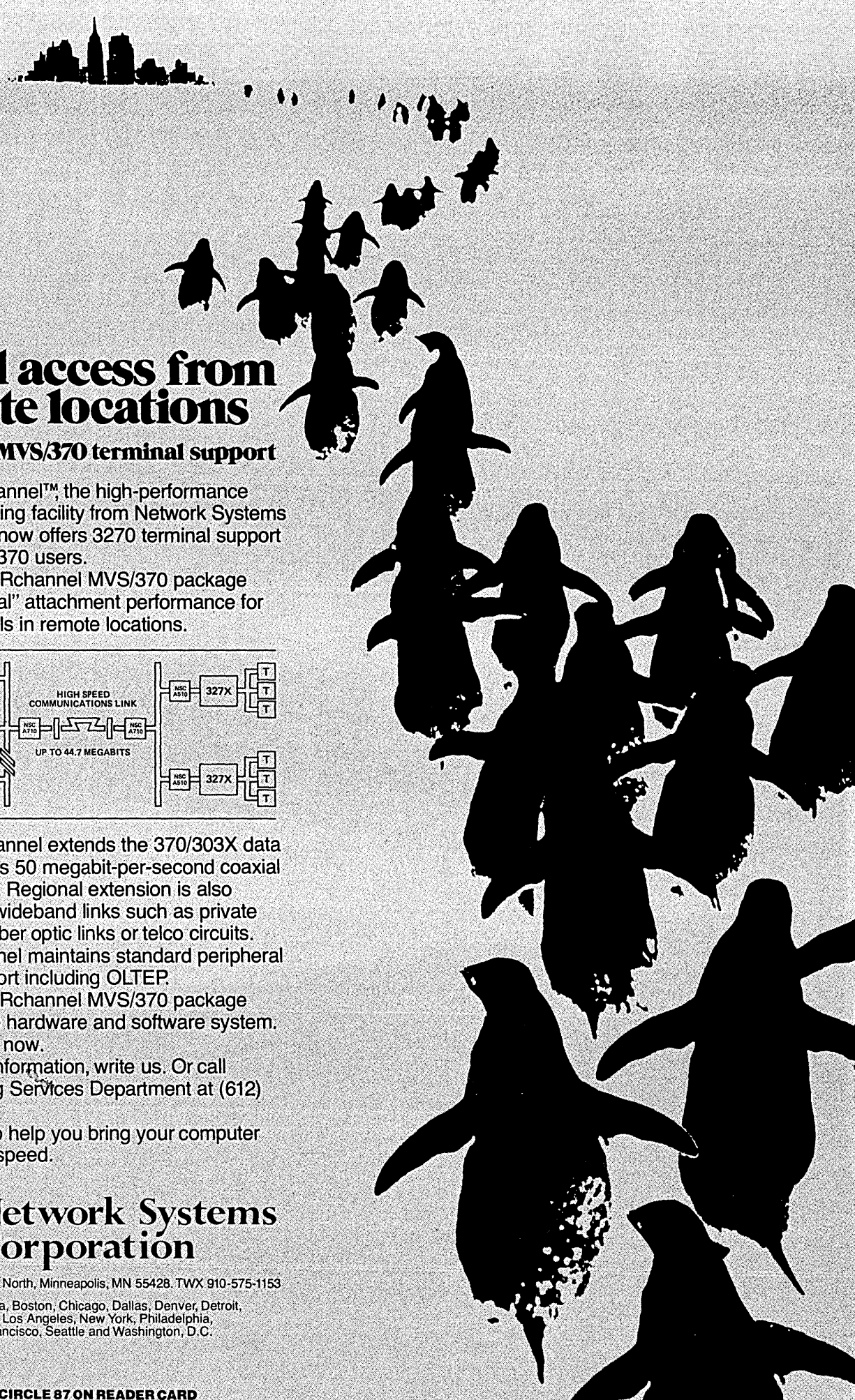


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Thread Your Data Through Any Environment

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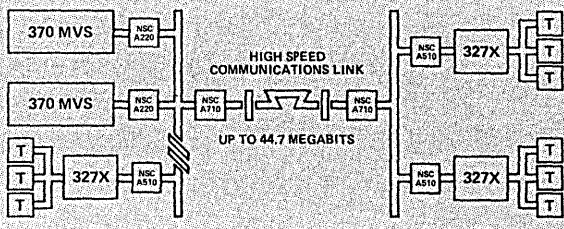


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CIRCLE 87 ON READER CARD

NEWS IN PERSPECTIVE

PERIPHERALS

CASHING IN ON CACHES

IBM and storage Technology have come out with cache-buffered disk controllers to ease I/O bottlenecks and boost performance.

As mainframes grow larger, they're spawning an even bigger growth in on-line disk storage. Some estimate that users' demands for DASD capacity run as high as 45% a year compounded annually, far outstripping the growth in cpu horsepower. This disproportionate growth in disk capacity, combined with a change in the mix of jobs running on big mainframes, has created I/O problems for which several companies have devised new hardware.

Essentially, the problems center on the relatively narrow bandwidth channel through which I/O requests and data must flow between the cpu and massive disk

files. Even with the doubling of IBM's channel speeds two years ago, a bottleneck has persisted in hampering the efficiency of many large systems. Critical system tuning has helped to squeeze out the last byte per second from I/O hardware, but there is still a nagging need for better throughput.

In recent months, IBM and arch-disk-rival Storage Technology have each come out with an upgrade to its disk controller equipment that promises to ease I/O bottlenecks, especially in light of the unprecedented production delays in IBM's biggest disk drive, the 3380 (May 1981, p. 48). The new hardware from each firm consists of a high-speed cache buffer that serves to store often-used data sets logically "closer" to the cpu and effectively free I/O resources for better efficiency.

IBM's cache buffers were added to its 3880 disk controller models 11 and 13, which were introduced last October. The company describes the new devices as keeping recently referenced data in a semiconductor cache memory so that accesses to them are done at "electronic speeds," as compared to the much slower mechanical accesses required when pulling data off a disk platter. The model 11 controller is designed for paging and swapping I/O, much of which is used by MVS and other virtual operating systems. The model 13, on the other hand, is designed to speed up access

to nonpaged and application datasets. IBM says the controllers are essentially the same as its previous 3880 models except that additional logic and memory has been added to perform the staging function. Little rewriting, if any, of system or applications code is required to install the buffered controllers, the firm claims.

Storage Technology says it has taken the cache concept event further than IBM in its recently introduced Sybercache 8890 controller. Essentially an upgrade of its copy of IBM's 3880 controller, the Sybercache is claimed to use more complex algorithms to manage the transfer of datasets from disk to cache. Storage Tech also hopes to help its users boost performance of older 3350-type disk drives while they wait for the delayed 3380 types. In particular, users installing the big 3081 H Series mainframes without 3380 disks will be hard pressed to "feed" their machines data at high enough rates for overall system efficiency, according to Jim Fleming, Storage Tech's director of disk product marketing.

"We expect we can help users retain their old cpus by reducing I/O times and improving throughput," he says. He points out, too, that IBM's DASD controller, the model 13, is designed to help boost I/O performance only for the as-yet rare 3380 disk drives, while Storage Tech's machine can work with the abundant 3350 population as



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CIRCLE 88 ON READER CARD

FEBRUARY 1982 87

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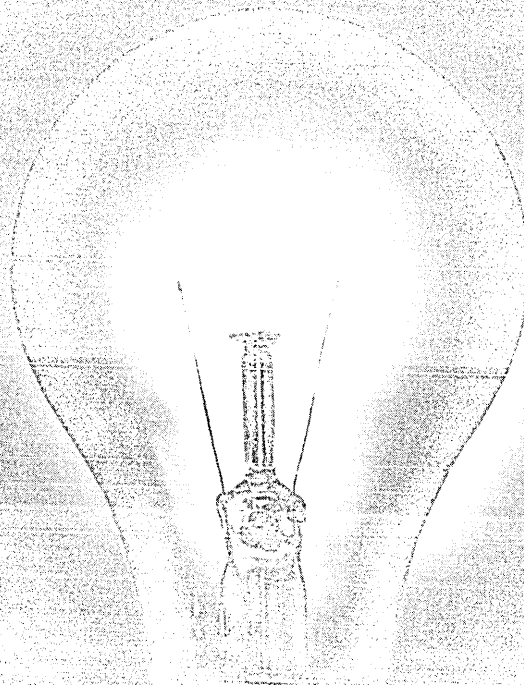
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NEWS IN PERSPECTIVE

well as 3380s in the future.

"The Sybercache can boost performance of 3350s to close to that of the 3380," claims Fleming. He adds that while IBM's new controller works with high-end 3700, 4341, 3081, and 303X machines, his company's device will operate on IBM mainframes as small as the 370/135. In addition, the Sybercache will run with the MVS, DOS, and VM operating systems while IBM's controller is limited to MVS/SP and VM systems. In comparison to IBM's caching algorithms, described by the company as a "modified least recently used" type, Storage Tech says its new box uses "heuristic" routines that can boost performance 35% to 75% over noncached disk I/O, depending on the mix between sequential and batch accesses.

IBM literature on the 3880 model 13 says the "actual performance gained using

IBM's buffered controllers are designed to help paging, swapping, and application datasets.

a cache storage director depends upon a number of factors besides the size of the cache. Applications with a low read-to-write ratio will not realize as significant an improvement as will applications with a higher read-to-write ratio. Applications where data are never reused, such as dumping from DASD to tape, will gain no benefit. Applications in which data tend to be randomly used will need a larger cache. Applications involving sequential reading of large data blocks will show less improvement compared to the sequential reading of small data blocks."

A company spokesman emphasized that performance also depends on the operating system, database systems, and hardware configuration.

Fleming says the Sybercache is capable of detecting when a sequential dataset is being accessed and then prefetching blocks of data before they are asked for by the cpu. The prefetched blocks are stored in the cache and notification of their residence is made to a directory. In addition, problems relating to record lockouts and updating are taken care of, the firm claims. Fleming noted that tests of the Sybercache have shown a 98% cache hit rate when sequential datasets are in use. That can translate into substantial improvements in random I/O access times because more resources are available to a random request.

Storage Tech has estimated that one-half to three-quarters of all DASD files are sequential, much of them used in batch processing running concurrently with interactive applications. Thus, its device, and for that matter IBM's, should appeal to many users. When used with IMS database files, the Sybercache can be directed to prefetch blocks of data on a "best-guess" basis, ac-

ording to Fleming.

Was Storage Tech's introduction of Sybercache, preannounced to industry press in early December, prompted by IBM's 3880 upgrades? No, says Fleming, stating that his firm was planning an early '82 intro all along. "Of course, it helped that IBM blessed the cache concept," he adds. Further enhancements to the 3880 and its plug-compatible rivals are expected to take advantage of the device's microcoded architecture which allows for much more flexibility than the hardwired 3830 controller it replaces.

"STC is ready for those changes," states Fleming, suggesting that IBM might eventually come out with cpu-resident software that will direct cache and I/O management commands to the 3880 and more fully manage the complete I/O path between disk platter and application program.

Neither IBM nor Storage Tech was the first to attempt an improvement in disk I/O through the use of a high-speed cache buffer. Memorex in 1978 introduced a similar device but it did not do well in the market, perhaps because of a faulty architectural approach. Some say the Memorex cache memory was placed too close to the disk devices themselves and therefore was unable to reduce channel reconnect delays as the Storage Tech and IBM units do.

—John W. Verity

COMMUNICATIONS

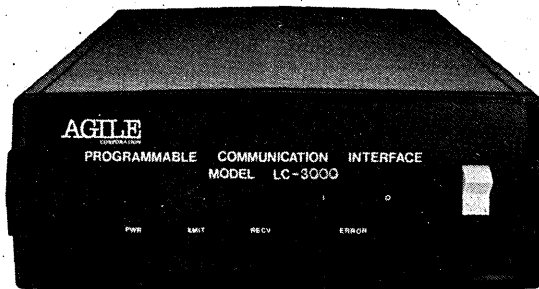
SUPER TELEX IS COMING

Western Union sees Telex as having even greater potential in today's message-oriented communications environment.

If you're one of the many Telex users who would like to upgrade the rather lackluster 50 baud message service, have no fear—Super Telex is coming. That's the word from Thomas Mathai, vice president for worldwide office message services at Western Union.

Far from being an outdated low-speed offering, Telex, as Mathai sees it, has great potential in today's message-oriented communications environment. Emphasizing that WU may have "underplayed" the capabilities of Telex service in the past, Mathai sees a real need for an enhanced version of the service that will add speed and protocol conversion and higher data handling speeds.

Hewlett-Packard MTS 3000 users



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AGILE's LC-3000 Programmable Communication Interface allows HP MTS-3000 users to attach common asynchronous RS232 peripheral devices, including data terminals, line printers, or typewriter quality printers to an HP-3000 synchronous communication line. AGILE's LC-3000 is compatible with the HP V/3000 software package. AGILE's LC-3000 supports either one or three asynchronous peripheral devices. For details, mail this coupon today, or phone (800) 538-1634.

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CIRCLE 90 ON READER CARD

NEWS IN PERSPECTIVE

Acknowledging that Telex "has the image of an older technology," Mathai understands that there must be a "migration" to an expanded service. He is working to set those upgrades in place with the Super Telex service scheduled for introduction late this year. New computerized communications switching processors are being installed that will handle 2400bps bisync formatted messages. Mathai also sees Super Telex as handling messages between otherwise incompatible word processors and personal computers. Using special ID codes, users with equipment from vendors such as Wang, Lanier, IBM (Displaywriter), Apple, and others will be able to transmit messages when the new service begins operating. Mathai emphasizes that his equipment list is meant only to illustrate the "generic range" of devices that will be supported under Super Telex, and adds that the exact terminals to be supported will be announced before the service becomes operational.

Even without the impending additions, Telex already has features not widely known to many users, Mathai says. These include a store-and-forward capability for delayed message delivery, abbreviated dialing, prestored lists for broadcast messages, and a reduced rate Nite Cast offering.

Mathai looks at Telex as more than a message service since it has all the characteristics of an electronic mail system. The major advantage as he sees it is the directory, which allows users to send messages to anyone on the system. This directory capability is lacking in most electronic mail systems, he claims. As presently structured, Telex costs just under 35 cents per minute to transmit a message anywhere in the U.S.; this should be compared with a cost of \$2 to prepare a letter, he explains.



THOMAS MATHAI: "We are the AT&T of the record communications business."



JOHN J. CASEY: He next plans to phase into the minicomputer and distributed processing areas.

Turning to the legislative efforts to allow WU to operate as an international carrier, Mathai says that the fall of '82 will see the start of overseas traffic. The major impact of this new authorization will be to reduce the rates of international messages to customers. When WU handles overseas traffic, "the middle man will be removed," he says, referring to the elimination of a competing International Record Carrier (IRC). Eventually the Super Telex service will be expanded on an international basis and access will be provided for both Telenet and Tymnet users.

"We are the AT&T of the record communications business," Mathai says, adding that WU is the only carrier that can handle messages end to end. The expanded services now being implemented will give WU definite advantages over its biggest competitors, ITT and RCA, followed by a lot of smaller IRCS, he claims.

Western Union has also been busy in the area of third party maintenance with the recent formation of a field service division. Based partly on the on-line Termicare program started by the now defunct Data Services operation, the new division is handling a variety of equipment. For example, it services TRS-80 personal computers in areas where Radio Shack and Tandy Corp. do not have such support, and in addition, it services terminals installed by customers of Beehive and Delta Data Systems. In another area, the division maintains in-house networks installed by such firms as E.F. Hutton, Sears, and the Ohio College Library Council.

With a network of 30,000 customers and 80,000 terminals that are under maintenance support contracts, John Ca-

sey, general manager of the division, said he next plans to phase into the minicomputer and distributed processing areas.

Using concepts pioneered under Termicare, the division has set up a support center where on-line diagnostics of users' terminals can be done. Each terminal covered by the center has a maintenance history that can be called up from an on-site database when a problem is reported. Such remote diagnostics by phone and terminals can often eliminate the need to send a field service staffer to the site, Casey explains. Termicare concepts are "clearing" more than 10% of all reported troubles, and that is already an important savings since the average service call on-site now costs "well over \$100," he said.

With a staff of more than 3,000, which includes 1,650 technicians, Casey's division has extensive in-house training programs. Each time an additional line of equipment signs up for service support by WU, the field service staff has to be trained. The program includes video tape instruction in 200 of the division's 450 nationwide locations.

Casey looks at TRW, Sorbus, and RCA Service Co. as his major competitors, but he notes that each of these specializes in a specific area of support. With revenues of \$30 million per year, WU wants to make a major impact in this market by having an across-the-board mix of support and maintenance services, Casey explains.

—Ronald A. Frank

NOT JUST BOXES BLACK

Infotron says the multiplexor has become the executive of the network function.

"We're not shipping black boxes. We're shipping networks and providing a service for the customer." That's the way James C. Hahn, president and ceo of Infotron Systems Corp., describes the operations of his company—a major supplier of multiplexors and other data communications equipment.

Although originally a company that supplied point-to-point multiplexors, today Infotron is more complex. According to Jeffrey D. Kraengel, vice president of sales, "The multiplexor has changed from a device that just offered cost savings to a device that has become a necessary tool to implement the network. In the past, we essentially saved users money. Now we sell features and benefits that enable [the user] to do more with a communications network

New from Timeplex:

Multiplexing with switching, for a more economical network.



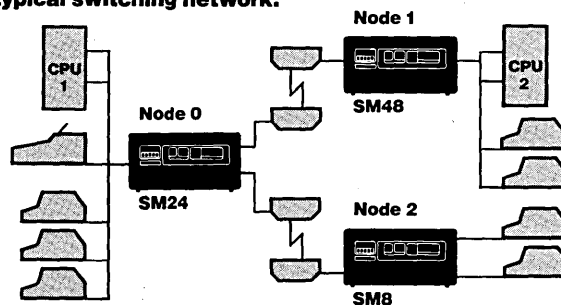
The SWITCHING MICROPLEXER gives you the economies of statistical multiplexing, port contention and port selection.

Timeplex puts all three together in a new 8-, 24- and 48-port SWITCHING MICROPLEXER family. You get all the line-saving benefits of statistical multiplexing, *plus* dramatic reductions in computer port and terminal costs.

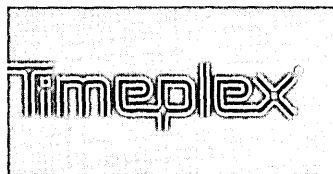
Fewer computer ports. Port contention permits you to have more terminals than computer ports. And the SWITCHING MICROPLEXER gives you both remote and local contention, for more efficient transaction processing.

Fewer terminals. At the same time, port selection lets you reduce the overall number of terminals required in your network. The SWITCHING MICROPLEXER functions as a Data PABX, allowing users to access all system resources. Think of it as the basic building block of a distributed data switching network with 1, 2, or 3 nodes—for up to 144 switchable ports.

A typical switching network.



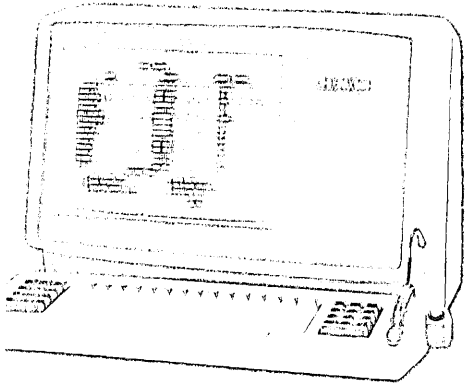
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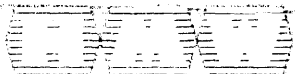
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NEWS IN PERSPECTIVE



JAMES HAHN: In order to generate larger revenues and larger profits you have to look at bigger systems and capabilities.

than ever before. We have off loaded a lot of functions from the computer into the multiplexor. These include the ability to perform network management functions, diagnostics, and rerouting. As we get further down the road, there will also be the ability to do billing from within the device. Because of its position, the multiplexor is the executive of the network."

Kraengel was describing the top of the line Supermux 790, which Infoterm calls a network concentrator. By combining microprocessor control with statistical multiplexing, the 790 in many ways is more of a communications processor. In addition to providing features like error control, centralized line status monitoring, and automatic dial backup, additional upgrades are planned for the intelligent device, Kraengel said. During this year the 790 will be enhanced with dynamic alternate routing so that when one line in a network fails, the processor will automatically begin to route data over another alternate line to keep the

This year the Supermux 790 will be enhanced with dynamic alternate routing.

network operating—all without manual operator intervention.

Built on a modular basis, the 790 has over 16 microprocessors, with each hub module controlled by a micro, Kraengel explained. "The amount of memory makes this [790] comparable today to an IBM 370-145," he claimed. Among the other features slated for the unit, Kraengel mentioned X.25 compatibility and the addition of modem diagnostics which can be run di-

rectly from the multiplexor. Already incorporated are integrated modems, which is important to users with a physical line problem. In addition, the intelligent modems cut down on costs compared to mainframe datasets and allow use of a common power source, he said.

Infoterm's network is also being moved into the data processing area. Originally, the company's focus was on a system called DataLink, which has now been replaced by a new system called DataLink II. The latter data processing system is scheduled for completion in a few months, Kraengel revealed.

The Infoterm spokesman said that the term data link is a confusing one. He believes that although an industry term, it is with more computer-related terms combined data and you will have a better idea. At present, however, the company has needs for both data and voice. But he hastens to add that the latter will not be permanent. Although he is somewhat vague about future Infoterm's capabilities as well as data processing, there is an in-house proprietary product related to the merging of the two, he said. It is a hybrid of a computer and a multiplexor, some of the features of which are being merged into the Supermux 790. Nevertheless, he said, the company is committed to the development of a mainframe.

One of Infoterm's competitors is finding an ally in the market.

One of Infoterm's biggest problems is finding enough people to fill orders for its products.

other slots. Infoterm's president said that data communications applications are added that his firm has been successful in getting the computer salespeople to do. It will come this year, he said, and will be a serious competitor to the Supermux 790. He is confident that the company will be able to handle the long-term loyal employees of the company. That provides a good bit of stability.

Infoterm's president Hahn said the company competing in all the multiplexor markets. On the low end, the Supermux 480 competes with products from IBM and more recently, from the mid-range, the 880 and 890. At the high end, the Supermux 790 competes with the 880 and 890. He said that the mid-range, the 880 and 890, are really up against it. In fact, he said, he is not sure while at the high end, the Supermux 790 is competing for the 880 and 890. He said that the strategy has been to offer a wide range of products, which has allowed users to upgrade to more advanced features as their needs have become pointed on.

As multiplexors are being used in

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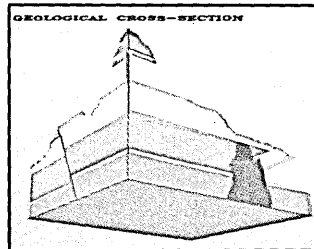
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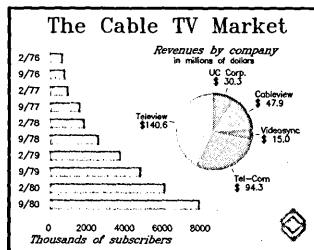
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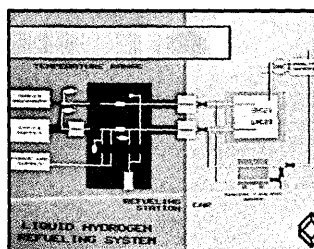
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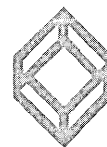
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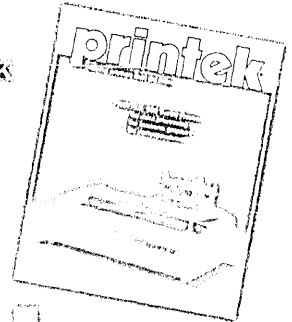
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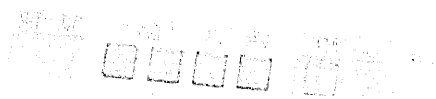
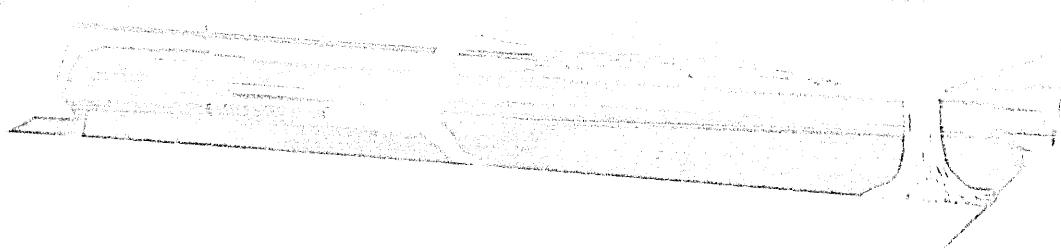
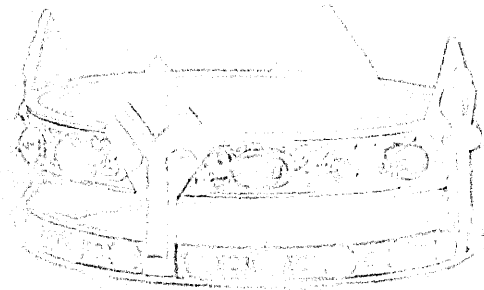
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NEWS IN PERSPECTIVE



JEFFREY KRAENGL: "The multiplexor has changed from a cost savings device to a device that has become necessary to implement the network."

sophisticated they have also added network testing functions such as those found in tech control centers. As these intelligent multiplexors get larger, the user has better control of them, Hahn believes, and he describes these advanced systems as more

user friendly. Although earlier models were like black magic requiring detailed expertise to operate, now, Hahn said, "an operator can understand what's happening in the network and can handle a sophisticated network without a lot of detailed nitty-gritty knowledge." He admits that this trend to larger systems is not without its marketing benefits since "in order to generate larger revenues and larger profits you have to look at bigger systems and capabilities."

Kraengel said that there still seems to be plenty of growth left in the multiplexing arena. He estimated that the low end is growing at 50% per year and the mid-range and above is expanding at about 30% per year, which he described as closer to "the true market rate."

The emphasis on customer support has led Infotron to set up a systems engineering group to support upper end products like the 790. That group has a "customer mode" which includes looking out for the user's communications interests, Kraengel said. The high level of support is necessary because of the many options available. Each multiplexor uses a mix of microprocessor-controlled modules to meet the specific network needs of the customer. And this modularity assures an upgrade path as the user's network needs expand, he concluded.

—Ronald A. Frank

LEASING

DOUBLE DIPPING IN DP

The computer leasing business in the U.K. may be operating under new ground rules in '82.

The computer leasing business in the U.K. could well be operating under new rules this spring when the British budget is unveiled. Causing this change is a combination of opportunism and risky business practices, both now evident in London.

Tax law differences between the U.S. and U.K. have enabled some organizations to arrange equipment leases that engender simultaneous tax benefits on both sides of the Atlantic. The situation has worried Britain's Inland Revenue Service (BIRS) more than it has troubled the U.S. Internal Revenue Service. As a result, an effort has been made to eliminate the British tax break on leases of American equipment, but the situation is still far from resolved.

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NEWS IN PERSPECTIVE

Some computer leasing deals in the U.K. also take advantage of American tax shelters. One such set of transactions is at the hub of a sticky web of financial hijinks. The British leasing company in question, which has based much of its business on deals that bear a striking resemblance to those written by New York's bankrupt OPM Leasing, may find itself under increasing pressure as technological and economic forces erode its profitability.

When the BIRS holds a series of meetings at which all the participants are pledged to secrecy, something important has got to be going on. This is precisely

The fierce competition in the leasing business forced everybody to consider double dipping deals.

what happened late last spring, when the U.K. taxation authority realized that the largest banks in Britain, the so-called clearing banks, were reducing their tax exposure by participating in American leasing deals. Not all these transactions were confined to computers—indeed, the most notable deals involved leases on entire automotive assembly lines and jumbo jets. The forthcoming opportunities to lease IBM 3081 processors, however, caused a number of the big British banks to look into extending such practices. Other British organizations, including the smaller and more numerous merchant banks, were keen to get in on the action.

The banking community calls such leasing arrangements cross-border transactions. But the use of tax breaks in both the U.S. and the U.K. to make the leases more economical gave rise to the more popular name for the deal—double dipping. The fierce competition in the leasing business forced everyone to consider double dipping schemes once it became obvious that anybody could play the game.

In essence, any capital equipment that is part of a normal American tax-leveraged lease can be sold to a British buyer and then bought back by the U.S. partner. During the time the U.K. outfit has the asset, time payments by the Briton and rentals from the American (who wants to use the asset) pretty much cancel each other out, so little money changes hands. The term during which the British organization has the asset is shorter than that of the U.S. lease, which enables the American to also set up a stateside tax shelter on the asset.

Under current U.K. law, this temporary asset holding enables a Briton to claim 25% of the price of the goods as an offset against taxable income. Some of the money that comes off this tax bill is passed on to the American partner, while the rest constitutes a profit for the British partner. As a result of all this, the cost of the asset is lowered, perhaps by 5%. In the case of a \$5 million IBM 3081, for example, the Ameri-

can lessor (and, therefore, the American lessee) comes out ahead to the tune of \$250,000, hardly small change. The American lessor of the gear also gets the usual tax breaks at home. This is why the deals are called double dips.

The tax breaks, mainly claimed by the big clearing banks in London's City financial district, attracted the attention of BIRS. The tax agency didn't like the idea of British tax breaks benefiting American lessees. So hush-hush meetings were called by BIRS with the Equipment Lessors Association (ELA), the financing industry's British trade group. ELA includes members from the clearing banks, other banks, and independent leasing companies.

During the closed-door meetings, BIRS said it wanted the double dipping to stop. Meanwhile ELA, with the interest of its members in mind, pointed out that deals were already in the works, all of them perfectly legitimate. In the end, ELA gave BIRS assurances that its members would voluntarily wind things down. BIRS, for its part, seemed to accept these assurances.

The secrecy surrounding British banking, however, makes it very difficult to determine whether the ELA members are in fact playing by the new rules. Indeed, there remains some suspicion that things are not exactly what they are supposed to be. Giving rise to these suspicions are the activities of some well-connected accountants, who, in the wake of the meetings, went to American lessors encouraging them to participate in double dipping deals.

Inland Revenue may well change the depreciation allowance rules when the next U.K. budget is released in March. This will not be an easy task, since Great Britain's membership in the EEC forces it to follow the same set of rules for domestic and foreign transactions within the community. The U.K. is also facing a potential political squabble over the touchy tax issue. There is mounting criticism over citizens having to pay more taxes so the banks can make cheap deals for Americans.

While the Britons are brooding over their tax laws, a prominent English leasing company appears to be heading for stormy seas. Atlantic Leasing, which specializes in a practice called flexible leasing, seems to be under financial pressure. This should come as no surprise to followers of the ITEL and OPM sagas, since Atlantic's modus operandi is similar to that used by the two bankrupt American lessors. The London lessor's fortunes are tied to used IBM product values, many of which have gone down the drain, taking anticipated leasing profits with them.

To make matters worse, Atlantic is also involved in very complicated transactions that include American tax shelters built around its British leases. One set of these transactions links Atlantic to a Pittsburgh company, FSC Corp., which recently

suffered large losses, some of them stemming from bets on computer residual values, and is now in bankruptcy.

Some of the London lessor's transatlantic ties were set up in 1977 and 1978, a period during which Britain controlled the export of assets through the Exchange Controls Act. While enforcement of that law has been suspended, it remains on the books. During those years, Atlantic sold final rights to some machines—believed to have cost as much as \$40 million—to European Leasing Ltd. of Monrovia, Liberia. ELL transferred the rights to Carena, a Netherlands company, which in turn sold the rights to Funding Systems, now FSC Corp. Tax breaks were picked up on both sides of the cross-border transaction, and some profit was kept out of England by the Dutch and Liberian companies. Officials within the British government have expressed an off-the-record interest in the situation, although the exact reasons for this curiosity remain unclear.

Atlantic's leases involve two contracts. One is a long-term computer lease assigned to a bank or other corporation. The second is a promise by Atlantic to take back a machine early, making good on the balance of the long-term lease if the lessee takes a successor machine under terms favorable to the lessor. Like OPM's indemnity deals, this kind of business makes money in the early years of a computer generation, but it can lead to losses down the road.

The users rarely realize what is going on until problems crop up. At least this is what happened in the U.S. in the cases of ITEL and OPM. So far, there have been few

The U.K. is also facing a potential political squabble over the touchy tax issue.

problems with Atlantic's deals. These troubles have only been acknowledged on an off-the-record basis, but the financial time bombs set three and four years ago are just now beginning to detonate.

Ironically, among Atlantic's lessees are Rockwell International, an apparently inadvertent participant in the alleged OPM fraud, and Lloyd's of London, which ended up as ITEL's fall guy. OPM's former European manager now serves in that role for Atlantic.

Atlantic's practices sparked some criticism from another London lessor, United Leasing, which issued a booklet on the pitfalls of flexible leasing. (United specializes in short leases, too, but in United's deals the lessor takes the risk.) Responding to United's attack, Atlantic cried foul, claiming the brochure was simply a competitive tactic. But United, which admits to losing some business to Atlantic, has a reputation for speaking out against practices it believes are not in the best interest of the leasing business.

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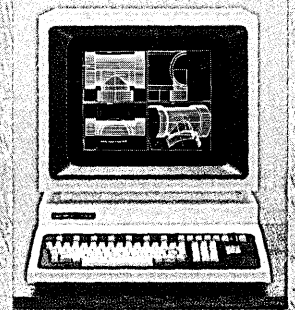
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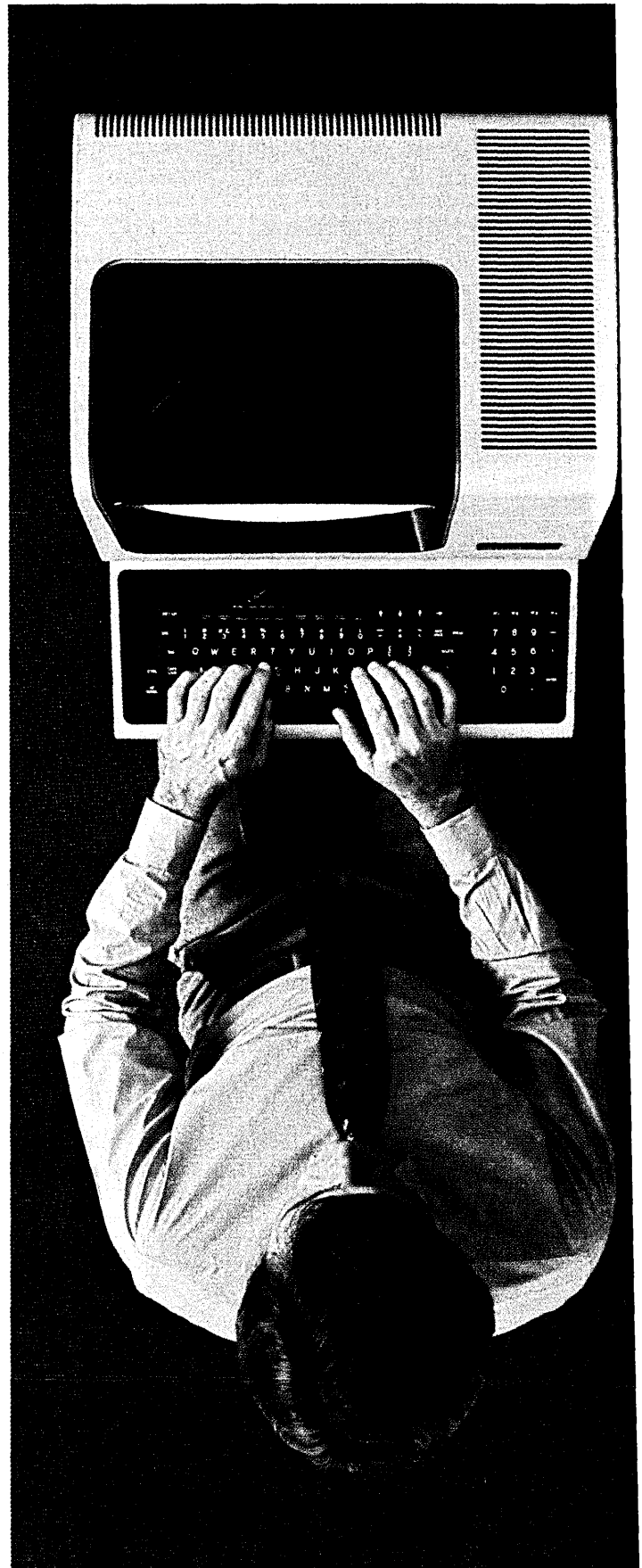
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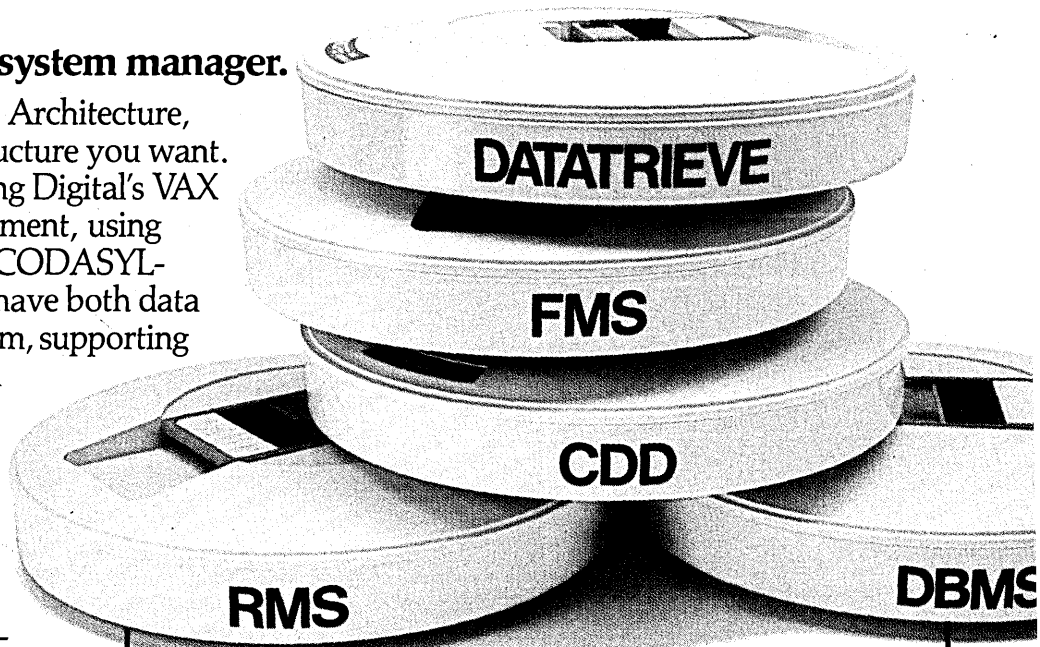
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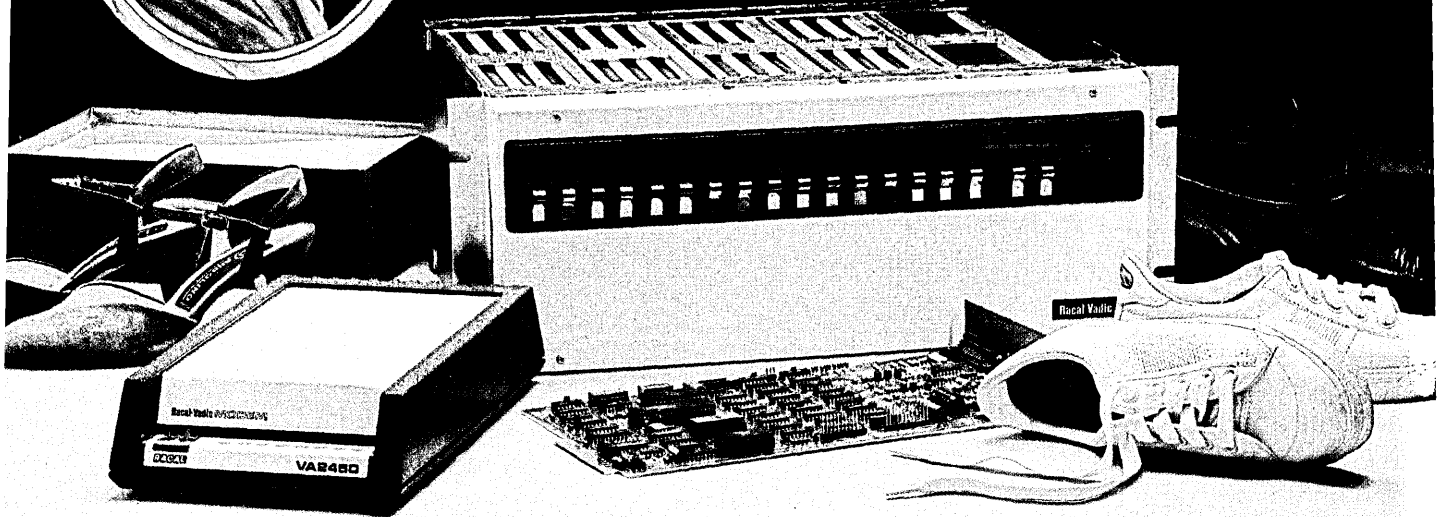
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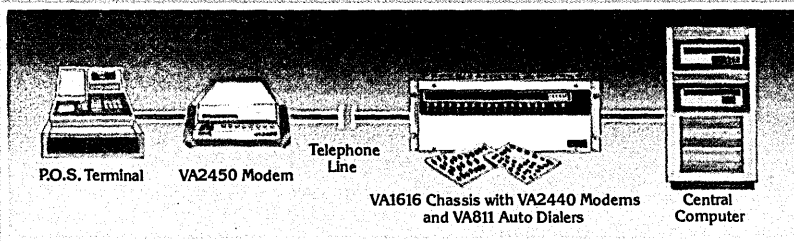
so the central computer site (using the VA2440 modem and VA811 dialer) can poll each retail store collecting sales, inventory and other data.

Up to eight VA2440 modems and VA811 auto dialers can be mounted in Racal-Vadic's 7-inch high rack chassis. The auto dialer(s) operate either in a singleline mode (one modem per dialer) or in Racal-Vadic's exclusive Multiline configuration where up to 60 modems can be accessed from a single RS366 or RS232C computer port. That's a tremendous savings in space and hardware.

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CIRCLE 99 ON READER CARD

NEWS IN PERSPECTIVE

proved that good leasing practices can pay off. While Atlantic blamed its 1980 decline on bad business conditions, United more than doubled its profits (from a smaller base) last year. The big boost in United's earnings came from a bonus paid by Standard and Chartered Bank. S&C was the former home of United's principals, brothers Parry and Ashley Mitchell, who had set up a 370 leasing business inside the bank before deciding to go it alone. Managing a portfolio composed of the very same types of systems that led to enormous losses for Lloyd's and which figured in the headaches of OPM, the Mitchells made a bundle for S&C, and for themselves.

United will not comment specifically on Atlantic, even though the lessor attacks the company's main business practice. But events shaping up in computer leasing could well show United's judgment to again be better than that of its rivals. In recent months, Atlantic seems to have shifted its emphasis from mainframes to disks. This comes at a time when United, among others, has begun to question the value of IBM 3350 disks over the next two to three years.

While it is a bit early to tell which way the disk leasing business will turn, the strategies of IBM, competitive U.S. supplier Storage Technology, most large American lessors, and the biggest computer users all point toward a defensive posture regarding the future value of 3350 disks. Meanwhile, Atlantic, which is rather quiet regarding its practices, is now increasing the loss reserves on its books and changing its contracts in an effort to avoid a repetition of certain embarrassing disputes that might affect relations with its bankers.

—Hesh Wiener

MINIS & MICROS

THE LOW END IS WAGGING

Small computer systems are giving the industry a new and, to some, bewildering look.

The so-called low end of the computer market could become the tail that wagged the dog.

Minis and micros, say numerous research firms, could reach an installed total of a million units by 1985 at a value of \$8 billion. This is not mainframe caliber in terms of dollars, but in excess of unit volume, and dollars can't stay behind forever.

The low-end phenomenon is chang-

ing the character of the industry as well as its size, as evidenced by Comdex '81, where small systems predominated (74 shown in all) and which was billed by its organizers as the "biggest computer show ever."

It was that, at least in terms of numbers of exhibitors—648 all told. Next year Comdex has a sellout at 2,300 booths and it's asking the Las Vegas Convention Center for more space.

Although attendance couldn't compare to an NCC, Comdex organizers were delighted with the 23,500 total, but all exhibitors were not. "It's too much," said a

"They could close the doors and it would be fine with us."

long-time industry observer who characterized Comdex as "a show for doing business," and felt a smaller attendance would have been better.

"They could close the doors and it would be fine with us," said Tom Gold, president of Lifeboat Associates, publishers of software products. Lifeboat was there primarily to talk to other exhibitors, and attendees got in the way, Gold asserted.

"The best thing about coming to a show like this is to find out what everyone else is doing," said Tony Glinskas, vice president of sales at Ramtek, Santa Clara, Calif., producer of graphics systems.

His sentiments were echoed by Bob Miller of Computer Power Systems, Carson, Calif., who was delighted with the fact that there were 12 power providers exhibiting at Comdex. "We were in the first show [three years ago], and at the time we were the only one exhibiting."

Some of the big mainframe companies were at Comdex '81 with low end and/or office automation products, but their big computer presence was felt too.

In the wake of oem pacts signed by Convergent Technologies, Santa Clara, Calif., with a number of big firms (Dec., p. 56), other small systems builders were out hunting for similar deals. The big companies, said many of them, "see us as an easy entry into the low-end markets."

"We've got several conversations under way," said Rolando C. Estevearena, vice president, Systems Div. of Zilog Computer Systems, Cupertino, Calif., talking about mainframers' efforts to oem their way into low-end markets. He and others indicated that such conversations continued late into the night, every night of Comdex.

Gary Friedman, president and chief executive officer of Fortune Systems Corp., San Carlos, Calif., noted that Thomson-CSF of France, a big company that has an oem agreement with Convergent Technologies, is one of the biggest investors in Fortune Systems. "They're selling Convergent systems now," he said, "but they have an exclusive right to sell our systems

in France, and they'll start getting them in March."

Comdex keynote Lewis F. Kornfeld, a director of Tandy Corp., noted that Tandy's Radio Shack computer category sales "are thundering relentlessly toward the half-billion dollar per annum mark."

Now, he said, "It's perceived that Shack and Tandy have encouraged companies like IBM, Xerox, Texas Instruments, DEC, Wang, NEC, Toshiba, Hitachi, and Fujitsu to get off their collective duffs and into a new business—a new playground. It was always there for them to play in had they not turned their armies of PhDs in the direction of researching market share, recruiting monks for their advertising, and writing papers on the automated office."

So it's the tail wagging the dog perhaps, but it's still the computer industry, with a very new look.

—Edith Myers

BENCHMARKS

SELLS OUT: Citicorp brought out its Axxa office workstation with great fanfare two years ago, claiming the machine would sell well despite its \$40,000 per station price. Now, however, the Axxa subsidiary has been sold to Anaconda-Ericsson of Greenwich, Conn., for an estimated \$8 million. A-E is a 17-month-old joint venture between Atlantic Richfield's Anaconda subsidiary and Swedish telecommunications equipment supplier L.M. Ericsson. Axxa's genesis has been a rocky one, with control of the company switching back and forth between Citicorp and outsiders. Some 100 of the firm's workstations, developed under the brand name Lexar, have been installed, according to industry reports.

HANG HEADS: Five ex-OPM computer leasing executives pleaded guilty to charges of defrauding banks and other lending institutions of over \$190 million by falsifying computer equipment leases. They also have decided to help federal attorneys who are prosecuting the case, according to industry reports. The five men—Allen Ganz, Stephen M. Lichtman, Mannes Friedman, Martin Shulman, and Jeffrey Resnick—were all OPM vice presidents at one time. Not indicted but named as "co-schemers" were OPM chiefs Mordecai Weissman and Myron S. Goodman. The falsified leases concerned equipment supposedly rented to Rockwell International. The leases were sold to 19 lending institutions for a total of \$190,450,727 in a scheme supervised by Goodman and Weissman, according to the U.S. Attorney John S. Martin Jr., who filed the papers in Federal Court in New York.

BELTS TIGHTEN: The semiconductor industry is looking at a lean year ahead as it watches prices spiral down and profits van-

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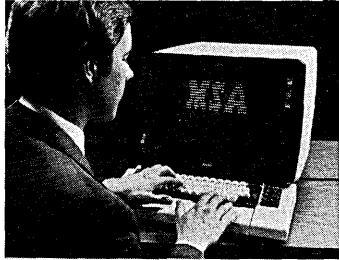
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NEWS IN PERSPECTIVE

ish into the already thin air. The end of 1981 saw many plant shutdowns, retrenchments, and layoffs as the overall industry suffered almost a 7% drop in business, according to the Semiconductor Industry Assn. The outlook for 1982 is bleak, with no upswing predicted until the second half at the earliest. And even that projection is optimistic, according to some observers. Meanwhile, in light of the domination of the 16K and 64K RAM market by the Japanese, the U.S. semiconductor industry is moving to form joint ventures between various parts manufacturers and materials suppliers for the next generation of devices. Also, U.S. vendors are hoping to make their profits in more sophisticated parts such as microprocessors, where software can be sold for added value.

EXITS: Another top-level manager at Data General left the company, triggering a shake-up in the corporate offices. Barry J. Fidelman, vice president and general manager of the Information Systems division, was the fourth highest paid executive at the firm, a veteran of 12 years. He said he was joining Apollo Computer, the Chelmsford, Mass., startup which builds 32-bit business computers. The shake-up enhanced the power of Frank P. Silkman, a former IBM executive who was brought in early last year over Fidelman to head DG's three business divisions. Silkman now reports direct-

to Herb Richman, executive vice president. Richman has lost direct responsibility for the three business divisions but has gained control over the field engineering division. The latter has been the focus of much concern by DG management as the company boosts its servicing capabilities at the cost of a sagging bottom line. Fidelman was the fifth vice president to leave Data General last year.

RESEARCH: An attempt to stimulate research in advanced semiconductor technology on the nation's campuses and at non-profit institutions has been launched by the Semiconductor Industry Assn. Its new Semiconductor Research Cooperative will attempt to get members to put up 0.1% of semiconductor sales to fund studies that a maker couldn't do by itself, to provide advanced equipment, and to attract more and better qualified degreed people into the field. "I personally believe the major benefit that comes out of this is people," says Robert N. Noyce, SIA chairman and Intel Corp. vice chairman. He labels this program "completely complementary" to an effort by the American Electronics Assn. to get members to put up 2% of their R&D budgets to attract more engineers into the industry. Noyce looks to be able to distribute \$4 million to \$5 million in 1982 and increase this to some \$40 million in the 1990 period.

BROADENS SCOPE: Management Science America Inc. of Atlanta has made a move into the manufacturing software business, a strong departure from its traditional business of accounting software. The firm said it signed a letter of intent to buy Arista Manufacturing Systems from Xerox, which bought Arista several years ago. No financial details of the proposed transaction were revealed, but sources said Arista has been profitable, with annual sales in the \$2 million to \$3 million range. Arista's software is designed to run on a number of mainframes, but MSA said it would concentrate its efforts on the IBM market in particular. The deal would be MSA's second acquisition since it went public in April 1981. Shortly after that time, it bought Peachtree Software, which specializes in packages for microcomputers.

MAKES OFFER: MCI Communications Corp., which has successfully battled AT&T in providing domestic long-haul telephone services, made an offer to buy Western Union International from Xerox Corp. for \$185 million. The purchase, which must be approved by the boards of both companies and the FCC, would put MCI squarely into the overseas message and data transmission markets. WUI is said to rank third among U.S.-based international record carriers with about 24% of the Telex/TWX market. It was to have been an integral part of Xerox's aborted XTEN communications network. MCI said it would like to add voice services to WUI's network should its offer of \$160 million in cash and \$25 million from a \$200 million line of unused credit go through.

YES, MASTER: Robots have a great future predicted for them in such fields as agriculture, hospitals, and underwater construction, according to a report released recently by the Japan Industrial Robot Assn. Even service sectors not traditionally considered when discussing the application of robots will benefit from the technology, the 444-page tome says. On farms, robots are expected to help in spraying insecticides, spreading fertilizer, inspecting eggs, and packing produce. Submarine robots will help build fish farms and look for mineral deposits. The report claims that robot spending by nonmanufacturing industry will be in the range of \$360 million by the end of the decade. The question remains, however: when will the robots form a union and demand better wages?

HELP: Research is under way on the annual DATAMATION 100, a ranking by revenues of U.S.-based providers of general purpose dp equipment and services. If your company wasn't included in last year's lineup, and had '81 dp-related sales of at least \$50 million, please send the latest annual report to DATAMATION, Top 100 Editor, 666 Fifth Ave., New York, NY 10103.

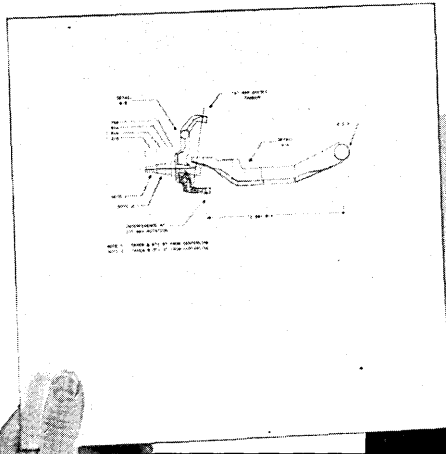
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SCIENCE/SCOPE

Application of magnetic fields during the growth of crystals from molten sources may control irregularities in single-crystal semiconductor materials. In experiments at Hughes, a magnetic field was applied for the first time to the float-zone growth of gallium-doped silicon crystals. The magnetic field substantially reduced the amplitudes of striations due to crystal rotation and thermal convection. It also made for more orderly rotational striations.

An advanced electron-beam lithography system is being developed at Hughes to make Very High Speed Integrated Circuits (VHSIC), the "super chips" that will give military systems a tenfold increase in data processing capability. The high-speed lithography system will focus beams of electrons to "write" circuit patterns with submicron dimensions. These patterns will be converted into transistors and interconnects smaller than any now in production. VHSIC chips will be faster, more reliable, use less power, and have more memory than ordinary chips. They will be used in the air, at sea, on the ground, and in space.

Better windows for infrared sensors may be forthcoming after more research into a new fabrication process. Hughes scientists have made discs of fluorohafnate and fluorozirconate glasses by pressing glass pieces under low pressure (1024 psi) and high temperature (340°C). The process offers two important benefits. First, infrared glass compositions, which tend to crystallize when large batches are cooled from the melt, can now be formed into large optical elements up to 30 centimeters in diameter. Second, because the discs are cast into their final form, they have neither surface strains due to grinding nor polishing impurities, both of which reduce infrared transparency.

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Solar-powered ion propulsion will be demonstrated on a spacecraft in the near future. Compared to conventional chemical propulsion, ion propulsion saves weight and is better for spacecraft control and interplanetary travel. It generates small but exact thrust for long durations. Hughes has developed a mercury ion thruster system having a specific impulse of 2500 seconds. It is being incorporated for NASA into a prototype Ion Auxiliary Propulsion System (IAPS) to be launched from the Space Shuttle on the U.S. Air Force P80-1 spacecraft. The flight package also includes diagnostic sensors and data processing to determine potential electromagnetic and contamination effects on the spacecraft.

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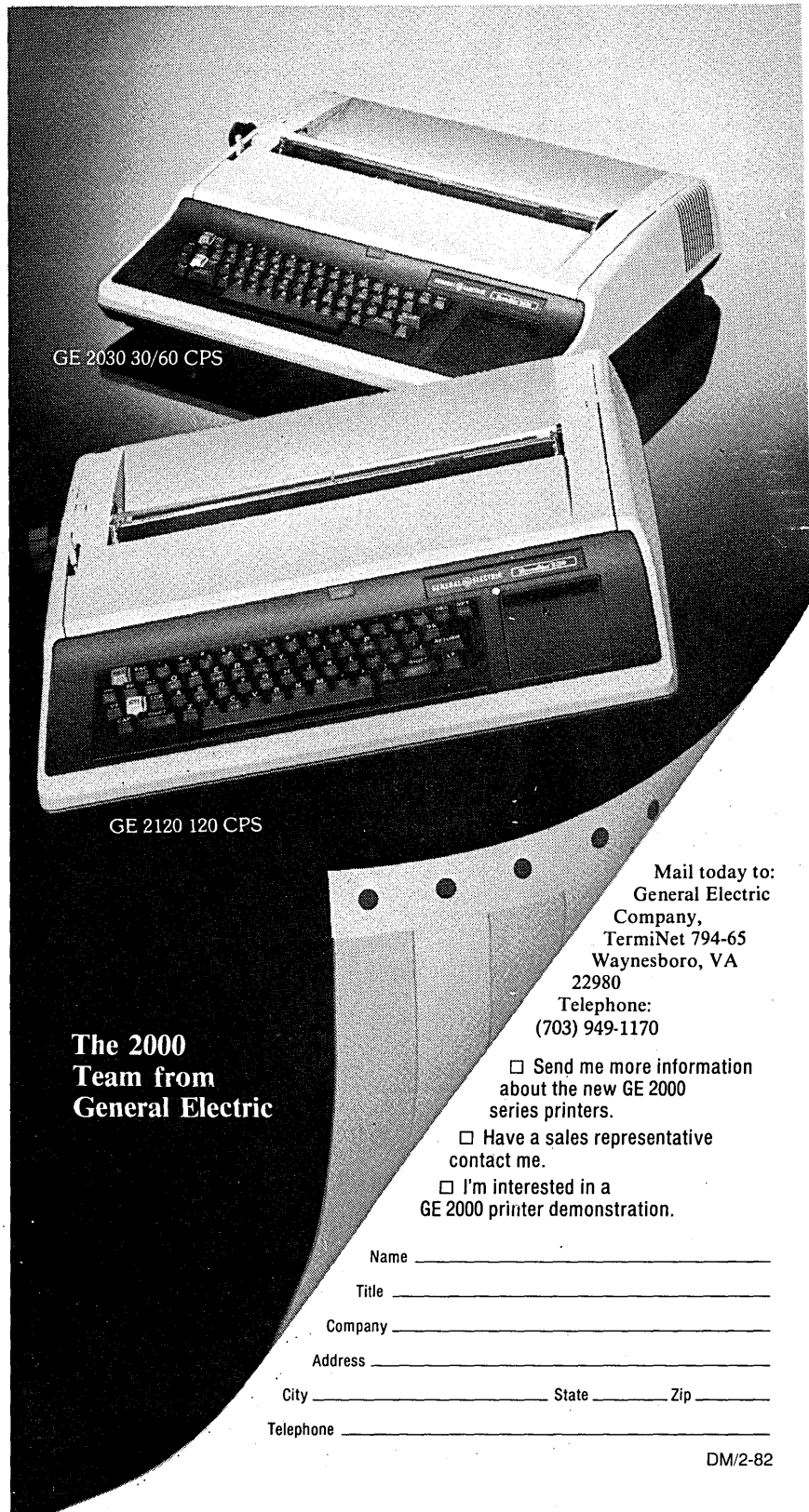
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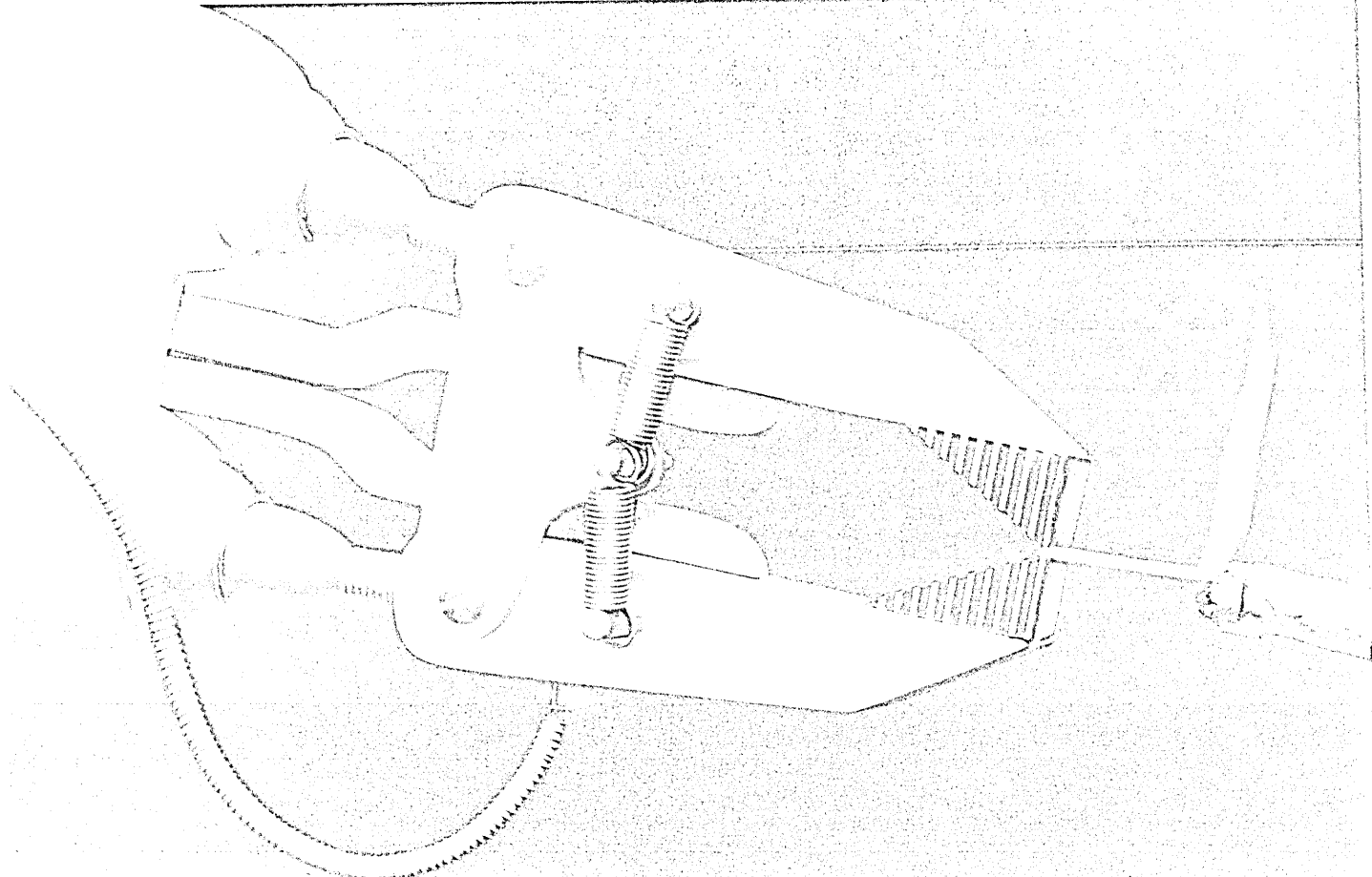
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CAD/CAM: WHO'S IN CHARGE?

Now that we have your attention, it probably behooves us to note that there's a lot more to CAD/CAM than mere robots and that despite the publicity attending the robot-related death of Kenji Ueda at Kawasaki Heavy Industries last July, these machines are not in the habit of attacking people—or of fighting their offsprings.

In a larger sense, though, computer aided manufacturing does seem to have some companies on the defensive, and to be making life easier for others. CAD/CAM systems are being put in place at a rapid pace—the holder prophets are calling it a second industrial revolution—and this seems a good time to take stock of what's going on.

A definition is usually a logical place to begin. What are the boundaries of CAD/CAM? According to Dr. Timothy O. Cahoon, vice president of the CAD/CAM industry service for Dataquest, the Cupertino, Calif., research house, they're not that easy to draw. "It extends to the entire process

of conceptualizing, designing, and manufacturing a product—any phase the computer is involved," he says. "It can be said to go right down the line from who to design and simulation, redesign, material handling and maintenance, process control, quality control, and inventory."

No one is close to producing compatible systems that can handle all those chores, the factory of tomorrow is still someplace in the middle of next week. As James W. Barstow, vice president of manufacturing development for Heide & Co., told the 1982 Autumn Conference in November, "CAD/CAM is not yet an integrated, efficient structure. Rather, it is a diverse set of systems, each of which can be applied to specific aspects of design and manufacturing activities." He went on to note that the chief long-term benefit of using the technology comes from an integrated (or at least coordinated) structure, and that the user is currently bearing the burden of developing a structure into which individ-

ualy selected systems will fit.

Yet an unwillingness to surrender that smaller half to account for the widespread attitude of many manufacturing industry associations that CAD/CAM and CAM systems are addressing the problem user "without the computer" is a widespread reality. In an approach to what they call computer-aided manufacturing or integrated, computer-aided manufacturing. A great many managers will be relieved when these organizations can report substantial progress. In the meantime, though, competition pressure is causing companies to move when they hope is the right direction, installing the components of the factory of the future one at a time. Dataquest's Cahoon says that because of a lack of software for manufacturing applications, it is in design that computers are most widely employed. "There are thousands of discrete manufacturing applications," he says, "which have to be handled almost on a case-by-case basis. In de-

PHOTOGRAPH BY JAMES HELEN, STAFF PHOTOGRAPHER

sign, a line is a line, whether it's for an integrated circuit or a cable on a bridge."

The New York market research firm MSRA Inc., in a report published last December, figures CAD/CAM industry revenues were \$800 million in 1981. That represents a rise of 44% over 1980, when revenues grew at a 63% clip. Most of the money is going for turnkey systems. The industry leader is Computervision, with a 34% market share. IBM is next with 16%, followed by Intergraph (which concentrates on mapping) with 12%. Applicon (which in early January was planning to merge with Schlumberger) with 11% and Calma (recently acquired by GE) also with 11%. Also present in the market are Autotrol, Gerber, and various hardware, software, and service bureau companies. MSRA divides the market into four segments: mechanical applications (including the heavy machinery, auto, and aerospace industries); electronics; architecture, engineering,

and construction; and mapping.

Putting CAD/CAM to work is no easy matter, says Dataquest's Gauhan. It's typically the job of a manufacturing professional who, though he may lack computer skills, is nevertheless unwilling to surrender control to a computer professional. The turnkey approach offers some of the answers, but complete solutions don't come ready-made. "The people who have had the greatest success," Gauhan observes, "are the ones with a thorough understanding of both the manufacturing process and the tools they are using to transform it."

That's a tall order, one that won't be filled by a quick perusal of this or any magazine. But the articles that follow should give the reader some idea of the scope of computer integrated manufacturing, of the equations that must be solved before it can become a reality, and of the social and philosophical questions we will have to answer as we move toward it.

—Kenneth Klee

An association of leading CAD/CAM practitioners is forging tools for the factory of the future.

CAD-CAM 

PUSHING THE STATE OF THE ART

by Jan Johnson

A unique organization based in Arlington, Texas, is quietly and quite deliberately forging the future of CAD/CAM. Called Computer Aided Manufacturing-International, Inc., CAM-I is a not-for-profit association run by a membership that reads like a worldwide *Who's Who* of computer software and hardware makers, as well as aircraft, auto, and heavy equipment manufacturers.

Among its 144 members (51 of which are educational institutions) are Applicon, Boeing, Cincinnati Milacron, Computervision, Emhart, Fujitsu, General Dynamics, Hitachi, Lockheed, McDonnell Douglas, Messerschmitt, Nippon Electric, Oki Electric, Siemens, United Technologies, Volkswagenwerk, and Westinghouse. Many are leaders in the application of CAD/CAM, and they can't afford to lose that edge. By banding together under the CAM-I umbrella they are able to pool their ideas, their experience, and their money and are blazing many of the new trails in CAD/CAM research and development. CAM-I's goal: the pushbutton factory, a factory that is computer designed, computer simulated, and computer operated.

"We are pushing the state of the art. Yes, I think CAM-I really is pushing technology. What we are doing really makes a difference," said Joe Tulkoff, director of manufacturing technology at Lockheed-Georgia in Marietta.

"The difference between CAM-I and other graphics conferences," said Peter Downey at the recent CAM-I conference in Fort Worth, "is that you don't just discuss where CAD/CAM is going." Downey, who is manager of manufacturing systems engineering-scientific for McDonnell Aircraft, St. Louis, added, "Through participation in project groups within CAM-I you help establish the direction of the technology."

At present, CAM-I members are sponsoring six projects. Each member company can elect which project or projects to put its money into, or it can elect not to support any project and just maintain a general membership. (Membership is open to any company that can afford a \$7,000 annual fee. CAM-I

members are wrestling with the problem of how to restructure the general fee to attract more medium- to smaller-sized companies.)

Of the six ongoing projects, the one on geometric modeling has attracted the most support—46 sponsors, each paying an annual \$7,000 project fee on top of their general membership fee. Although much work has been done in geometric modeling, CAM-I members felt an acceptable means of describing and processing three-dimensional objects had yet to be found. The group set out to define standard terminology for discussing solid objects and a standard method for describing them.

Since the project began in 1978, the group has produced design specifications for an interface for the geometric modeler and for a boundary representation and file management system. Recently, the group contracted with Shape Data Ltd. to design a geometric modeler with an applications interface. The team has also contracted with Cornell University to implement a Japanese-developed solid modeler, called TIPS, and to translate the TIPS documentation into English. All documents are available through CAM-I's "public library" in Arlington.

So far, \$500,000 has been spent since the project's inception in '78. By 1985, the group estimates it will have spent \$1.55 million to attain its goal. That goal is to provide draft specifications for a generalized geometric modeling system and to ensure that the system will be compatible with the data needed to run an advanced numerical controller.

"The projects give us the opportunity to get involved in the development of a system we couldn't do by ourselves," agreed Max Armour, group engineer, computer aided design and manufacturing for Bell Helicopter Textron, Ft. Worth. "This way we get to put our two cents worth in on what we would like the system to do by donating personnel who help write the design specifications. Of course these people bring some of that technical perspective back to the company immediately."

"Some companies call in consultants when they are planning to buy CAD/CAM technology and pay them \$20,000 for a report that

sits on a shelf. Why not nurture that kind of talent inside," posed Lockheed's Tulkoff. "With CAM-I you rub shoulders with the best in the industry and you become like a consultant. For \$7,000 to \$14,000 a year you can begin to acquire the kind of knowledge that might save your company from making a \$200,000 mistake." Through his association with CAM-I, Tulkoff implemented a computerized process planning system at his plant.

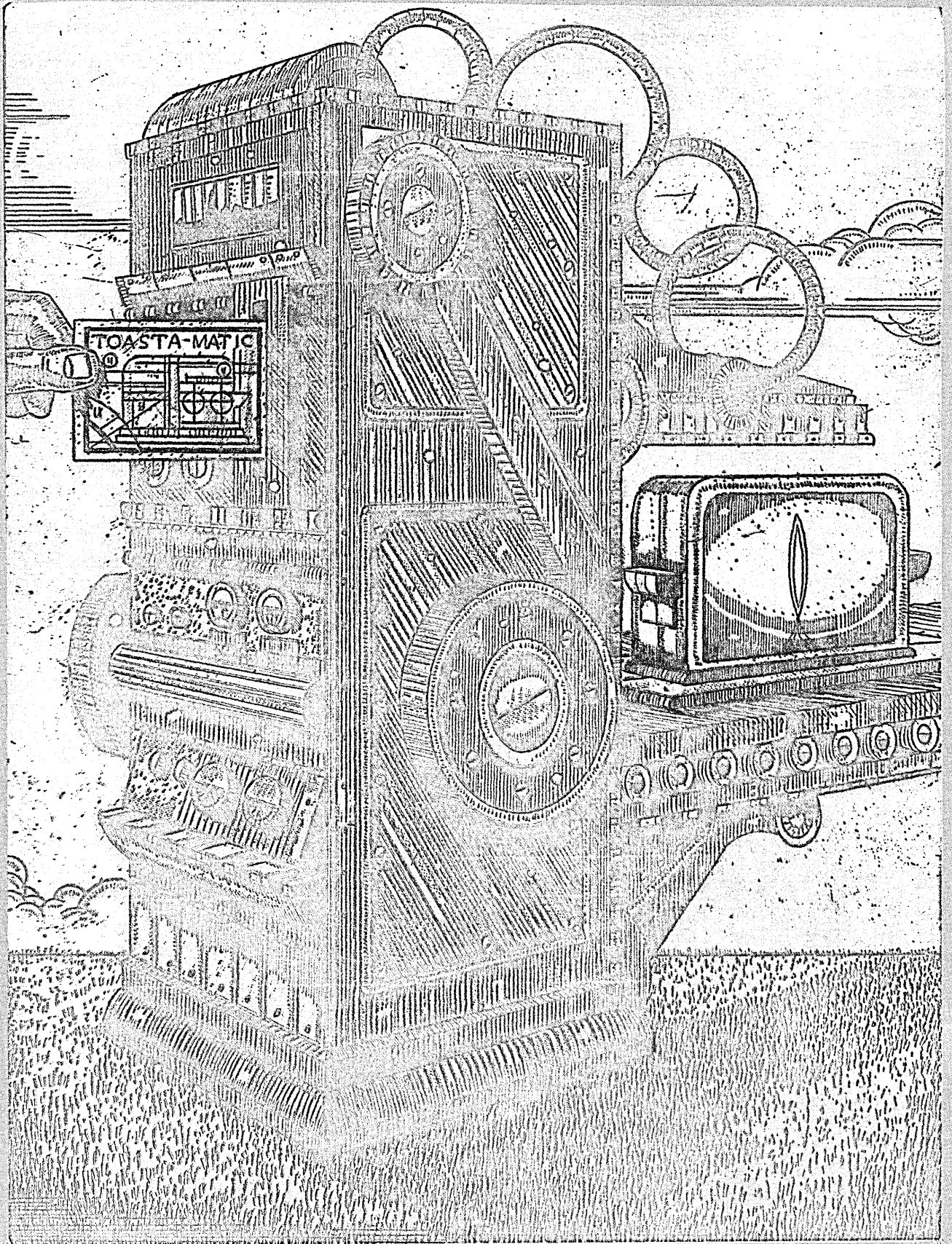
The basic technology for that system came out of the work of the processing planning project group, the second most popular project group with 36 sponsors. Driven by the need to reduce manufacturing costs while increasing the variety of precision products produced, CAM-I members in 1974 struck out on a venture to computerize the task of making routing cards. Routing cards, sometimes called process plans, describe what machines and tools are to be used as the product is cut, drilled, milled, polished, and coated. In 1976, the group released version 1.1 of a software system called CAPP, for CAM-I Automated Process Planning. Sitting before a screen, a manager characterizes the part to be made according to a standard classification table. Then a code is typed in and a standard routing plan appears on the screen which the manager can change to suit the specifics of the particular part.

SYSTEM GROWS RICHER

An important feature of this system is that it grows richer with time, Tulkoff pointed out. The more process plans that are created using the system, the richer the whole system becomes. The basic concepts developed in CAPP have been incorporated into several process planning systems offered by outside vendors such as Manufacturing Data Systems and Computervision. Or a magnetic tape of the software system can be ordered direct from CAM-I for \$500.

With CAPP on its 3.1A release as of this year, the project group is off and running on a more advanced approach to shop floor management. Called the "generative" approach, this system will be designed to take data from a common manufacturing database and create a process plan without human in-

ILLUSTRATION BY CHRIS SPOLLEN



CAM-I's goal is the pushbutton factory, a factory that is computer designed, computer simulated, and computer operated.

CAD-CAM

intervention. Among the problems to be solved by the group is identifying and capturing the logic of process planning and creating a database where the part is clearly and precisely defined. A standard 3-D modeler would be one method for producing such data, Tulkoff said. Next year, the group plans to prepare requests for quote, select a contractor, and initiate software development for the advanced process planning system, called XPS-1. In addition, it plans to develop the logic for making processing decisions based on such things as raw materials, basic shapes, form features, and functional feature information.

SYSTEM TO RUN MACHINES

Another piece in the integrated factory of the future is a system for running the machines and tools. The advanced numerical control project group, boasting 28 sponsors, is tackling that problem. Its goal: to create a numerical control processor that will use bounded geometry for representing solid shapes so that the machine will ultimately recognize the solid part model including tolerances; automate tool selection, feeds, and speeds and move the product through the proper sequences for machining; identify material to be removed; avoid clamps and fixtures; and predetermine the optimum path the tool should follow.

The contract to write a detailed design for the advanced N/C system was placed with

McDonnell Douglas Automation Co., and work was begun in October 1980. An evaluation of the detailed design is scheduled for second quarter 1982, and work on a prototype system is to begin fourth quarter 1982. When this project is completed, CAM-I will have crossed a major barrier in its pursuit of the integrated factory. Existing N/C systems are based on the philosophy that the direction and position of the tool is the "known" and the problem is to "define" the part with programmed tool motion commands. With bounded geometry the problem is reversed. The description of the part is known and the problem is finding the tool path.

In the meantime, until new systems are developed and new interfaces are written to allow information to be passed among different CAD/CAM systems, there is no satisfactory, standard way for transferring data among systems. The promising method for the short term is IGES, for Initial Graphics Exchange Specifications, now a draft ANSI standard. As John Lewis with General Electric's corporate research and development center explained it: "Regardless of the application, IGES provides a stable, well-defined format which all CAD/CAM systems can employ for database interchange. However, if IGES processors are not carefully specified and verified, all or part of a product definition may be lost or modified during the interchange." To prevent that, General Electric, a

CAM-I member, developed a number of possible design specifications and verification procedures.

"Much of the world is watching CAM-I development," said Bell Helicopter CAD/CAM engineer Max Armour. "Some vendors are waiting to see what comes out of CAM-I projects before making major changes to their systems." One such example is Manufacturing Data Systems Inc.'s Design program. Design is an advanced computer-aided engineering system applied to a range of designing jobs from small assemblies to large complex mechanical systems such as a machining center or a motor vehicle.

"During the development of Design, MDSI was a member of CAM-I and an early sponsor of the geometric modeling project," said R. H. Johnson, director of the design program for MDSI, a division of Schlumberger Technology Corp. "The directions of the research in that project and the needs of companies in that group had an influence on the goals of MDSI's Design project."

CAM-I has also influenced the development of CAD/CAM systems within companies. "A lot of where we are going has come out of CAM-I," said McDonnell Aircraft's Downey. A "robocarrier" material delivery system is just one of several projects under investigation at McDonnell Aircraft. The robocarrier system, driven by a DEC PDP-11, uses wire-in-the-floor technology to guide electrically powered, computer controlled carts, and is made by Eaton-Kenway. It carries parts and tools from one workstation to another. As part of that project, McDonnell has developed a graphics-based layout and animation system for displaying cart movement.

"The initial simulation pointed out needed changes in the number of pickup and delivery stations in key areas," said Downey. The next step is to analyze for "excess wait" points. McDonnell is also using animation to simulate the performance of robots. Using a robot animation package in conjunction with a recently developed manufacturing control language, McDonnell simulates almost any application of robots in a workstation. "This provides an extremely powerful tool for evaluating robot applications—all without investing in a robot or other sophisticated hardware," said Downey.

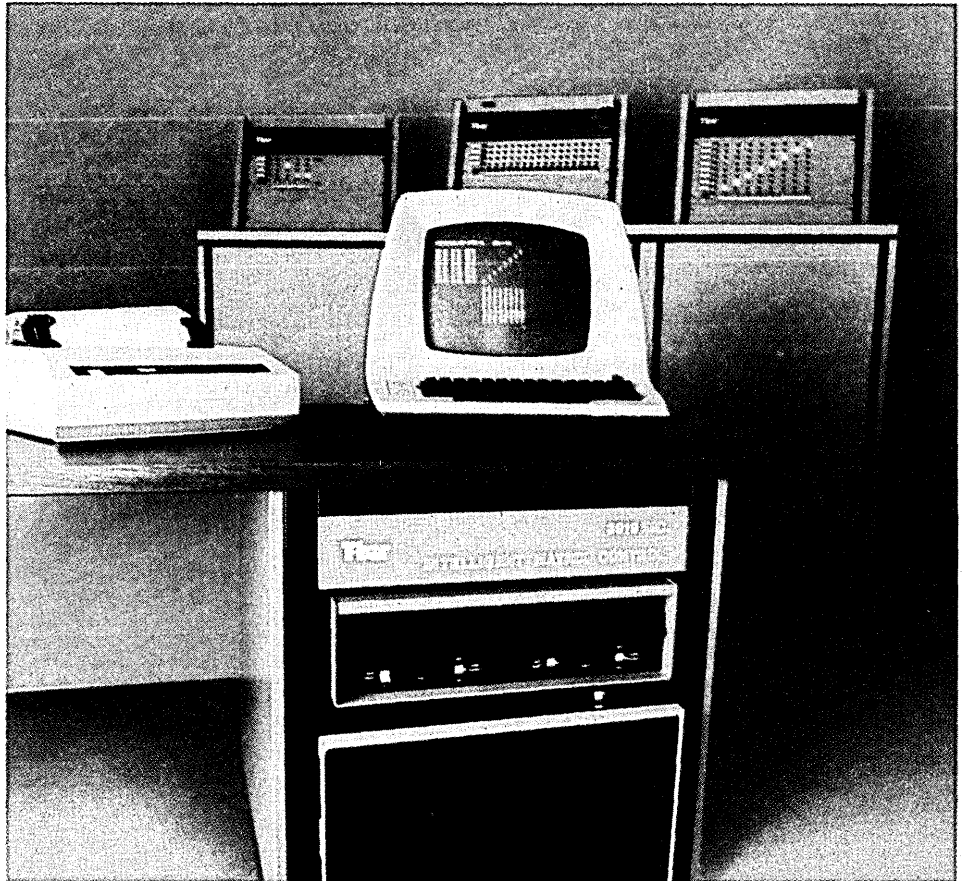
The long-term results from today's research efforts, he predicts, "may provide an ultimate in technology integration—a crt-based factory status display system which can view factory operations at multiple levels of detail and easily provide for alternative analysis of loading and routing conditions. A dream? Perhaps, but what factory manager has not dreamed of such an information system for the factory of the future?" *



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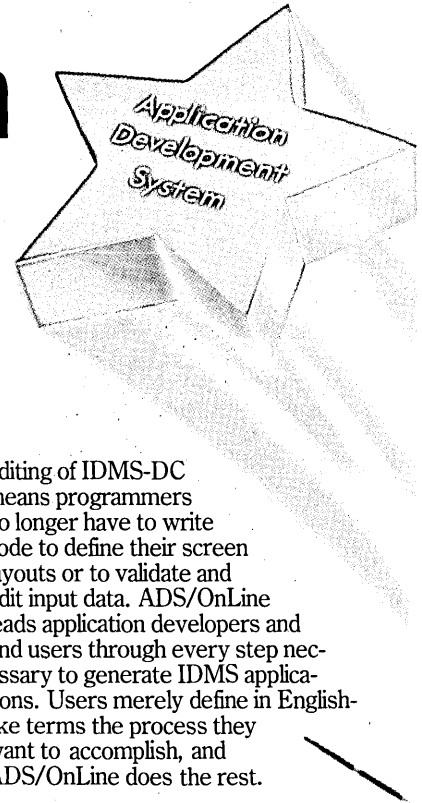
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CIRCLE 110 ON READER CARD

Computer aided design and drafting can open the door to better productivity and higher quality.

CAD-CAM 

CHOOSING A TURNKEY CADD SYSTEM

by Eric Teicholz

Turnkey CADD (computer aided design and drafting) systems are standalone, complete, and integrated hardware and software tools for automating design, drafting, engineering applications, and manufacturing tasks. Support, service, hardware, and software are all offered by a single vendor. CADD systems consist of several functional components, including:

- a central processing unit (micro, mini, or maxi) for data manipulation, systems control, etc.;
- an interactive graphic workstation usually accompanied by a keyboard and digitizing tablet for menuing operations and for interacting with the graphic and textural data;
- random access and/or serial storage devices associated with a cpu and other types of workstations;
- a manual or automatic digitalizer for encoding graphical (coordinate) data;
- a variety of hardcopy output devices associated with either the graphic workstation or with the cpu for producing final drawings;
- systems and applications software to serve a number of application areas.

Prices for CADD systems normally range from \$40,000 (for micro-based systems) to over \$1 million. Surprisingly, the average price of a mini-based CADD system (which currently dominates the market) is approximately \$350,000 and has remained constant over the last five or six years, despite decreasing hardware costs. This decreasing hardware cost, on the other hand, is balanced by increasing people costs for software development and a relatively stable price structure for graphic input and output devices. Within the same time frame, however, mini-based turnkey CADD systems are offering increasing amounts of application software, including traditional applications such as engineering software primarily for aerospace, automotive, electrical (semiconductor and inte-

grated circuit), petrochemical, and utility industries, as well as newer design disciplines such as building and construction.

If a firm were to engage a CADD consultant, it would find that the consultant would typically recommend undertaking a number of preliminary tasks performed in an organized sequence. First, it would be necessary, for example, to develop a list of desired functional capabilities for the CADD system, procure computer hardware, and install, maintain, and operate that hardware over time. Additionally, the firm would need to:

- develop a preliminary study design;
- visit a CADD site at another installation;
- prepare a summary report of findings;
- prioritize functional capabilities and finalize a plan; and
- develop a preliminary request for proposal (RFP).

The first of our tasks has a number of objectives. Primary among them is the selection of a CADD evaluation group, which will consist of management and technical staff and have responsibility for system selection. Other objectives include the determination and evaluation of management objectives and the development of a list of desired system features. The type of systems analysis performed by a consultant or done in-house would include the determination of a number of micro and macro issues. Examples of macro issues might be:

- total scope of the problem
- functional areas of company
- current decision-making procedures regarding technology
- expectations regarding automation
- goals and objectives regarding CADD (i.e., increase production or save money)
- kind of payback desired
- organization of company
- growth objectives
- in-house expertise (skill groups)

Examples of micro issues related to CADD might include:

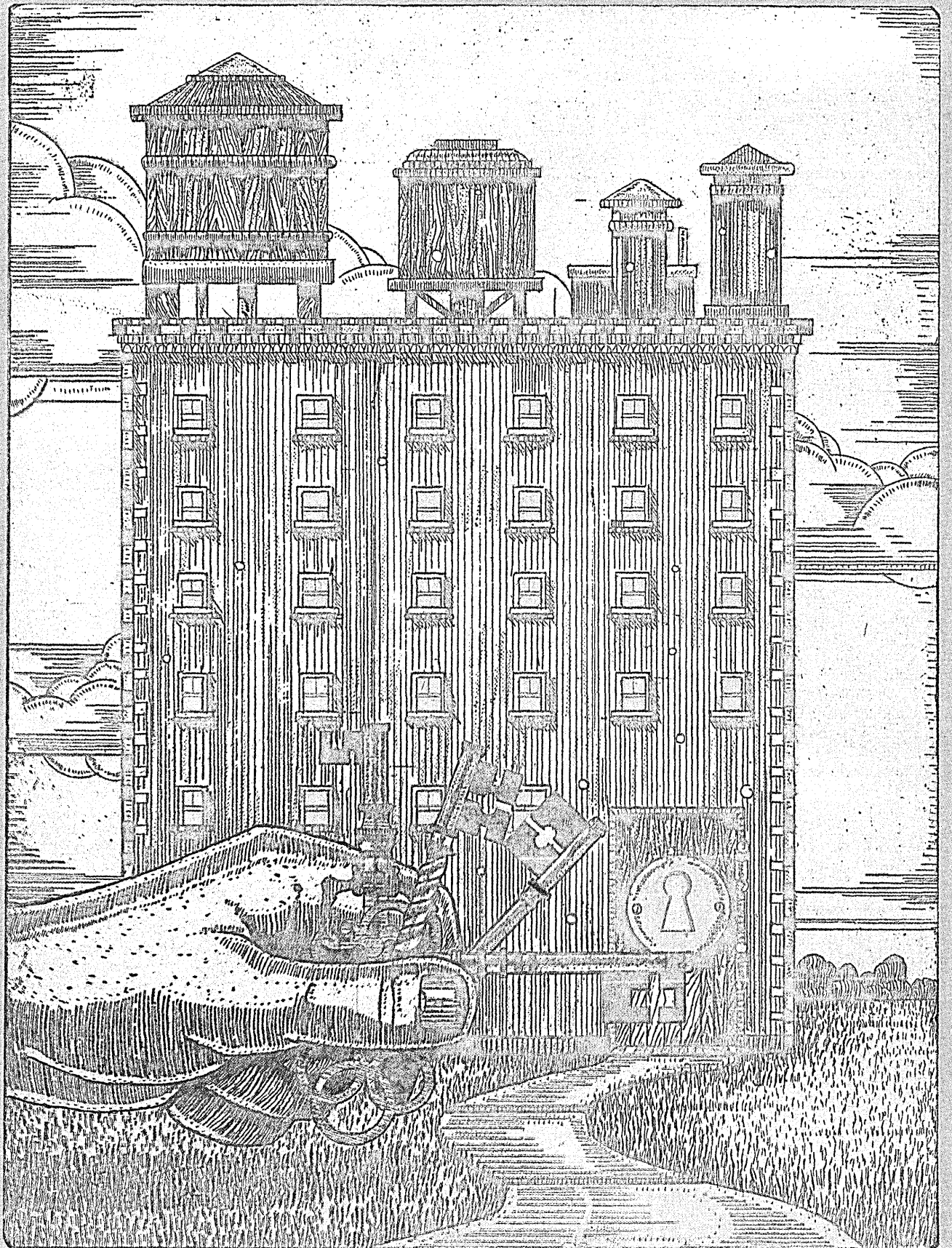
- differentiation of draftspersons or other skilled task groups
- coordination of work tasks
- determination of output formats
- determination of nature of work
- establishment of work flows
- dispensation of database
- determination of number, kind, magnitude, importance, and frequency of revisions and updates
- determination of frequency, types, and priorities of work tasks
- establishment of potential interface areas
- establishment of potential adaptation of existing facilities

WHY A SITE VISIT?

The purposes of the site visit are first to educate the potential procurer regarding similar case studies and relevant applications of CADD systems and second to gather all the information needs defined above. Once the information is gathered, it is possible to explore tradeoffs of mini, micro, or maxi-based systems, to look at alternative hardware configurations, technologies for crt displays, soft and hardcopy workstations, and CADD organizations, and to pose questions.

The outcome of the site visit will be, in part, the determination of a features list which will be incorporated into the summary report of findings. The site visit should normally take from three to 10 days depending on the CADD sophistication of the user and on the number of orientation or educational meetings necessary.

If at all possible, the summary report should be written in outline or draft form while the consultant is still at the offices to expedite communication and to obtain additional needed input about the user's company. It is also worthwhile to present to key management personnel and the CADD evaluation group a summary of findings of the site visit.



One purpose of the site visit is to educate the potential procurer and to gather all information needs.

CAD-CAM

Another important objective of the site visit is to evaluate senior management objectives in terms of CADD. These types of discussions focus on corporate structure and integration of CADD systems in the firm and, if relevant, in its associated offices. It is important to get management ideas regarding applications, projected work flow, key financial issues, capital equipment planning, personnel selection and training, and installation procedures, and management objectives related to CADD implementation.

The summary report is a written document consisting of results and implications of the site visit. It represents an initial benchmark whereby the consultant or the evaluation group specifies the implications of objectives in terms of management and technical needs and makes a preliminary analysis as to how these needs could be met. It represents a common basis of understanding about how to proceed with the development of functional capabilities for the CADD system and how to reflect these capabilities in the development of the preliminary request for proposal. This report should also contain alternative hardware and workstation configurations as well as an applications feature list.

Once the summary report is accepted, it is possible to develop an action plan for development of an RFP. Responses from senior management, the heads of the various functional departments, and the evaluation team will determine priorities based on need and desired potential productivity increases for various CADD application areas. The consultant and evaluation team has by this time converted the application task list into a prioritized features list to be incorporated into the turnkey CADD system.

Most significantly, the features list will provide criteria against which candidate systems can be tested and benchmarked. In addition, it will help determine a short list of vendors to which the RFP will be sent. It is even possible to do some preliminary analysis in preparing vendor lists by preparing vendor capabilities and the features list. You will often find, for example, that vendors offer capabilities well in excess of those on your own features list. Some of these might not be needed, but others, in turn, might be added to your own list.

Finally, the prioritization of the features list means that you will certainly not exclude any features that are deemed critical to your desired CADD applications.

At this point, it is also desirable to perform a preliminary cost/benefit analysis using management cost structures and both internal and industry standard costing routines, projected productivity increase ratios, and projected utilization schemes for the various applications.

HOW TO DEVELOP THE RFP

A request for proposal can run from five to 500 pages, depending upon the depth in which the total information needs for the user have been defined. At the very least, however, and in light of the features list, vendors should have enough data to address the following issues:

- general systems capabilities and how they respond to users' needs
- detailed hardware recommendations and operating systems software
- application software recommendations
- support and maintenance
- education, training, and documentation
- benchmarking
- acceptance/inspection testing
- installation/environmental requirements
- shipment and delivery
- warranty
- terms and conditions
- names of relevant users
- policy regarding future enhancements
- contractual arrangements

In order for the vendor to respond appropriately, the RFP must be as clear, concise, and specific as possible. Secondly, the RFP should not make unnecessary demands on vendors, or they simply will not respond.

If detailed information needs are not specified within the RFP, it is possible to request the vendor to specify how he performs certain functional tasks. For instance, either you can request the vendor to describe basically how he provides the capability of defining the location of the point, or you can specify, for example, that a point must be defined by methods such as digitizing, explicit coordinates, end of an entity, origin of an entity, intersection of two entities, delta displacement, on a grid point, on a surface, projected along a vector and dropped onto a surface, normal to a surface, etc. That is, the RFP can contain as much or as little detail as necessary. Finally, the RFP should contain examples of typical drawings.

Examples of major sections of a typical CADD RFP would include the following:

1. *Introduction:* This section contains general background information, objectives of the CADD system, structure of the user organization, motivation for CADD, projected growth of the CADD system, user experience, selection procedures and criteria, minimum requirements, and projected workload.

2. *User Groups:* This section of the RFP should define which departments will be using the CADD system and describe the work tasks. Information on location (to determine communications needs), workloads, organizational structure, etc. should be presented.

3. *Hardware:* This section of the RFP covers performance specifications for the various hardware devices. Hardware to be

specified includes the processor, disk and/or magnetic tape drives, graphic crt workstations, alphanumeric display, pen and tablet or other types of digitizers, hardcopy devices, line printers, etc. Operating system software should also be specified in terms of desired system security, file management, text editors, and response time under various workloads.

4. *Applications Software:* This section contains specifications for application areas of interest. For example, mechanical design and drafting would contain data relevant to geometric primitives and nonprimitives, dimensioning, properties, associativity, data input mode, display aids, multiple views, grids, labeling, symbols, text, surface data, measurement, finite element modeling, bill of materials, and graphics construction language.

For a generation of printed circuit/electrical schematics, the RFP might contain data on database representation, analytic features, and postprocessing capabilities. For numerical control data on tool path creation capabilities, associativity and other desired features would be listed.

For mapping data related to input, line fonts, analytic capabilities, editing, output capabilities, database specifications, etc. would be specified. For piping, information on the operation, database structure and dimensioning would be included.

For wiring diagram application, data on diagram creation and editing, parts library, diagram construction and editing, and report generation and verification should be specified.

LEAVE ONUS ON VENDOR

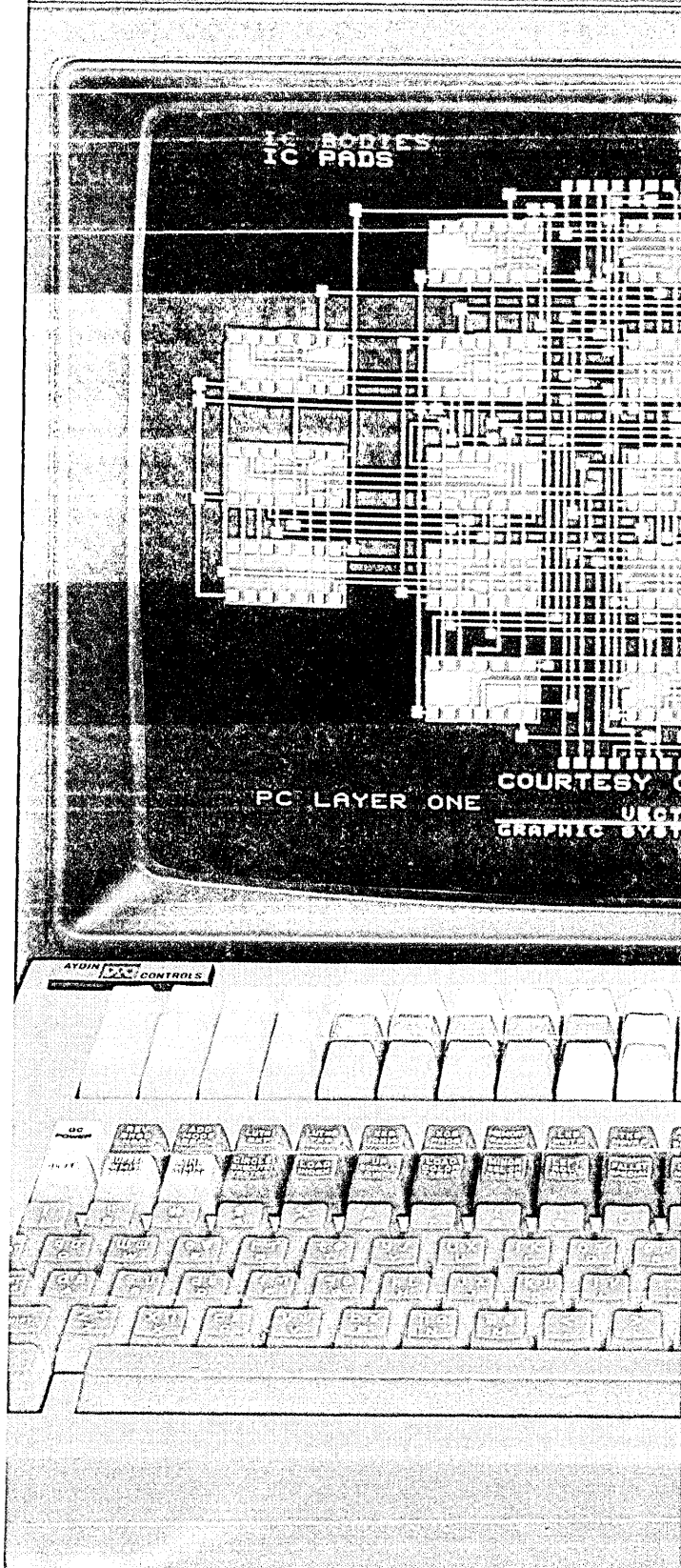
In summary, the RFP can either contain detailed information needs of the company that determine precisely how the features are to be performed or it can simply leave the onus on the vendor about how the features are to be performed. The former approach requires an extremely sophisticated user group and a great deal of time and money to generate the appropriate RFP. It also mandates the use of benchmarks to be used for systems comparison. On the other hand, most RFPs can be written without detailed information needs, letting vendors respond by stating how features are accomplished within their particular system.

Finally, depending upon the size, number of workstations, response time, etc., vendor-supplied capabilities such as education, training, and documentation can become as important as the actual hardware and software. Visits to relevant vendor sites and talks with other users are obviously critical as well.

There are a number of interesting

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CIRCLE 111 ON READER CARD

Foremost among the trends in the CADD area is the entry of micro-based systems into the turnkey marketplace.

CAD-CAM

trends taking place in the CADD area. Perhaps foremost among them is the entry of micro-based systems into the turnkey marketplace. At present, there are over 30 suppliers of micro-based systems costing under \$100,000 that support most of the functions contained in mini- and maxi-based systems. Within the next six months, announcements will be made from micro-based suppliers offering three-dimensional geometric modeling capabilities and color raster scan workstations. Most of the micro systems currently support one or two users and have very limited applications software. This will obviously change in the near future.

Another emerging development in CADD is the current effort to network mini-computers to be more competitive with large mainframe systems. Small standalone systems are beginning to be linked together to

create standalone networks that can be connected, via telecommunications, to large mainframe computers in order to access databases and other application software.

A third trend in CADD is for the more traditional hardware companies to develop joint marketing and support relationships with CADD software systems. IBM's relationship with and support of Lockheed's CADAM (Computer Graphics Augmented Design and Manufacturing) software and Dassault Systems' CATIA (Computer Graphics-Aided Three-dimensional Interactive Application) packages are examples of this trend. Also supporting this are GE's purchase of 48% of Structural Dynamics Research Corp., a major vendor of CADD software, and Prime's support of MEDUSA.

Other trends include a more integrated CAD/CAM relationship (using a common

database), the emergence of third-party software vendors, and the increased leasing of hardware and software. Computervision, for example, leases almost half of its products through third-party vendors.

A few hardware developments taking place include touch and speech input, the rasterization of both input and output devices, the proliferation of 32-bit word processors, and the increasing use of color for all aspects for CADD systems. In terms of software, you will see increased specificity related to applications and turnkey systems being developed for very specialized applications. You will also see the integration of CADD with other types of software such as word processing, management graphics, project control, and the like.

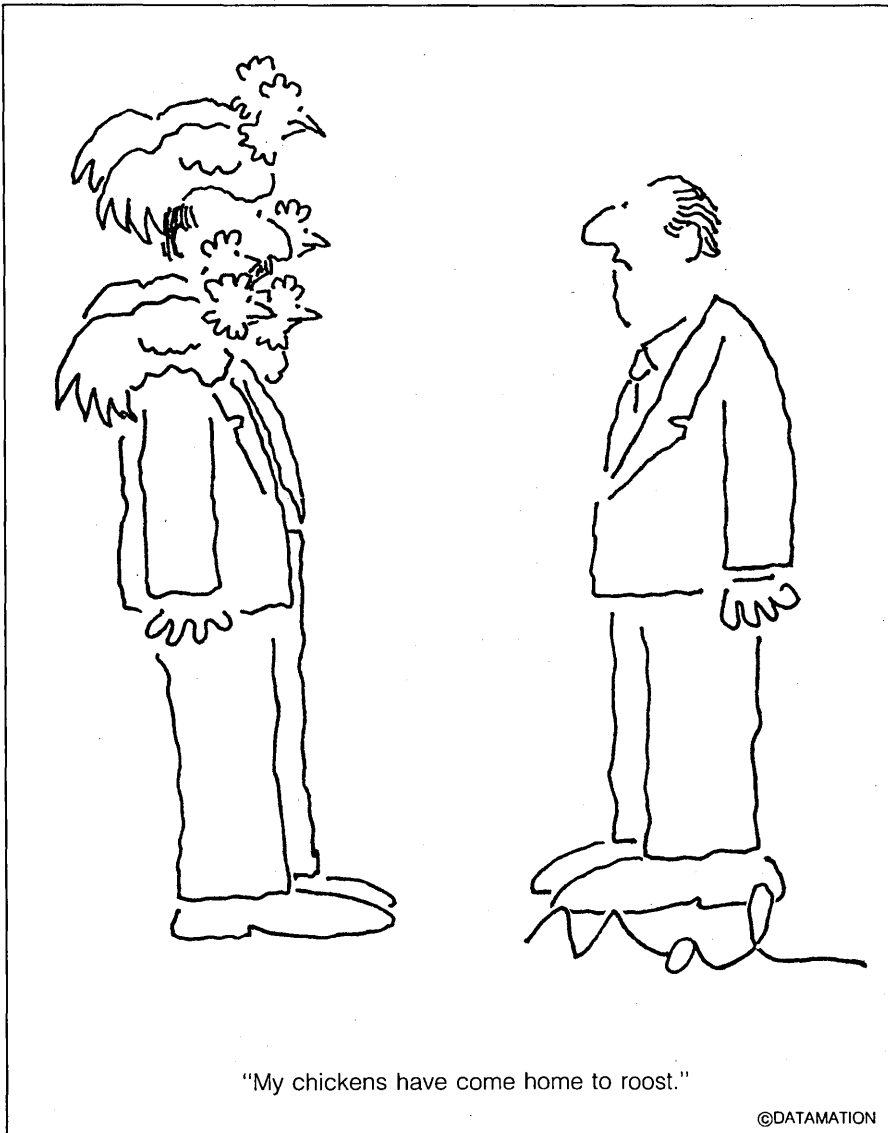
By offering applications software, software support, customer training, systems installation, etc., turnkey systems will offer a viable approach to CADD for many years to come. It is very important to spend a great deal of effort planning for the technical and management changes that result from the implementation of CADD systems. Of the 13 or so years that turnkey systems have been present, there have been documented benefits such as productivity enhancement, time savings in drafting, improved product lead times, improved drawing quality, and significant time savings for engineering analysis.

All of these give the user a potential competitive advantage over firms employing traditional manual drafting methods and should make CADD a serious area of investigation for most firms that are involved in engineering and drafting operations.

Market analysts are extraordinarily optimistic about the growth of CADD. In a recent industry CADD review prepared by L.F. Rothschild, Unterberg, Tobin (New York), it was estimated that sales for turnkey CAD/CAM systems were \$325 million in 1979. The review further projected close to a \$1.9 billion in sales for the turnkey market in 1984, reflecting a compound growth rate of 42%. It is hoped that this paper will provide future users of these systems successful planning and utilization of CADD systems. *

Eric Teicholz is president of Graphic Systems, Inc., a Cambridge, Mass., firm specializing in CAD/CAM consulting and micro-based graphics systems. Mr. Teicholz also teaches at Harvard University, and until last July was associate director of Harvard's laboratory for computer graphics. He is currently conference chairman for "Computer Graphics in the Building Process," sponsored by the National Academy of Science, to be held in Washington, D.C. March 22-26.

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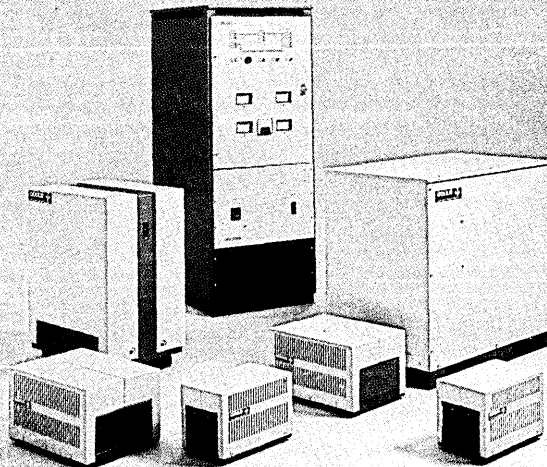
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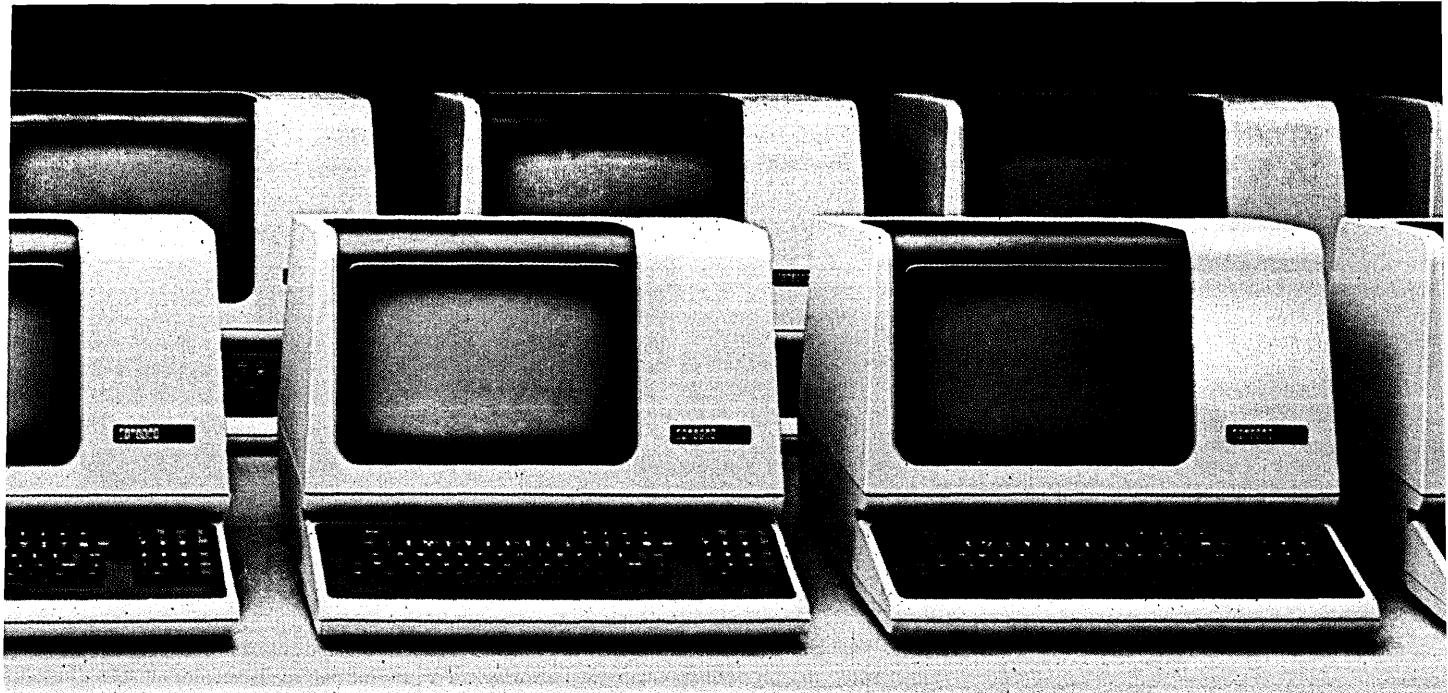
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Manufacturers who have not yet faced up to the problem of integrating their automated systems are in for a nasty surprise.

CAD-CAM 

MEASURE TWICE; CUT ONCE

by Daniel S. Appleton

Because of the need to achieve near-term results, most businesses are compelled to automate by implementing many small application systems. They really don't have the luxury of designing and implementing one grand, total system. The most serious problem faced by manufacturers today is the fact that after implementing those systems, one at a time, the systems do not fit together into an integrated whole. They end up being parts of a Rube Goldberg construct, a hodgepodge of computer files, programs, reports, screens, transactors, processors, and terminals, with no overall purpose or concept.

In a recent study our company completed as part of a USAF Integrated Computer Aided Manufacturing (ICAM) program coalition, this issue of nonintegrated systems surfaced as one of the five most critical problems facing manufacturing companies as they attempt to use information resource management techniques to improve overall productivity. The big five were:

- Poor system integration
- Poor data quality
- Poor data accessibility
- Little user control
- System inflexibility

These problems are characteristic of almost every manufacturing concern that has implemented a significant number of computer application systems using the classical bottom-up approach. There are over 50 functional areas that manufacturers can profitably automate. Most have already implemented 10 to 20 systems. Poor coordination has slowed them down significantly, and the results of after-the-fact integration are perhaps the most serious impediments to effective automation.

The consensus in the manufacturing community appears to be that a database approach will facilitate solution of overall problems. ICAM, along with Computer Aided Manufacturing International (CAM-I) and the Computer and Automated Systems Association (CASA) of the Society of Manufacturing Engineers have all turned to such a concept. The CASA/SME scheme (see Fig. 1) is typical.

The hope is that such a data driven approach can solve the big five problems and slowly but surely drain the quagmire of standalone applications. Nice concept, but the details are still missing.

Two of the three organizations have finally begun to attack the problem of getting out of the swamp. Both CASA and ICAM are advocating that manufacturers: 1) start with an overall framework or functional architecture as a strawman, 2) define the requirements for common versus private data, and 3) automate various applications using the architecture and the data as top-down controls over the total plan. ICAM has constructed a generic framework (called the ICAM Architecture of Manufacturing) for manufacturers to use in developing their plans, and CASA recommends the use of its scheme as a mechanism for scoping the completeness of an overall plan for computer integrated manufacturing (CIM).

This article will explore the new concept of data driven manufacturing automation. We will examine first its value as a planning concept, then some of its implications for implementation methods and procedures. Finally, we will demonstrate some specifics of how data driven manufacturing automation can work.

The data driven approach to manufacturing automation evolved from work done by the American National Standards Institute (ANSI). In 1970, the Committee on Computer and Information Processing (called the X3 Committee) set up a special study group called the Standards Planning and Requirements Committee (SPARC) to evaluate various approaches to automation. The ANSI/X3/SPARC produced a landmark paper in 1971 that defined the optimal architecture for automation planning and implementation. This architecture centers on database technology; that is why we call it data driven.

The ANSI/SPARC architecture is elegant because it is simple. It drives the automation problem into three structural parts. The first part, called the external structure, describes what the user sees. Next is the internal structure—what the computer sees. According to the report, all conventional ar-

chitectures have only these two structures. As a result, the external structure must be directly implemented in internal structure. When one changes, the other must also change. SPARC's problem—which was the same problem pointed out by the ICAM study—was that user structures are dynamic and computer structures are not. Tying one to the other serves only to restrain users from changing their needs. This is not only unreasonable but extremely expensive, since user needs constantly change and computer structures must support those changes, not inhibit them.

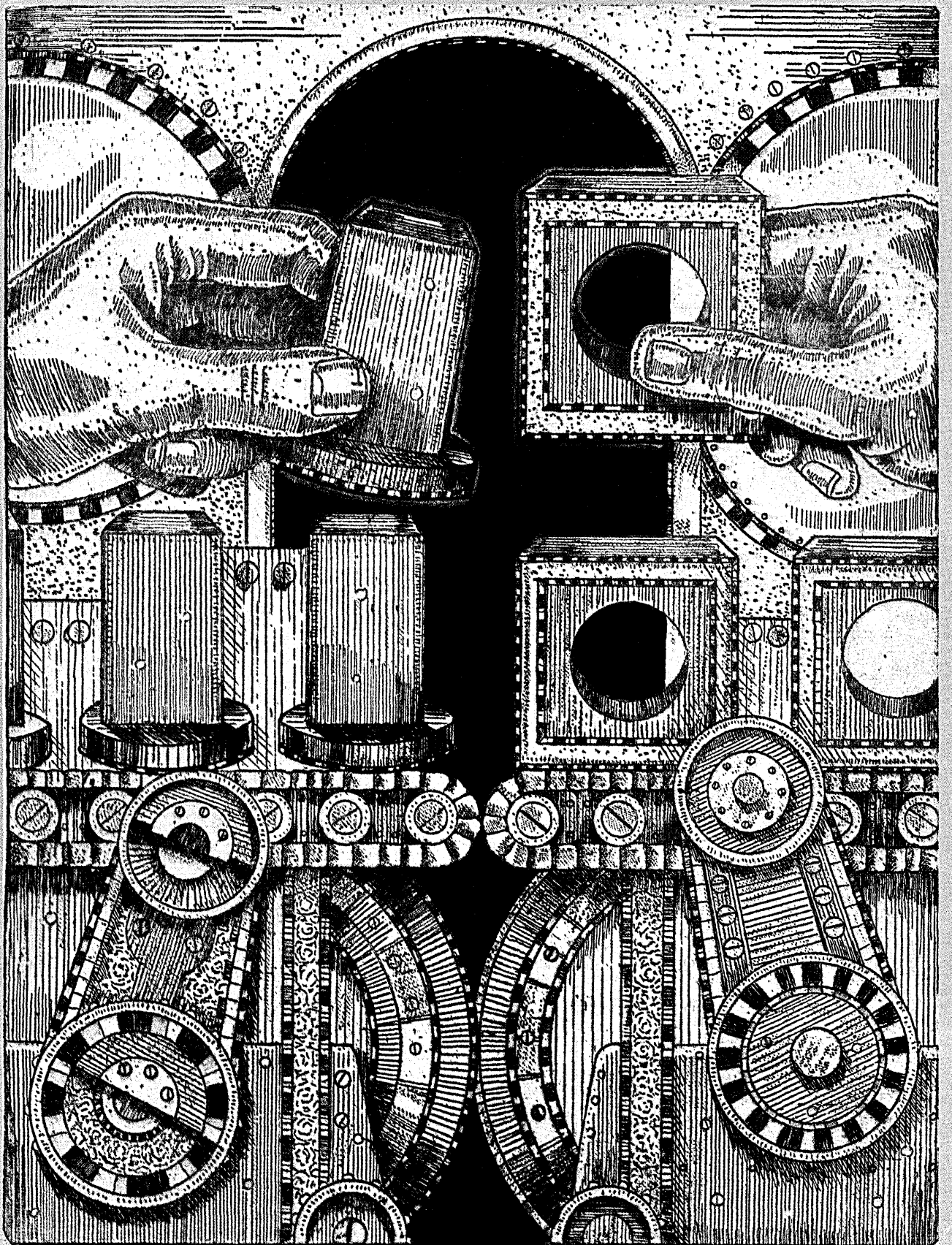
To solve this problem, SPARC introduced the notion of a third structure. This structure acts as the shock absorber between the internal and external structures, facilitating changes in either and shielding each from modifications in the other. Its responsibility is to translate back and forth between the other two structures. Because it functions to keep logical consistency between the two other structures while maintaining physical independence, the third structure is called the conceptual structure. Its focus is on data.

DATA DRIVEN APPROACH

The data driven approach to manufacturing automation is centered on planning and implementing a conceptual information structure for the manufacturing enterprise or business unit. As the ICAM, CAM-I, and CASA logos imply, this structure represents the locus of all computer integrated manufacturing systems. It defines the data standards that the enterprise intends to implement on various computers (internal structures) to support various, dynamic user needs (external structures).

Data driven techniques define and apply independent data standards. These standards are precise statements about the company's most important information, i.e., the information commonly employed by many different workers and managers. They define the entities (such as customer, part, employee, cost account, etc.) of most concern to the business, the attributes of those entities (such as employee height, weight, age, etc.), the relationships among entities and attributes, any constraints on these relationships, enti-

ILLUSTRATION BY CHRIS SPOLLEN



Data driven planning says that no two independently developed systems can be integrated unless they have parts in common.

CAD-CAM

ties, and attributes, and certain other crucial aspects of the information that will ultimately find its way onto computer and into the company's databases, whether these databases are centralized on a big computer or distributed over many small computers.

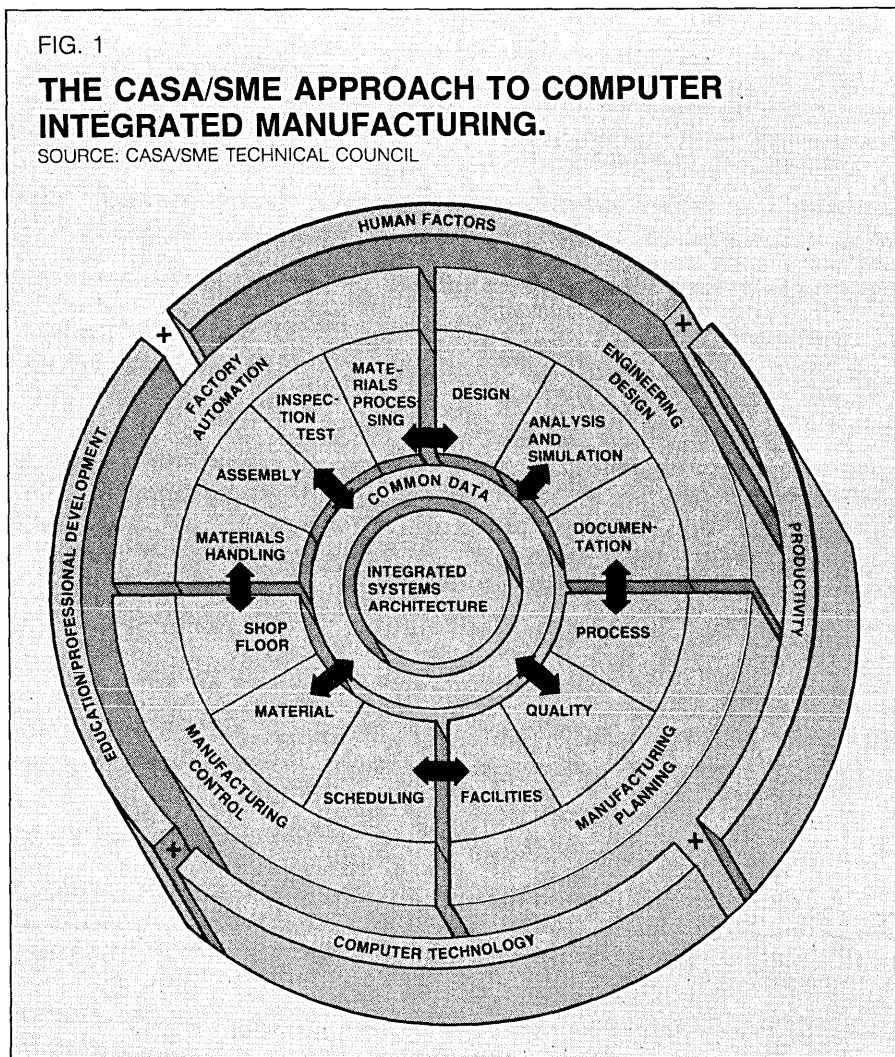
In keeping with the ANSI concept, independent data standards must be truly independent—dependent of specific vendor hardware or software packages, and of any specific application systems configuration. They belong to the company, not to an individual, a department, or an application system. By defining data standards in this way, manufacturers can begin to free themselves from specific computer hardware technology and specific application system structures.

Data is the most stable aspect of information. Therefore, data should be able to support a wide variety of constantly changing user requirements. Data should also be able to survive changes in the computer technology on which it resides. Nevertheless, without a concept such as independent data standards, specific applications come to depend on specific computer technologies, and there is little hope that the company's information structure could survive changes in either.

In summary, data driven means building independent data standards and providing a mechanism for implementing those standards in the optimum computer environment, given the company's cost/performance requirements. Data driven means basing computer software development and procurement on those independent data standards.

There are two dimensions to the data driven approach to integrating computerized manufacturing: top down and bottom up. Top down means management planning—the umbrella under which automation projects are defined, funded, and managed. Bottom up means implementation—the package of tools needed to implement, integrate, and maintain computer hardware and software and to keep them aligned with changing business requirements and computer technology. These top-down and bottom-up dimensions are closely tied to one another, each depending on the other to ensure an integrated environment.

Top-down data driven planning must be done within the context of a complete business unit. The data driven approach focuses on the business unit concept so that computer integrated manufacturing will be consistent with the business logic used for capital management and control. After all, the major purpose of automating is to optimize the utilization of capital resources, by maximizing capital turnover and minimizing capital investment in, say, inventory, receivables, or equipment. Alignment between automation strategies and capital management strategies is a crucial concept in the data



driven approach. It is not sufficient to plan for automating individual departments or distinct processes such as shop floor control or computer aided engineering. The total business unit must be considered, usually in terms of an overall architecture.

Another important aspect of the data driven top-down process is its concentration on what is called common data. Databases are meant to be shared, so they should not contain private data, i.e., data with only one user. Private data can be stored on private computers and used for private purposes, but common data are another matter altogether. Many people must rely on these common data, and they are concerned with their quality, consistency, accuracy, accessibility, availability, completeness, etc. They deserve special company-level treatment, or else they will atrophy and become more of a hindrance than a help.

Data driven planning says that no two independently developed systems can be in-

tegrated unless they have parts in common. These common parts are defined in the independent data standards. The classical application-oriented planning approach dictates that two application systems must be interfaced. That is, similar parts in those systems can be translated back and forth by an interfacing mechanism of some kind. But integration is an impossibility in the classical approach, because there is no mechanism to define independent systems with common parts. There are no independent data standards.

There are several reasonably well-documented procedures for data driven automation planning. Among them are IBM's Business Systems Planning (BSP) and Business Information Characterization Study (BICS) methodologies; Data Base Design Inc.'s Data Planner approach; and DACOM's Requirements Analysis and Planning (RAP) approach. These approaches use different concepts of data definition and classification, are procedurally different, and work with

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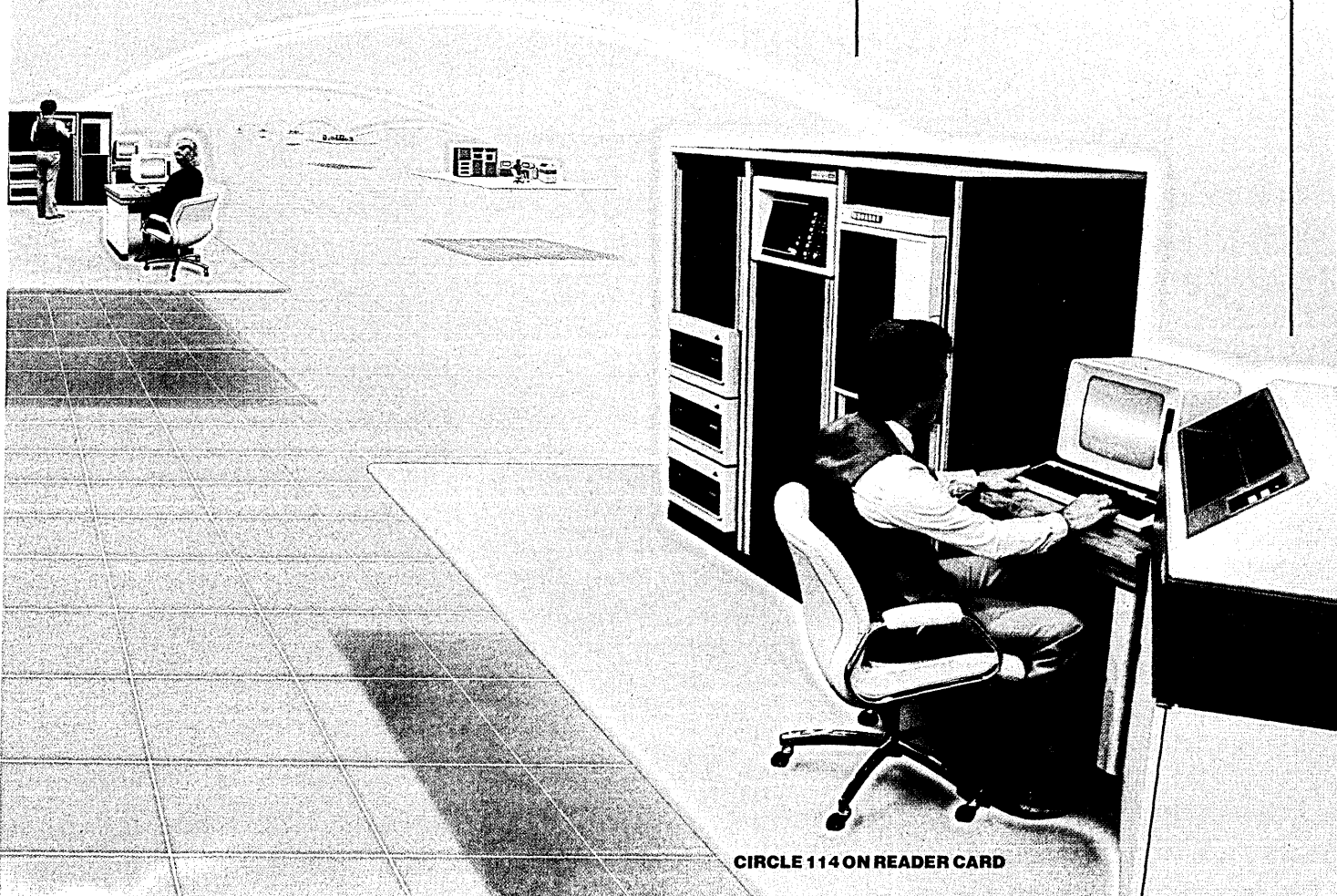
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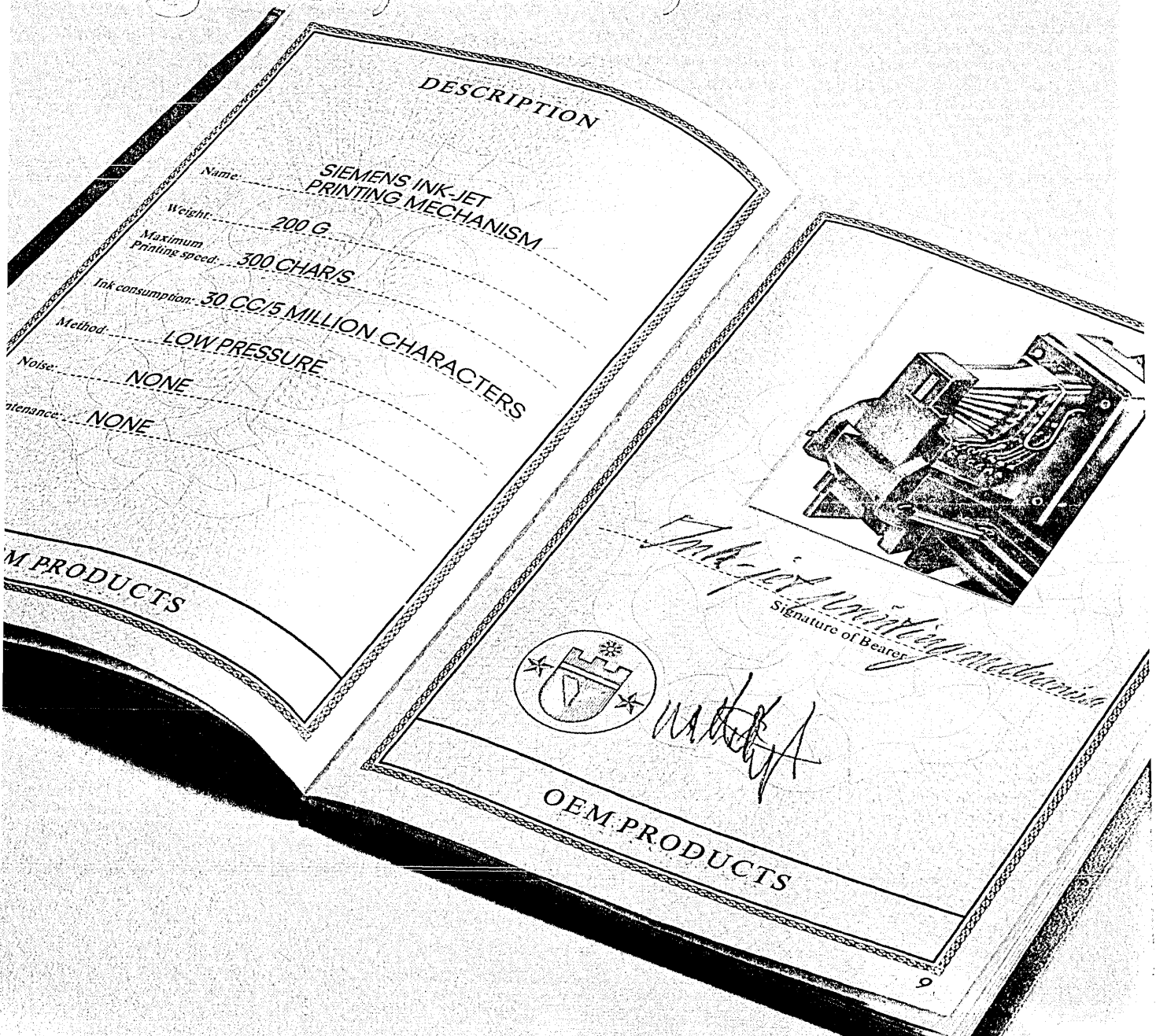
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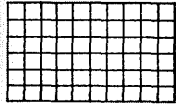
FIG. 2

ENTITY CLASSES, ATTRIBUTE CLASSES, RELATION CLASSES

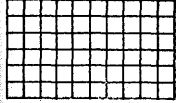
CODD

Relational grids containing domains (columns) and tuples (rows)

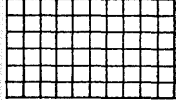
RELATION 1



RELATION 2

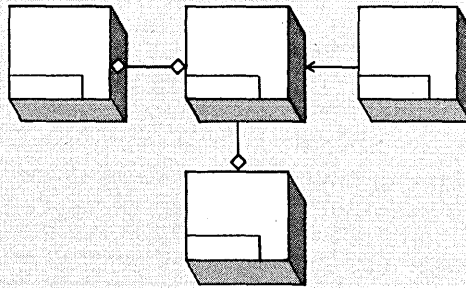


RELATION 3



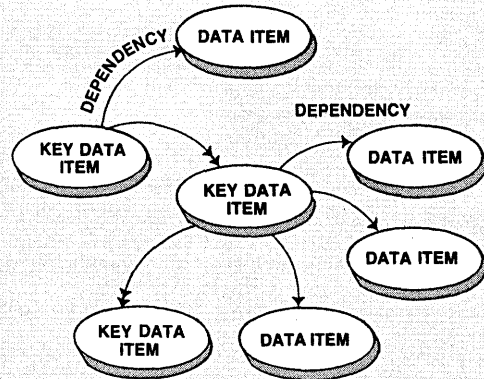
IDEF₁ (ICAM)

Entities and relations among entities



MARTIN

Bubbles and arrows, depicting data elements, keys, and functional dependencies



varying degrees of success; but all four are distinctly data driven. Most other top-down approaches are not.

HOW DATA DRIVEN WORKS

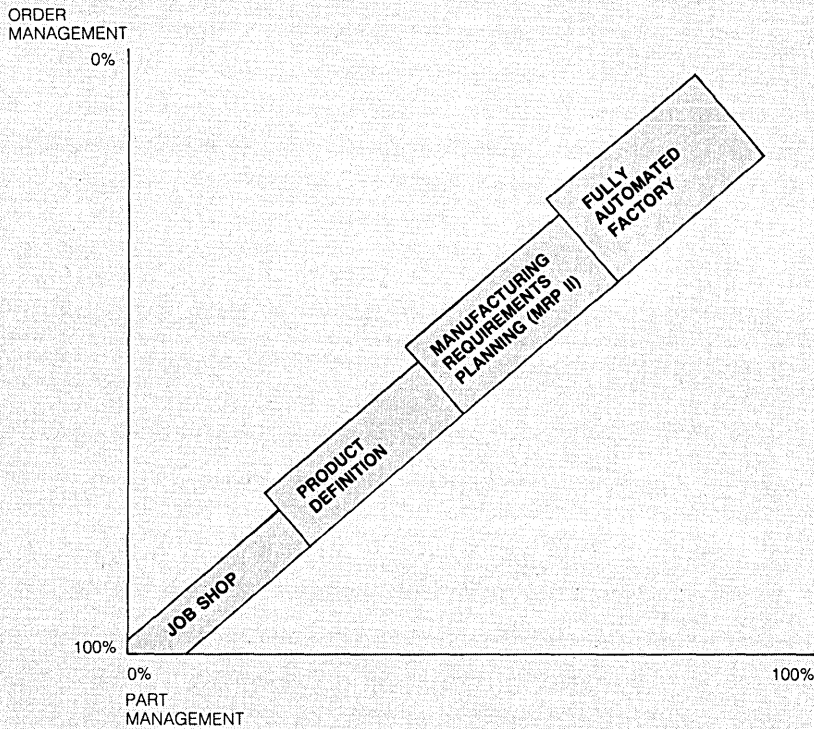
The problem with data driven planning methodologies has been that they have had to be implemented with classical application-oriented software engineering procedures and tools. The two approaches are like opposite poles of a magnet. To be truly valuable, data driven plans must be implemented through data driven tools and techniques, which until now have been in short supply.

Data driven implementation methods focus on tools and procedures for database definition and transaction management. First they define the database aspects of the system, using the independent data standards. Then they construct transactions that update the database. Finally, they develop transactions that retrieve data from the database. The order of development is crucial. By defining the database first, data driven implementation tools and procedures ensure integratability. Since traditional application-oriented methods concentrate on defining reports first, ignoring data commonalities, and then develop input programs to load the data into files that contain only the data required by the reports, they actually forfeit integratability. They also promote redundancy because each application system stores its own data, even if those data are used by other systems. Redundancy leads to inconsistency and poor data quality.

Unlike the classical application engineering approaches, the data driven procedures are based on the ANSI architecture. The ANSI architecture requires separation of applications (external structure) from computer technology (internal structure). Data driven system design methodologies first design logical structures (i.e., databases and transactions) and then convert those logical struc-

FIG. 3

MANUFACTURING MANAGEMENT MATRIX



tures into physical implementations. Maintaining this logical versus physical separation is a primary job of the independent data standards.

There are a few complete, bottom-up implementation methodologies for the data driven approach, including DACOM's PDM 80 and Clive Finklestein's Information Engineering. More are on the way.

All data driven implementation procedures are centered on what are called logical database design methodologies. We use

these methodologies to build independent data standards. They trace their roots to IBM's Dr. E.F. Codd and his relational database concepts. Dr. Codd has been joined by Dr. P.P. Chen of UCLA, James Martin, Dr. R.R. Brown of Hughes Aircraft, Bob Curtice of Arthur D. Little, Dr. C.M. Nijssen of Control Data, and Stuart Coleman of DACOM, all of whom have constructed operational methodologies for logical database design. These methods form the nucleus not only of the bottom-up implementation procedures, but

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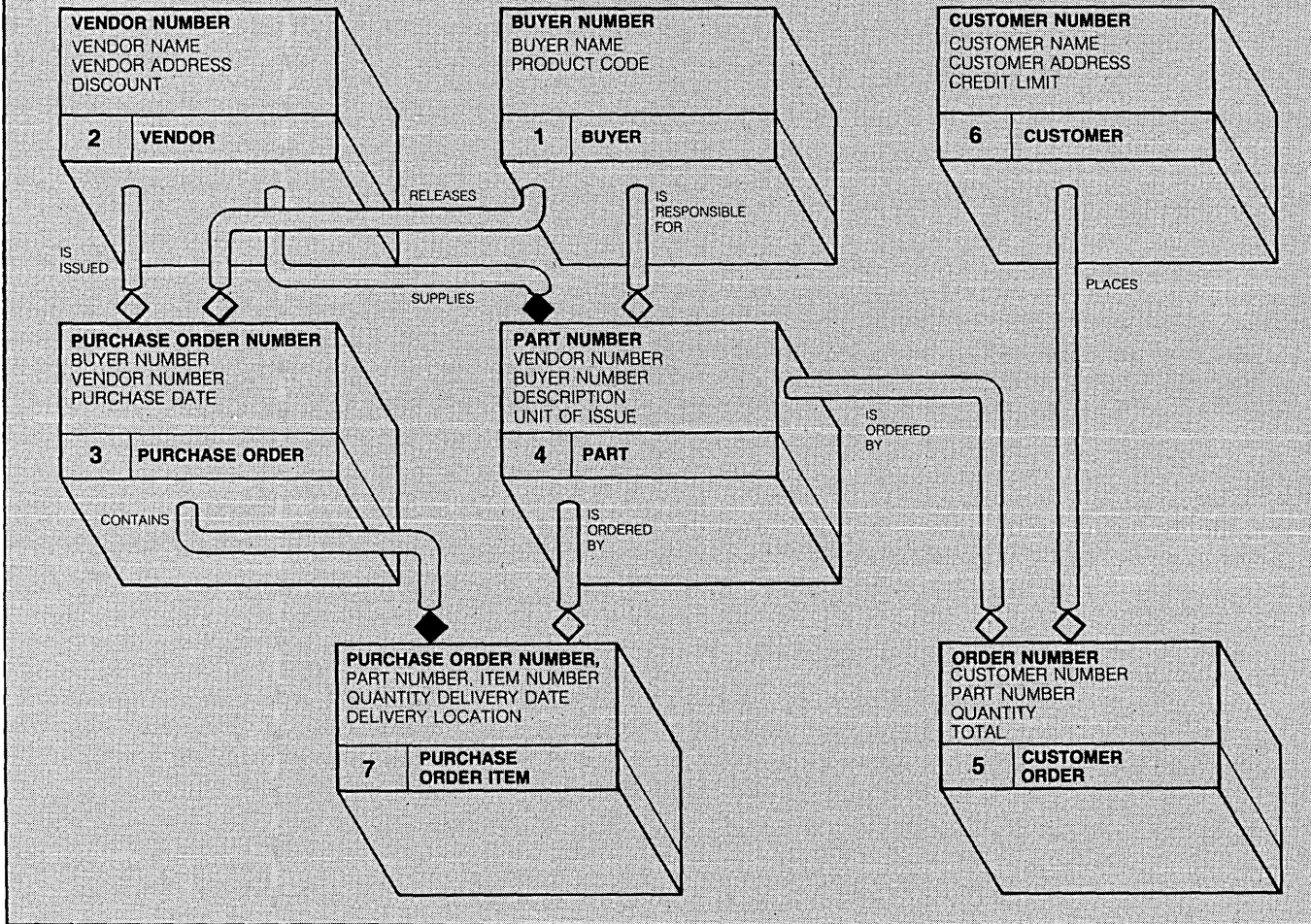
Data driven implementation methods facilitate in-house development and, in many cases, even make it preferable to outside procurement.

CAD-CAM 

FIG. 4

ICAM DEFINITION METHOD FOR INFORMATION MODELING (IDEF₁)

Diagram of the independent data standards for the entity "part."



of the total data driven concept. They are the threads that bind top-down and bottom-up data driven methods.

Briefly, logical database design methods refine independent data standards using well-defined sets of information primitives. The Codd approach uses a set of primitives describing what he calls relations, domains, tuples, and keys. The Chen approach uses information primitives he calls entities, attributes of entities, and relations between entities and attributes. Fig. 2 shows three popular methodologies, their primitives, and their graphics.

Most logical database design techniques are based on rules of mathematical logic. If they are properly applied to small problems, the results are consistent and, ultimately, integratable.

In manufacturing, as in other industries, each business unit goes through a dis-

tinct life cycle. A manufacturing business unit usually evolves from an adolescent stage, where it specially engineers products for its customers (a job shop), through a product standardization phase, to a phase where it assembles and delivers its products from standard, preengineered components (a process shop). The impetus for evolution through the phases is, of course, productivity improvement.

This manufacturing life cycle concept was central to an article published in an earlier issue of DATAMATION (October 1977). As shown in Fig. 3, the concept is based on a matrix that contrasts the two fundamental manufacturing control strategies: control by customer order and control by part.

The four-step approach centers on the concept of common data. Productivity in manufacturing correlates directly to the data strengths and weaknesses of an enterprise.

Job Shops (step 1) are notoriously weak when it comes to important data structures such as standard bills of material, standard process plans, and MRP data. The article also proposed that Product Definition (step 2) must implement group technology data such as classification codes, part geometries, etc. to stabilize the product concept before MRP data such as unit forecasts, pegging levels, standard costs, etc. can be employed effectively.

This four-step concept can be the foundation for defining a top-down data driven architecture: We know that before a manufacturer can migrate from being a job shop to being a process shop, he must build the required data structures into his company. If these structures are missing, it will be impossible to implement successfully, much less integrate, computer aided design, MRP, process planning, computer aided manufacturing, or any other new process. The data struc-



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CIRCLE 117 ON READER CARD

Many manufacturers who have already faced the problem of after-the-fact integration are experiencing serious setbacks.

CAD-CAM

tures provide the foundations of the functions, live out their usefulness, and, ultimately, die as the company changes products, markets, and directions. More importantly, unlike the functions, which are constantly changing, the data structure has a life cycle that directly mirrors the business unit's life cycle.

BOTTOM UP METHOD

The bottom-up data driven concept focuses on defining precisely what the logical structure of the new data from each step is, and how it relates to the old (see Fig. 4). Once this logical structure is defined in terms of independent data standards, it is employed to write specifications for software procurement or in-house development, or both.

Bottom-up procedures take the important data requirements from the top-down plan and, using the independent data standards, evaluate alternative solutions in a three-step approach. Individual systems packages are first evaluated for their compatibility with regard to the data standards. (The most expensive part of implementing turnkey software is changing its database structure and content, or the company's data concepts and structures. The biggest blunders occur when software packages are procured that will not support the way the company actually structures its data.) Second, packages are reviewed to ensure that input transactions will be user friendly and will maintain high standards for data storage in the database. Finally, packages are reviewed for their reporting capabilities. Data driven procedures

assume that if the data structures are defined properly, data stored therein can be retrieved in any format.

This three-step technique can be used to evaluate turnkey packages for computer automated process planning, classification coding, numerical control, computer aided design, shop loading, capacity planning, inventory control, project management, cost, etc. It should ensure that various aspects of the independent data standards are implemented in an integrated way, and are consistent with the life cycle of the business unit.

While the preceding is geared to a software procurement strategy, it by no means excludes in-house development. In fact, data driven implementation methods facilitate in-house development and, in many cases, even make it preferable to outside procurement. This is because the ANSI/SPARC architecture offers greater flexibility and ease of integration. The procedures make maximum use of database management software, user friendly (nonprocedural) programming languages, and data dictionary facilities—all of which are ignored by classical application-oriented implementation procedures.

Many manufacturers who have already faced the problem of after-the-fact integration are experiencing serious setbacks. They are being forced to rewrite most of their programs, rebuy many different software packages, jury-rig interfaces between existing systems, and absorb large amounts of overhead to translate information back and forth among standalone application systems. Those who have not yet stepped up to the problem of integration are in for a nasty surprise. The situation won't get better, because most manufacturers are rushing helter-skelter to automate and maintain their competitive positions. If they continue to use conventional automation strategies, they will, like lemmings, rush headlong over a cliff. Better to step back, get it together, and move purposefully toward the goal of integrated, flexible, user-controlled information resources, which provide good, easily accessible data. The data driven approach just may be the key to successful computer aided manufacturing.*



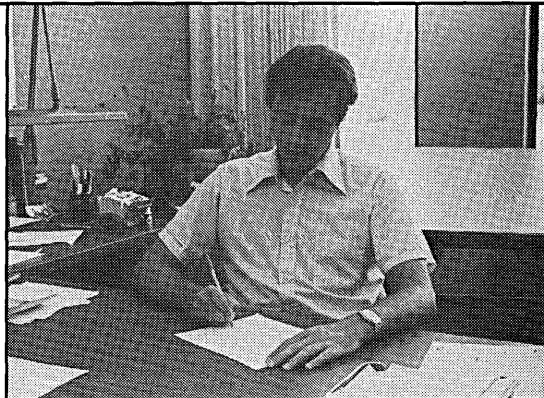
Daniel S. Appleton is president of D. Appleton Co., Inc. (DACOM), a consulting and contracting firm that specializes in developing and implementing computer integrated manufacturing systems. He is also chairman of the CASA/SME Committee on Computer Systems Integration. Prior to establishing DACOM, he spent eight years as the director of strategic business planning and management information systems for a large division of the Borg Warner Corp.

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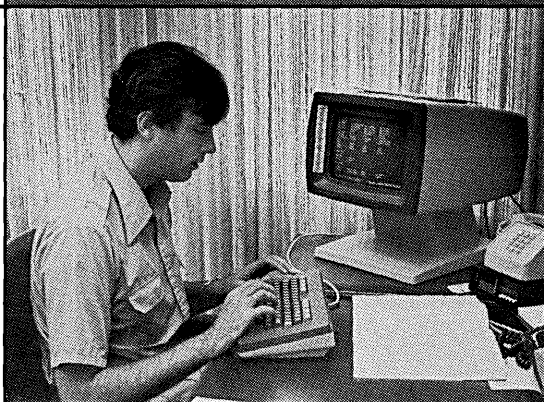
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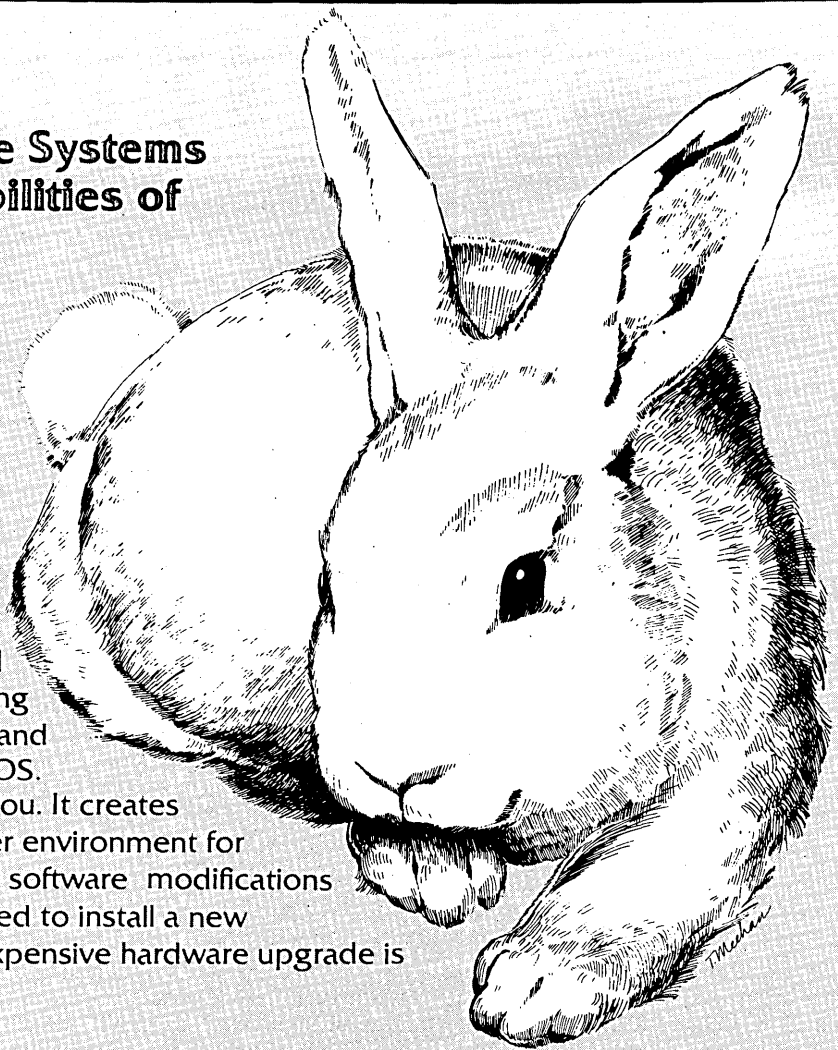
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Is computer-aided manufacturing ready to remake our society for the better, or is it a pig in a poke? We don't pretend to know, but the time to ask is now.

CAD-CAM 

MESSAGE FROM PORKOPOLIS

by Leopold Froehlich

The whole country was a perfect forest then. In the Ohio Valley, oaks, buckeyes, and walnuts mixed with wild grape and elderberry. Settlers cleared land, deadening trees with wide cuts across the bark. Maize was planted among the leafless trees, where it grew easily, particularly on newly cleared land where wheat could not. Corn was eaten by both man and beast. It grew abundantly, so that in some sections of the State of Ohio in the early 19th century it would not "command 6¢ per bushel, and in others was of so little value as to be substituted for wood as fuel."

There would be no national market for the corn until the completion of the Ohio and Erie canal and the Baltimore & Ohio Railroad made transporting it economical. So the surplus condensed into durable commodities—whiskey and pork—which could be brought to eastern markets. Pigs, the lazy man's whiskey, fit neatly into this scheme. Swine could eat the by-products of a mash still, and could just as easily convert into bacon. Charles Cist, historian of Cincinnati, wrote in 1859 of a labor-efficient method of harvesting corn known as "hogging down": "The hogs run in the woods until within five or six weeks of killing time, when they are turned into the cornfields to fatten. If the acorns and beechnuts are abundant, they require less corn."

Farmers could spend their afternoons drinking whiskey while listening to pigs devour the corn in the fields. After rounding up their swine, they drove them to market in Cincinnati. Some farmers would fatten a thousand head in a season.

Cincinnati became Porkopolis, the world capital of hog butchering, surpassing even the slaughterhouses of Cork and Belfast. Between November 1862 and February 1827, 40,000 hogs were packed there. Still, pigs were overrunning the young city. One could not cross the street without "brushing by a snout fresh dripping from the kennel."

What could be done with such an army of swine?

In the 1830s, the slaughtering process was still distinct from packing and preserving. Most of the work was done on Cincinnati's east side. The highly perishable product had to be processed quickly (the slaughtering season ran from November to February). How best to secure an uninterrupted line of production? With a minute division of labor. By 1840 the slaughterhouse and packinghouse had merged into one structure. C. F. Hoffman wrote of this innovation: "The division of labor and the fearful celerity of execution in these swinish workshops would equally delight a pasha and a political economist; for it is the mode in which the business is conducted, rather than its extent, which gives dignity to hog killing in Cincinnati."

The hogworks were typically a three- or four-story building with an inclined ramp leading to the top floor. Pigs were driven up this ramp, where they were slaughtered on the top floor. Gravity transported them down, floor by floor. It is in frontier Cincinnati (not, as commonly believed, in Henry Ford's conveyors) that we find the origins of the modern assembly line. Siegfried Giedion describes the process:

"After catching, killing, scalding, and scrapping, the hogs are hung from an overhead rail at 24 in. intervals and moved continuously past a series of workers. Each man performs a single operation. One splits the animal, the next takes out the entrails, the third removes heart, liver, etc., and the hose man washes it out."

"No iron cog wheels," wrote F. L. Olmsted, designer of Central Park, "could work with more regular motion" than these packers. In 1834, Cincinnati slaughtered 120,000 swine. By 1847 the number had risen to half a million. Hogs became even more abundant; Sir Charles Lyells wrote in 1845 of "free hogs," belonging to no one in particular, which "roamed about the handsome

streets." After his visit, Olmsted remarked: "Though the country was well wooded, I venture to say we met as many hogs as trees."

The hogsheads of bacon, barrels of salt pork, and kegs of lard that the hogworks turned out began to pile up, because Cincinnati lacked the means to store or ship them. The surplus, Cist writes, was dumped in the river:

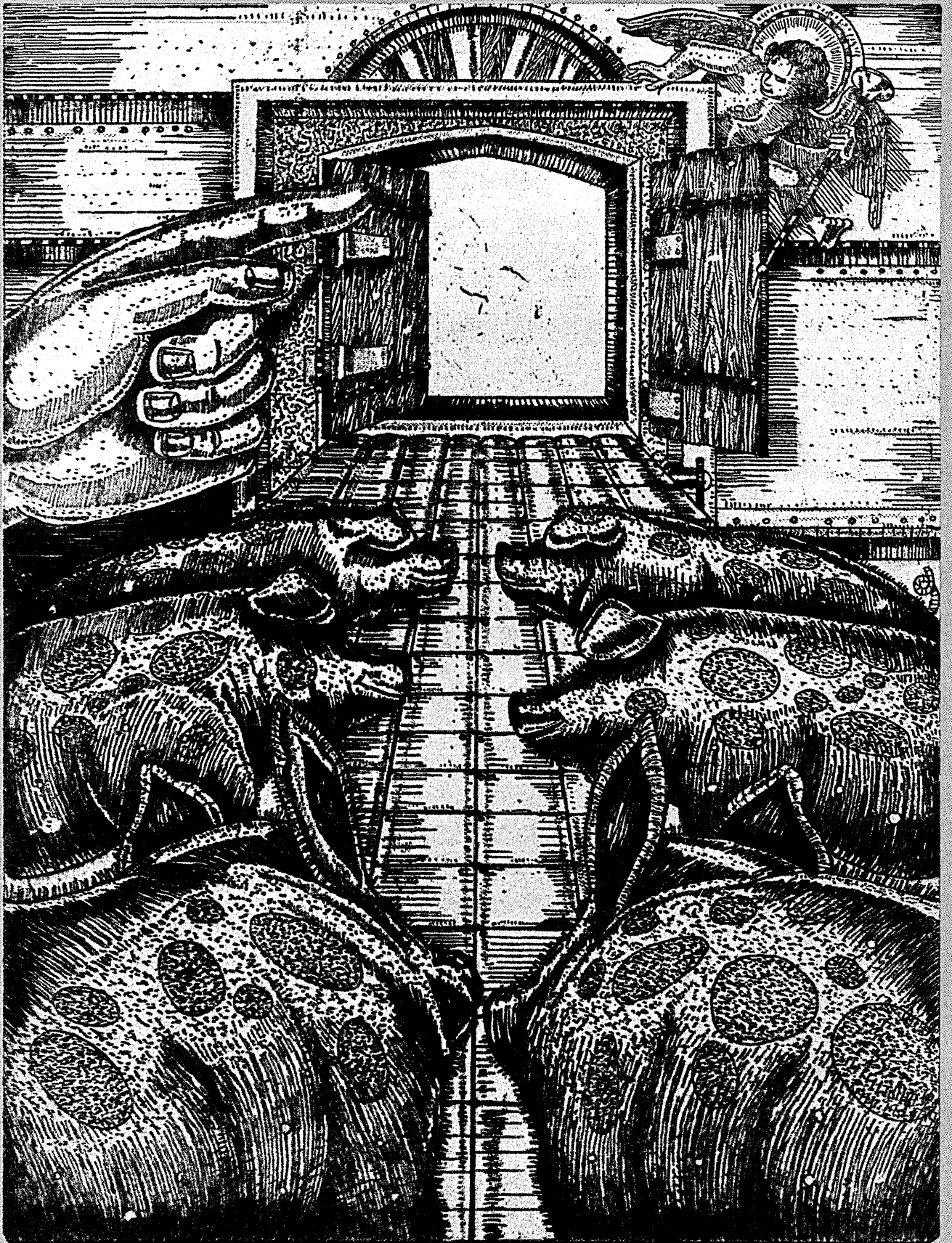
"I well recollect cartloads upon cartloads of spareribs, such as could not be produced anywhere at the east or beyond the Atlantic, drawn to the water's edge and emptied in the Ohio, to get rid of them."

WELL-LAID PLANS

Cincinnati was not the only river city contemplating meat. On the banks of the Seine, simultaneous with the development of the pork disassembly line in Ohio, the emperor Napoleon III defined imperial projects for adjusting Paris to new scales of production and population. He selected Georges-Eugene Haussmann to transform the city from a crowded, medieval area to a modern urban one. As city planner, Haussmann razed slums to make way for arterial streets like the Boulevard St. Michel, and designed parks, water and sewage systems, opera houses, courts and ministries, markets, fire stations, and cemeteries.

The Slaughterhouse at La Villette, completed on Jan. 1, 1867, was to be Europe's prototype abattoir for the rest of the century. In La Villette, Haussmann centralized the slaughtering process into three elegantly designed main structures of glass and iron: one for beef and calf, one for swine, and another for sheep. Although La Villette was one of the first European efforts at the centralization of slaughter and meat processing, it still maintained many of the careful elements of old handicraft production. Butchers and slaughterers performed their tasks separately, while each ox had its own booth for slaughter.

ILLUSTRATION BY CHRIS SPOLLEN



The great planner Haussmann produced a splendid structure that was obsolete when it was completed.

CAD-CAM

The hogs grown with minimal effort in the Ohio Valley required a different, more urgent method of slaughter. This led some anonymous purveyors of pork to discard the old handicraft paradigm and design a new method: mechanization. The great planner Haussmann, free from such pressures—and also, one gathers, from any intimacy with pigs—produced a splendid structure that was obsolete when it was completed.

With the development of superior rail facilities, Chicago began to absorb much of Cincinnati's pork in the 1850s. Construction of the Union Stock Yards began on June 1, 1865, and the rudely made yards were operating by Christmas of that year. (La Villette, by contrast, took four years to complete.) There was no architectonic plan, just a sprawling, 120-acre structure laid out more or less rectangularly: "Built entirely of wood, and doubtless gradually, no one has ever thought of making a general plan of it. All has been constructed in haste and according to the needs of the moment." By 1883 the Union Stocks had a processing capacity of 200,000 hogs daily, a figure that the shiny La Villette could not equal in a year.

PRESSURE TO USE CAD/CAM

Like the hogworkers of Cincinnati, we find ourselves at the cusp of another paradigm today. Integrated, computer-aided manufacturing systems will be our way of processing hogs we can't yet recognize. The current recession notwithstanding, there is considerable pressure to get such systems (or at least components of them) up and running. We are told that this is not a particularly contemplative issue—that the erosion of our competitive edge demands abrupt action. But the men who work the marketplace are busy, and certain questions go unasked.

What, exactly, are we trying to build? Does Porkopolis adumbrate the automated factory, or does La Villette? Had Haussmann been aware of American efforts, it's doubtful he would have changed his plans. He saw no future in electric lights, either. Does all this serve to prove that haste pays, that we can expect to pull another serendipitous process out of the hat, like those early Cincinnatians? How extensive are the changes we're proposing? Are we concerned with manufacturing steps in individual factories, with integrating whole factories, with constructing giant systems of factories, or with remaking society? How easy is it to move from one stage to the next, and what will we have when (or if) we arrive at the final one?

When pigs ran wild, they were not driven inexorably to slaughter, but simply stumbled on to it. The course we choose could lead, as some claim, to unrivaled prosperity. It

could alternately lead to a depression, as Norbert Wiener wrote, "that would make that of the 1930s seem like a pleasant joke."

One grows accustomed to hearing all sorts of scare stories, the most prevalent being that of the Asian hobgoblin, which has our market undermired by Japanese, South Korean, and Taiwanese industries. "A greater danger," writes Philip Sadler, "is posed by increasing industrialization in other [less developed] parts of the world. . . . Adopt new technologies and lose some jobs, or fail to remain competitive and lose most or all your jobs." The Motor City's misery is routinely attributed to this Asian threat, even though Japan's mechanical prowess is only one of its causes.

Still "automate or perish" is the battle cry. Modern Mr. Smooth-It-Away assures us that, with new mechanical technologies in place, we will remain a jump ahead of our competition and someday languish in a lotus land of material abundance. The traditionally irregular work habits of Americans, which seem to have something to do with this country's mania for invention, are overlooked, as is the fact that mechanical technique alone has not elevated the Japanese auto industry to its present status. Work is socially as well as materially productive. There may be something wrong with our perception of manufacturing that shiny tools can't correct.

The manufacturer's reluctance to implement CAD/CAM right away is not too surprising; our current understanding of manufacturing dynamics is far from complete. CAM systems are, by current accounting methods, expensive. With all the talk of capitalization, threats to our survival, and being left in the dust, it is difficult to establish a sensible course. Perhaps we should be searching for a new F. W. Taylor to rationalize the new automatic processes. Without one, who wants to offer odds that current CAD/CAM efforts won't be as obsolete in 1990 as La Villette was at its completion? It's a familiar conundrum: the enthusiasts want to ride the learning curve, while the more sober-minded manufacturing market, nonplussed by the hurry of many CAD/CAM proponents, prefers to wait for a more coherent product.

To hear some tell it, automaticity is inevitable. It approaches, breathing smoke beyond the next hill. "Technological change exercises its influence," one reads, beneath the headline "The Robots Are Coming!"—which is much snappier than "Robots Are Being Installed." But technology is a human manifestation; it is not a Moloch or Godzilla afire in our streets, a teleological creature to be addressed in the third person. *We* are technology. Those who hawk the technological imperative remind one of sharkskinned salesmen touting bottomland properties: on ac-

count of their various interests, they cannot be hailed as objective sources.

Writing in 1904 on this notion of deterministic force, Henry Adams noted: "Man always made, and still makes, grotesque blunders in selecting and measuring forces. . . . In the earlier stages of progress, the forces to be assimilated were simple and easy, but as the mind of man enlarged its range it enlarged the field of complexity." In other words, things don't get any easier. What is the persistence of a blundered force? What is the imperative of La Villette or the autonomy of asbestos?

CAST NET WIDE

This is not a matter of bottom-up or top-down as much as it is a process that converges inward from a vast perimeter. The net must be cast as wide as it will go: this is the only way we catch the prawns of success. "Mass production," writes Peter Drucker in the *The New Society*, "is to be regarded not only as a mechanical, but also as a social principle." Top-down planning can be top-heavy and imperial. It lacks the essential knowledge of an operator familiar with production technique. A bottom-up approach, with many hammers pounding madly, can proliferate quickly to saturation and lacks an essential structure. Only a total systems concept that recognizes the manufacturing process as something greater than commonly believed will have any chance at succeeding.

What is the social principle of automated manufacturing? "The same cause," wrote David Ricardo, "which may increase the revenue of the country may at the same time render the population redundant and deteriorate the condition of the laborer." Machinery and labor have been in constant competition for the past two centuries. What would happen to the laborer if the automatic factory were to become a reality? It would seem a manager's dream—virtually unmanned factories requiring a fraction of a conventional plant's labor. An unlimited and seemingly inextinguishable line of production. The workers who remained wouldn't have any bargaining leverage, so labor costs would plummet.

But what do we do to keep the redundant population from getting underfoot, like those porkers on Main Street? Some of those displaced will return to handicraft methods and build machines by hand. Some will move into the information business. But will those who remain be forced to sing jingles, serve sausages, dress in drastic uniforms, all while smilingly proffering their services? There isn't capacity in the service sector. Redundant cooks will not become waiters; disgruntled machinists won't become smiling por-

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**Top-down planning can be top-heavy and imperial.
A bottom-up approach can proliferate quickly to saturation.**

CAD-CAM 

ters. What then?

We can decrease our labor supply by various methods: raising the school-leaving age, lowering retirement age, or increasing public sector employment. None of these methods is currently in favor. Where will the money come from for these extra Americans, that "great class of people," as John Stuart Mill called them, "who have nothing to give for their food but ordinary labor"? A reverse corvée perhaps, where industry pays the worker for work not done, say in recognition of past efforts? Not likely, but possible. Pay for volunteer work, which sounds like no work at all?

Edward Everett, a 19th century champion of American technological progress, asked innocently: "Do you wish to lay on aching human shoulders the burden which so lightly is borne by these patient metallic giants?" But what of those aching human shoulders? Do they not support a head as well? Negligent of the ecological or human effects of their efforts, many managers have overlooked the human capacity to collaborate. As a result, industrial management assigns a nonfunctional (or derived) prestige to

work, at the neglect of its intrinsic prestige. But work patterns our social world. Work itself does not alienate; the manner in which work is directed does.

**PLANS
OUTSMART
PLANNERS**

Even with the problems of workers solved, the path for management might not prove as pleasant as many now believe. All a priori plans have their unknown quantities. Workers may often systematically disobey managerial orders in order to achieve the goals of the organization. But boneheaded directives from above would be obeyed literally, and on a vast scale, by the machine. Problems have a way of enduring, in one form or another. Consider the pigs of Cincinnati: "It is a favorite amusement of the boys to ride upon the pigs, and we were shown one sagacious old hog, who was in the habit of lying down as soon as a boy came in sight." Hogs have their ways of outsmarting boys, just as plans have ways of outsmarting the planners.

We needn't be pushed around by the grand guignol of technology. We can sit at tables, if we please, put our feet up and

smoke cigars. The right ideas will come with time. But what, it is asked, if competitive advantage does in fact accrue rapidly to those who are first with the new technology? That needs debating. It's far from certain that the Asian labor market will remain so pacific, and that Japanese management is infallible. Even if both were true, it would not follow that we should leap off a cliff into further centralization of our industrial power.

So where's the fire? We're no longer rushing to the prairies, throwing up towns, and drumming our wares. More than ever before, we have to live with the consequences of our decisions: These are not just production figures, these are human lives. On leaving Cincinnati in 1830, the English writer Frances Trollope wrote: "Our feet, that on leaving the city had expected to press the flowery sod, literally got entangled in pigs' tails and jawbones; and thus the prettiest walk in the neighborhood was interdicted forever."

We don't have to spoil our own stroll.

Leopold Froehlich is DATAMATION's robotics consultant.

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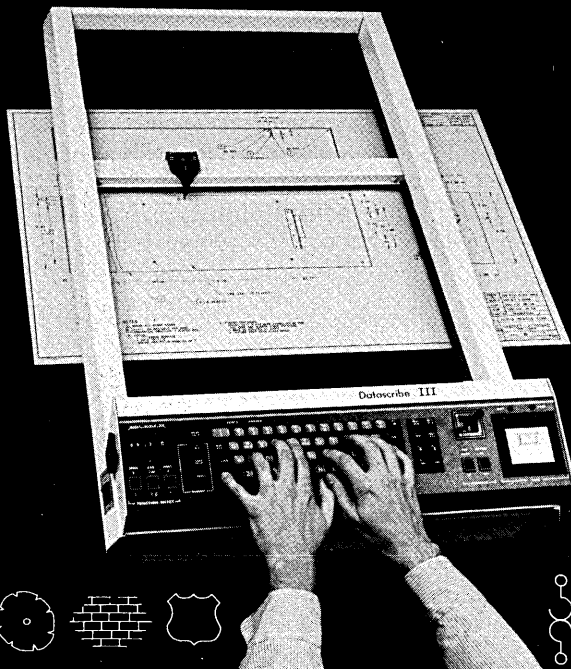
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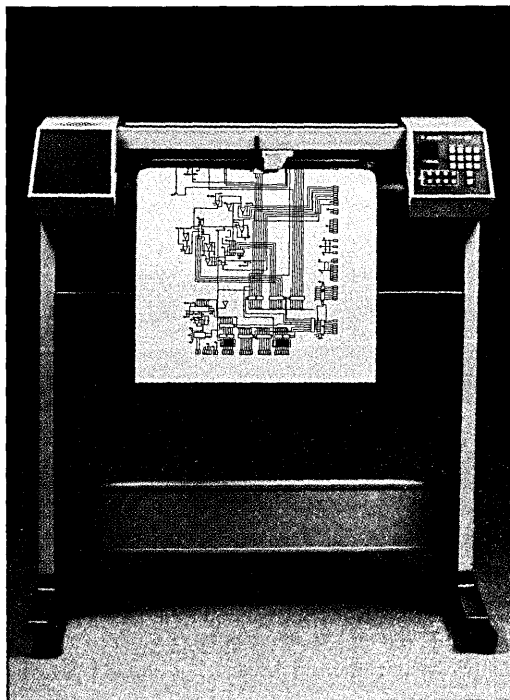
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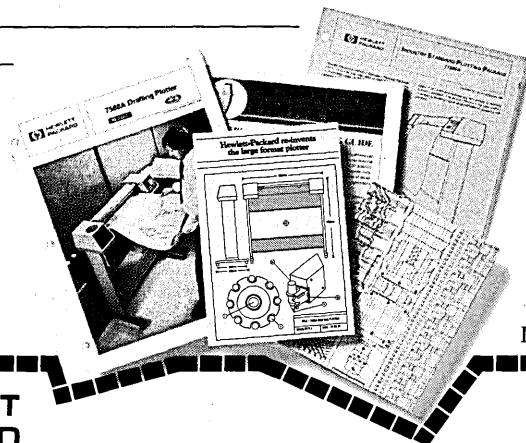
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A cybernetician suggests that man's nervous system is the proper model for managerial control.

THE SHORTER CATECHISM OF STAFFORD BEER

For better than 10 years, industry has lived cheek by jowl with the computer in a marriage that's still unconsummated. The prospects for a full and harmonious union have picked up of late.

That's the considered opinion of Stafford Beer, a 55-year-old Englishman who doesn't consider himself a computer expert. He admits to being a cybernetician, and is in fact one of the few members of this rare species who is commonly ranked alongside Norbert Wiener (whose name is all most people know about cybernetics). Within his small circle of peers, Beer furthermore is unique in the degree to which, he, as author, teacher, executive, and consultant, has applied cybernetics to the problems of business and management and MIS.

Cybernetics is concerned with control and communication in complex systems. Its basic insight is simple: In their control arrangements all complex systems are very much alike—ecosystems as much as the human nervous systems, companies as much as governments, economies as much as whole societies. Therefore, to learn about controlling businesses and other human organizations, a subject on which we have little systematic knowledge, we need to look at the natural systems about which we know a great deal more. For Beer, this thought singles out man's neurophysiology as the proper model for managerial control.

Beer admits he has come close to giving up hope in the cause he has made peculiarly his own. At times, it has seemed to him as though industry would never grasp what cybernetics and neurophysiology have to do with them and their computers. Two recent developments, though, have made him feel optimistic again.

One is the emergence of a generation which understands that computers are more than number-crunching drudges. The other is microprocessing, which in Beer's view had radically improved the economics of MIS innovation. Formerly, such innovation required very large investments, which were easily controlled by the established power centers of business and industry. And these power centers, including those of the dp in-

dustry itself, were and are bound to resist all perturbing innovation—a fact of life, and as Beer notes, of cybernetics (nature itself being archconservative).

Thanks to the microprocessor, MIS has become a matter of profusely varied and much smaller investments, to which those power centers cannot pay much attention. Innovation has gained one of its rare opportunities to blind-side the establishment. Whether it will succeed in this instance depends on whether senior managers and the MIS entity within the corporation can be brought to acknowledge the significance of three basic questions:

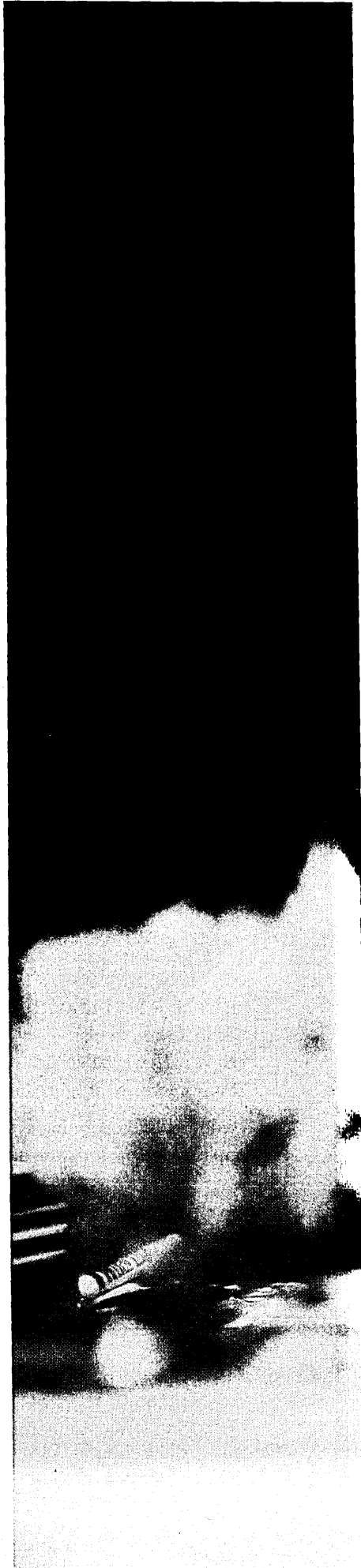
- How do successful complex systems control themselves?
- In communication and decision making, what are people good at and what are they not good at?
- What are computers uniquely good at?

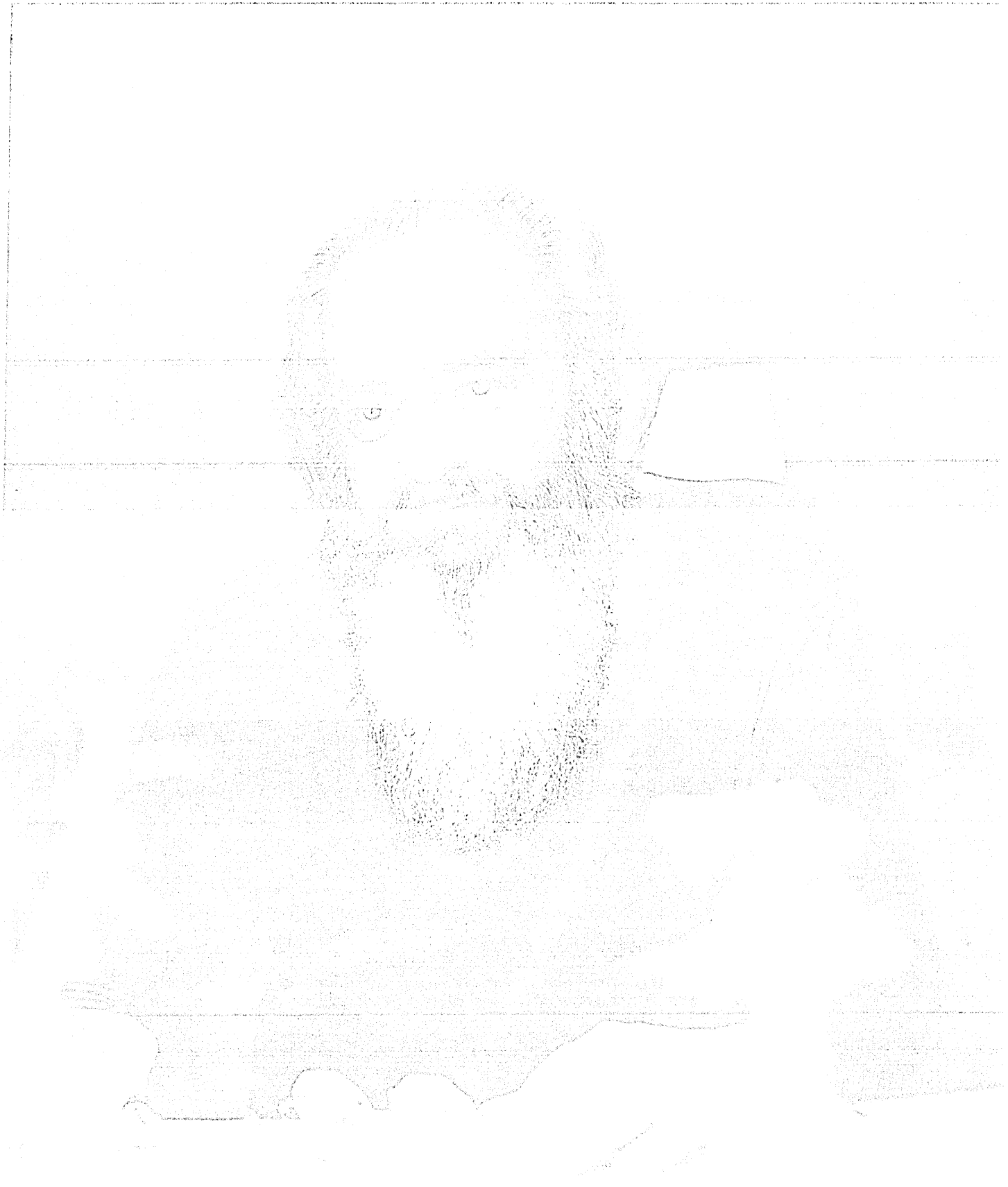
As one follows Beer's argument, it's impossible to miss that he considers the last question to be the real stumbling block. Correctly answered, it leads to conclusions that are so profoundly counterintuitive as to require for most of us a leap of faith to make them acceptable.

Beer also makes plain his conviction that a decade of wrong-headedness has made it harder rather than easier for us to arrive at a true understanding of the computer. All of which strongly implies that if Beer is right about that run up the establishment's blind side, it's dp people and departments who will have to make the running.

Beer has illustrated his full vision of management in a new era of technology in numerous books, as well as in a stream of papers and articles. There's no way to summarize his thoughts in a few paragraphs. The synopsis Beer provides in two of his books—*The Heart of the Enterprise* and *The Brain of the Firm* (just out in an expanded second edition)—is only outlines and highlights.

It is possible, however, to distill from Beer's writings a highly selective shorter catechism. Disfigured by crass overstatement, it nonetheless conveys some of the gist of the neurocybernetic model of corporate management:





Technology has reached the point where computers can be used to predict what is likely to work for the corporation.

1. *Top management's primary job is to make the hard decisions.* This is commonplace, but consider what its inverse implies. Most decisions made in the corporation are routine and therefore *not* difficult. It follows that almost everything about these decisions and the information they are based on is *none of top management's business* and must be filtered out. Only inputs of the form, "There is an unpredicted, nontrivial change, and it is . . ." should go all the way to the top.

VARIETY IS CURSE OF CONTROL

2. *Variety is the curse of systemic control.* "Variety" here is the cybernetic term for all the different states that can be assumed by a collection of variables. Even in the simplest real-life situations encountered by a small business, the variety is unimaginably large. Yet it is an iron law of cybernetics that no control system can respond correctly to more variety at its inputs than it can discriminate and process in its control center.

3. *The only feasible ultimate objective of systemic control is to hold the system within its natural boundaries.* These define the system's range of equilibrium states and change as the environment changes. The virtue of equilibrium, Beer notes, is simply that it guarantees survival. This leaves much uncertain, like "What exactly is the problem?" or "What is the best solution?" But, because of variety, these cannot be answered.

4. *Successful systemic control is based on monitoring the system's own changes of state as it responds automatically to changes in its environment.* Directly monitoring the environment only brings down the curse of variety. It's easily demonstrable from biology that you don't have to understand the why and how of what is going on around you, provided you have a way of adapting to what you perceive is happening to you.

5. *In any control loop, the error-correcting feedback comes to dominate the output regardless of changes in input.* This well-established truth of control theory is grist to Beer's mill. Managers can neither shape nor understand much about the inputs to the corporation from the world around it. Nevertheless they will have a control system with a high probability of success so long as the system's feedback loop works as it should (which is a matter of sophisticated operations research and dp design).

6. *The conventional circuit diagram is the wrong model for corporate control.* Wired from a diagram prescribing a specific path for any signal that is processed, the control system of even a small business would become so large as to crowd out from existence all the rest of terrestrial life. The proper model is the human nervous system, which at its cortical center has a dense network of neu-

SPOTLIGHT: STAFFORD BEER

Contradictions? He is adjunct professor of Special Systems Sciences in the Wharton School of the University of Pennsylvania, and a part-time professor in the Business School of the University of Manchester. He is also a member of that most exclusive of clubs, of professors at first rank universities who have not received a first degree.

A natural academic then? Well, yes . . . and no. Norbert Wiener, the father of cybernetics, was to call Beer the father of cybernetics in business, and applying cybernetics to business and the organization is what Stafford Beer has been doing for a long time.

In the '50s, he ran the world's first computing system in private industry (in steel) that was devoted to problems the most academic of cyberneticians would have recognized as theirs, but in the steel business it was generally camouflaged as "operations research."

Doubting that he would survive World War II and determined to cram as much as possible into what he thought would be a short life, he joined the army at age 18. He began as a private, was posted to India, and quickly rose to the rank of staff captain (Intelligence) in the Gurkhas. While in India, he began to practice operations research and "made some advances," learned some Indian languages, studied Vedantic philosophy, started to practice Yoga, and became a tertiary of the Order of the Franciscans.

Then he became in succession an army psychologist, chief of personnel selection for the Corps of Royal Engineers, commander of a special unit for the training of illiterates, and researcher of personality disorders. He also found time to marry and father his first child.

He has written about this period of his life: "Shortly afterwards, I left the army, rather surprised to realize that I had after all 'made it' to the age of 22."

He was to live at that pace for the next quarter of a century, years during which he wrote countless papers, nine books, and worked in, or advised, some of the world's more thinking, usually large, often powerful corporations. He also ad-

vised many international organizations and governments, including NATO, various offshoots of the U.N., Canada, Portugal.

He also worked for President Allende in Chile, which was to bring him considerable notoriety. In Chile, he created, in less than two years, a system that initially gave the government accurate and appropriate economic data on the performance of the 40% of the economy it controlled. He did this 24 hours after the event.

The Pinochet coup d'etat put a stop to the Chilean experiment. Beer then spent the best part of a year trying to extricate from Chile those who had worked with him.

Beer is a very far-sighted democrat, one with a habit of putting his judgment on the point of criticality well in advance of the rest of the world. He was, for instance, one of the first to see that in a digital electronic future, the point where print ends and electronic begins would become increasingly difficult to discern. In the late '60s as development director of the International Publishing Corp.—the world's largest magazine publishing group—he was the moving spirit in the abortive merger of this corporation, the British electronics goup Plessey, and computer manufacturer ICL.

Today Beer lives a simple life in a little cottage set deep within the heart of an old overgrown quarry, which in turn is buried in the depths of Wales (he has learned the language.)

His cottage has electricity, but no telephone or running water. The only sounds, apart from the distant rumble of a local farm's daily milk lorry passing down the lane, are the sounds of birds and, occasionally, of taped music of Beer's singer son, Mark, who at the time of this writing had a number one spot at the top of the Italian pop charts.

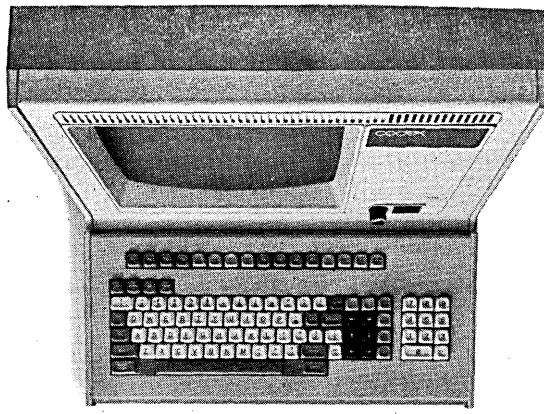
So there sits Stafford Beer, thinking, painting, writing poetry, and practicing yoga. He is not, however, entirely cut off from the world. He comes out to teach his students, both in England and America, occasionally consults, and lectures. But always, he hurries back home.

—Rex Malik

ral pathways so thoroughly diffused and profusely interconnected that it's unmappable by the conscious mind. The probability that any input to this network will trigger a correct response is excellent, though for any particular path through the network the probability of success is always miserably low. The cortical control center cannot be replicated in the corporate control system, but it is now possible, Beer argues, to design that system so that

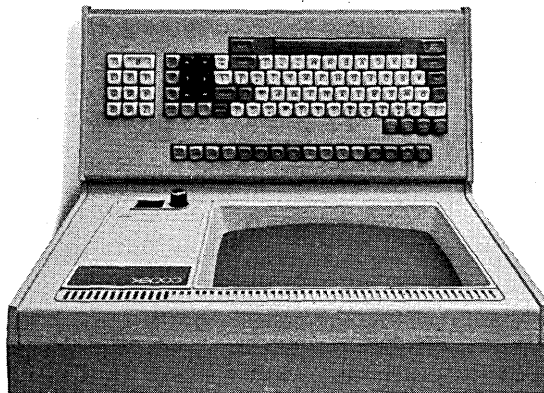
as a whole it mimics the probabilistic operations of the human brain.

7. *Computers reduce variety.* If "variety" is reformulated in binary terms, an initial set of say, 524,288 different possibilities, becomes at once a mere 18. This smaller set can then be reduced smoothly and swiftly to just two options. Since the digital computer is an immensely more powerful binary operator than the human brain, this is its true



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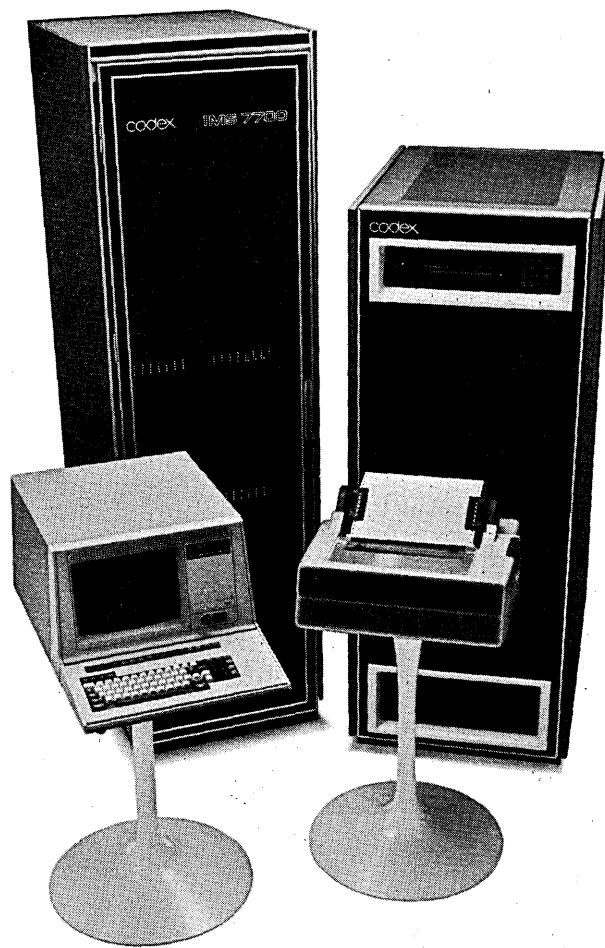
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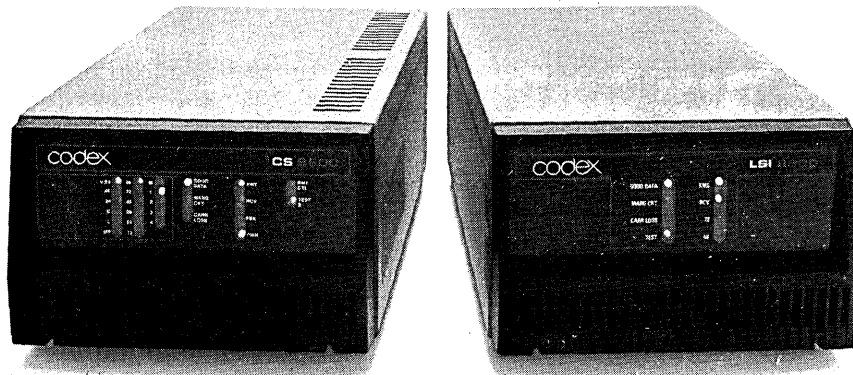
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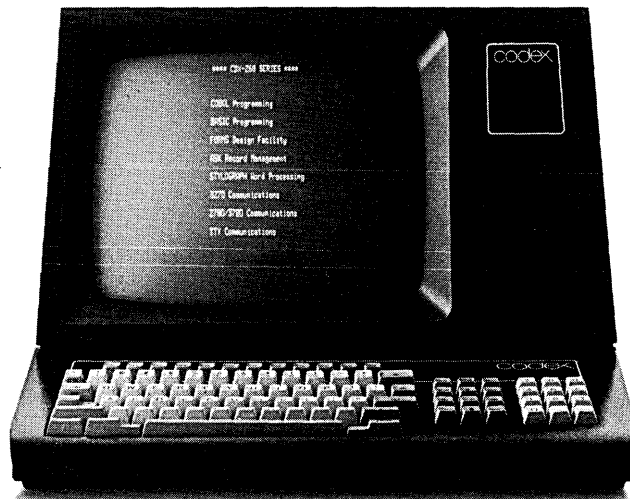
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point of leverage in corporate control. To be sure, it cannot exert its leverage until decision making is thought of, and thought through, as a binary process. Human decision making has always in fact been that kind of process, but for millenia there was no real need to explain this to ourselves.

8. *Computers can learn and can become smarter than people.* Beer validates this double proposition in just a few pages, which should be a pleasure to read for believers and doubters alike. He spends more time on the question that follows: If the computer can be instructed to operate on input variety to define a usable small set of decision-making options, any of which may have an internal structure that literally surpasses human understanding, have we really been helped? We have, because the computer can be further instructed to rank those options according to higher-level criteria that at the same time are simple enough for us to use, like "What costs more?" or "What takes longer?"

9. *The corporate control system must have distinct "conscious" and "autonomic" control modes.* Beer fills several chapters sketching the startling implications of this startling claim. His basic thought, though, can be expressed very succinctly in neurophysiological terms: We do not decide consciously to do most of what we actually do. We aren't even aware of our ceaseless autonomic activity. Yet none of this impairs our justified confidence that most of the time we are in control of ourselves.

10. *The building blocks of corporate control must be alike and different at the same time.* Any complex organism can be controlled only through a functionally arranged, hierarchic multiplicity of systems (which cannot be mapped as an organization chart, Beer warns). Each of these systems is like all the others in basic structure. For example, each must have distinct conscious and autonomic modes. In terms of interconnection with the rest of the overall system, though, there is a unique system design for each level of the control hierarchy. (So the problem of input variety has a built-in component, too.)

11. *The information top management really needs must be separately collected and processed and must flow along separate pathways.* Beer contends that no part of a complex system can do its own job well and at the same time truly understand what the whole, of which it is a part, is doing. Neurophysiologically, the heart remains ignorant of the mind's reason. The situation is essentially the same in the corporation, only not so easily expressed. Top management cannot rely on the lower levels of management to pick out the information needed for conscious control from the much larger volume of inputs used in autonomic control. That's one of many

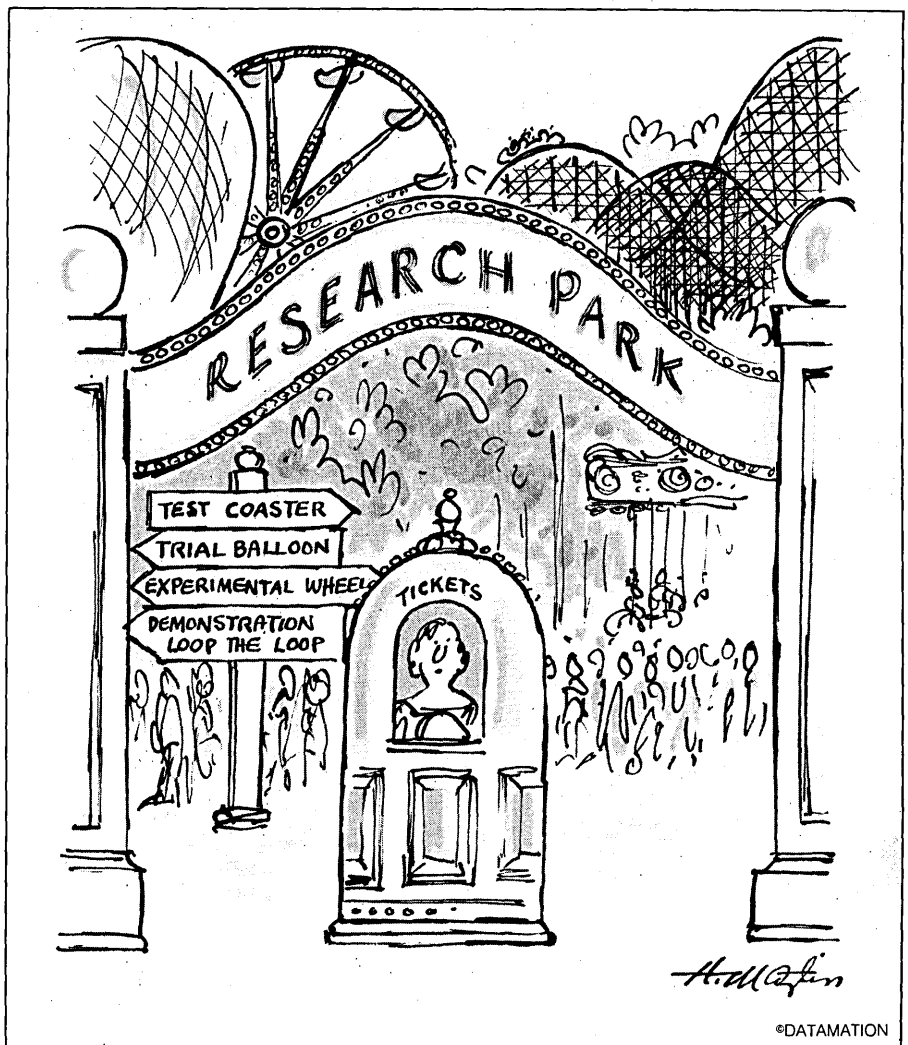
reasons why Beer believes that almost all of today's databases aren't worth the silicon they are stored on.

12. *Performance measurement for control purposes must be in pure numbers based on statistical probabilities.* Beer again needs quite a few pages to make his point. Here the point is that no other, more conventional metric can establish swiftly enough the relationships among what is being done, what has been decided to be done, and what will probably be done next and farther in the future. Without a firm grasp of these relationships, Beer stresses, management will remain condemned to managing after the fact, its eyes on the rearview mirror instead of straight ahead.

13. *But numbers should be left where they belong—in the computer.* The final readouts for decision making should be in analog form wherever possible. Should this seem puzzling, consider how long it would take you to decide that a crowded intersection was safe to cross if all you could use were the exactly expressed absolute quantities de-

scribing all the variables of the situation. What you rely on, of course, are analog evaluations of relative force and motion that come so naturally you aren't even aware of making them.

14. *Managerial control in real time is now virtually possible.* Believe it or not, Beer argues very persuasively that technology has reached the point where computers can be used to predict, with a sufficient degree of confidence, what is likely to work for the corporation as the environment continues along its unpredictably changing way. First-class but feasible operations research for the modeling of the criteria of internal operation, sophisticated but feasible dp design based on well established methodologies in the logic of decision making and probability theory, and new ways of managerial thinking—that's all it will take, Beer says. He adds a final provocation: If managers do ever reach the point of decision making by "inventing the future," then whenever they come together for this purpose, not a single piece of paper should be allowed in the door. *



An excerpt from the first full-length biography of Herman Hollerith, inventor of the punched card tabulating machine, entrepreneur, and a founding father of modern information processing.

WINNING THE MERCHANTS

by **Geoffrey D. Austrian**

With his thinning hair turned steely gray, Hollerith looked fully his 45 years as he peered out at the world through steel-rimmed glasses. His battles and worries had taken their toll, which was reflected in his rapidly changing moods. "You never know what he will do," one of his workers was heard to remark. It was rumored that the doors on his home were built extra strong so that they wouldn't fly off their hinges.

Since he had written "my invention is no longer a crude idea" as a young man 21 years before, Hollerith had counted on the Census Office as the main proving ground for his ideas. He had relied on its hundreds of clerks and ample resources to provide a record of practical work performed. And "Dr. Hollerith's Work-Shop" at the Census Office had been a staging point for both the hand tabulating machines and the newer automatics. The unique demands of the census more than anything else fueled the creative drive that pulled his business ahead. Suddenly, in mid-1905—when the Census Office, now a permanent bureau, was becoming the statistical clearinghouse for the government—Hollerith found himself looking in from the outside. He had to rechart his life at mid-career. "After my row with [census director] North," Hollerith would later recall, "I devoted myself entirely to commercial work."

Where many men would have caved in and spent time counting their losses, Hollerith released a store of restless and explosive energy. "I have been working for some time with the Pennsylvania Railroad, trying to get them into shape," he wrote George F. Swain (a professor at MIT and a longtime friend and backer of Hollerith's company) 18 days after his machines were expelled from the Census Bureau. "We have started using the machines at the shops of the Atchison, Topeka, & Santa Fe . . . [and] at the Denver Gas & Electric and I am also in correspondence with Brown & Sharpe. . . . The Regal Shoe Company is also coming along."

The seeds that Hollerith had planted in defining his first commercial applications a few years before were beginning to grow. Even the railroads, which had derided his

"white elephant" machine at the New York Central, were starting to show some life. In 1904, Hollerith had feared losing the Pennsylvania, but inch by inch he was winning over its affiliated lines. In August 1903, the Long Island Railroad started experimenting with his system. In 1904, the West Jersey & Seashore Division had come aboard in March; the Northern Central in June; the Philadelphia, Baltimore & Washington in August; and the Philadelphia & Erie in September. The total had grown in 1905: the Buffalo & Allegheny in January, and the United Railroads of New Jersey in May. Now Hollerith was closing in on the parent Pennsylvania itself: "They are using the machines, but . . . not . . . for the entire system and, therefore, in a certain sense, must be looked upon as still experimenting. Ultimately, I want to get the shops at Altoona to use the system for cost accounting."

At his urging, the Pennsylvania's comptroller, Max Riebenack, wrote to Gershon Smith on July 11. Inviting the railroad official "to visit our works . . . to show you what we have accomplished," the Pennsylvania Steel Co.'s comptroller replied: "We are making a daily distribution of all our labor (9,000 men) at Steelton, also of our stores and supplies, and, partially as a result of our using this machine since January, 1904, we have gained 14 days' time on our monthly costs." All of the work, Hollerith's friend reported, was now proved out daily and at less cost than under the old system. Three departments were also tabulating detailed costs of shop orders. Smith concluded: "To enable us to do this, we have one pretty good man at the head of the Tabulating Department who is selected for his executive ability and not loaded down with details. Most of the punching of the cards and the reading of tabulations is done by boys to whom we pay salaries of from \$25 to \$30 per month."

In later years, Hollerith was fond of saying that after he lost the Census contract, "one customer brought another." While the inventor's personal distaste for salesmanship barred him from soliciting business himself, he nevertheless found it permissible, and dignified, to have others speak for him. And who could do so better than an enthusiastic

and knowledgeable customer? In mid-1905, the proselytizing Smith [who later became general manager of the Tabulating Machine Co.] was also penning letters to Browne & Sharpe and to his former employer Pope Manufacturing Co., the bicyclemaker at Hartford. A year later, another convert, Pierre Bontecou, who had been employed as a tabulating clerk at the New York Central in 1900, wrote Hollerith from Yale & Towne, eager to know "all the different ways the machine is being used. . . . If I can interest the firm to handle the tabulating work on a large scale, it will make a good thing in the way of promotion for me and would also make a market for the machines."

Recalling the young man favorably, Hollerith replied, describing the Pennsylvania Steel installation and enclosing "a number of different cards used by some of our customers." Among them was the card the Studebaker Brothers at South Bend, Ind., were trying for keeping an inventory of their lumber supply. "In their case, they make quite a use of the cards for keeping a running inventory of their stock on hand. In the case of lumber, of course, the question is not only quantity, but how long in stock. In other words, the question of seasoning is important." Soon, Yale & Towne was expanding its installation and Bontecou was winning a reputation for which his future fellow IBM sales representatives would hail him:

Oh, he's strong for the system;
He makes it pay,
He carries great schemes in his hat,
He got seven raises last year,
So they say,
Now what do you know about that?

Although he was disdainful of hiring salesmen—"If the machines are any good they will sell themselves"—Hollerith was not beyond reacting when an important prospect failed to show interest. Annoyed that he had never heard from any of the New England railroads, he wrote to Swain: "If you would get Mr. Tuttle (President of the Boston & Maine) to write to the Fourth Vice Presi-

Excerpted from *Herman Hollerith: Forgotten Giant of Information Processing* by Geoffrey D. Austrian. Copyright © 1982 Columbia University Press. Reprinted by permission of the publisher.

PHOTOGRAPH BY STEVE COOPER. PORTRAIT COURTESY OF HOLLI FRITH FAMILY

"His personal distaste for salesmanship barred him from soliciting business himself, but he found it permissible and dignified to have others speak for him."

dent of the York Central Railroad, or if you could get him to write to the Pennsylvania Steel Co. regarding their use of the machines at Steelton, I think it would be a great point for us. Can you not arrange to do that?"

At the same time that he was encouraging friends and admirers to seek new business, Hollerith was also keeping a weather eye on possible competition, though he had little to worry about in 1905. He reported to Swain: "I had understood . . . that [Charles F.] Pidgin [whose machines had replaced Hollerith's at the Census] was trying to get into railroad work. Of course I am sorry, for his efforts in this direction will probably simply result in bringing the tabulating machines into ill favor, due to his ridiculous ideas." Ridiculous or not, Hollerith was taking no chances. He had copies of the Census Commission's Competitive Report for 1900—in which he had defeated Pidgin—printed up and distributed to his friends. He also asked Swain: "If you can in any way get some idea of what Pidgin is driving at, it will be of great service to me."

NEW LINE ABSORBS HIM

The stirrings among his new commercial customers buoyed Hollerith's spirits. But by far the most important activity that engaged his renewed flood of energy was the impending birth of a new line of machines. He wrote to Swain: "We are developing an entirely new line of tabulating machines for commercial work which I think promises much better results than the old forms. While we have lost the Census Office contract, as you know, there is plenty of work in other directions."

Taft-Peirce, the supplier of Hollerith's machines for the 1900 census, had floundered two years before, but had been wrested from bankruptcy almost singlehandedly by its acting receiver, Frederick S. Blackall. A bear of a man, who stood six feet three in his stocking feet, the shrewd and energetic Blackall had not only paid off all the firm's debts in two years' time—the receivership was terminated Aug. 22, 1905—but had repurchased the Tabulating Machine Co.'s 1,970 preferred shares. The transaction, in which Hollerith's company received almost what it had paid for the stock, was the best of two worlds. Under Blackall, vice president and general manager of the reorganized company, Taft-Peirce would continue to manufacture Hollerith's automatic sorters, tabulators, and key-punches. Though it had parted with its interest in Taft-Peirce, Hollerith's company held onto its most valuable asset. On May 1, 1905, it employed Eugene Ford "as a mechanical engineer for . . . developing, improving, and perfecting" the machines and devices used in its business.

While Hollerith respected the talents

of few people, he had a high regard for those of the Mississippi-born engineer. When Ford, who was married to a local girl, insisted on working "within 40 miles of Uxbridge, Massachusetts," Hollerith agreed, paying \$25 a month for work space that Ford selected. He nevertheless cleared out a large light front office next to his own in the Georgetown plant, which he reserved exclusively for Ford's infrequent visits. On his part, Ford considered himself more than another "hired hand." Though paid the handsome salary of \$150 a month for the first year—he would receive \$200 the second—Ford was also eager to have a stake in Hollerith's company. Earlier, Swain had told Hollerith that he wanted to dispose of a few shares of his Tabulating Machine Co. stock. Hollerith replied: "Regarding your stock . . . Mr. E. A. Ford . . . who is now engaged in making designs for the newer forms of machines on which I am now working, is the one who wants to purchase this stock. Ford knows the condition of the Census Office contract, and as he is anxious to buy some of the stock . . . his opinion of the newer development of the machines must be quite favorable."

The "new forms" of machines, although basically refinements of the automatics developed for the 1900 Census, differed markedly in appearance. The automatic feed unit that had perched on a separate stand by the side of the tabulating machine had lost its makeshift appearance. It was now joined solidly to the left side of the machine. The counters, or adding machines, which had peered at the operator through a glass case at the rear of the console, were now sunk downward into the base of the machine. Only the counter wheels, raised slightly above the work surface, remained visible. A crank, not unlike that for starting a car, appeared on the right side of the tabulator. By turning the handle, the operator cleared the adding wheels and reset them to zero. Brushes, similar to those already in use in the sorter, took the place of the reciprocating pin box; as in the sorter, they could sense cards in motion. Gone completely in the new models were the oak and ash covers of the earlier machines—and the homey feeling the wood imparted. Instead, impersonal metal panels, mounted on steel frames, lent a functional and strictly businesslike appearance to the new commercial line.

For the most part, Hollerith had neatened up his older designs. But there was a new and useful element, borrowed from the telephone switchboard. It was the plugboard used by operators to route calls before automatic dial systems came into use. In Hollerith's earlier machines, connection between the counters and the mechanism that sensed hole positions in the card had been hard-wired. And the resoldering of wires, a deli-

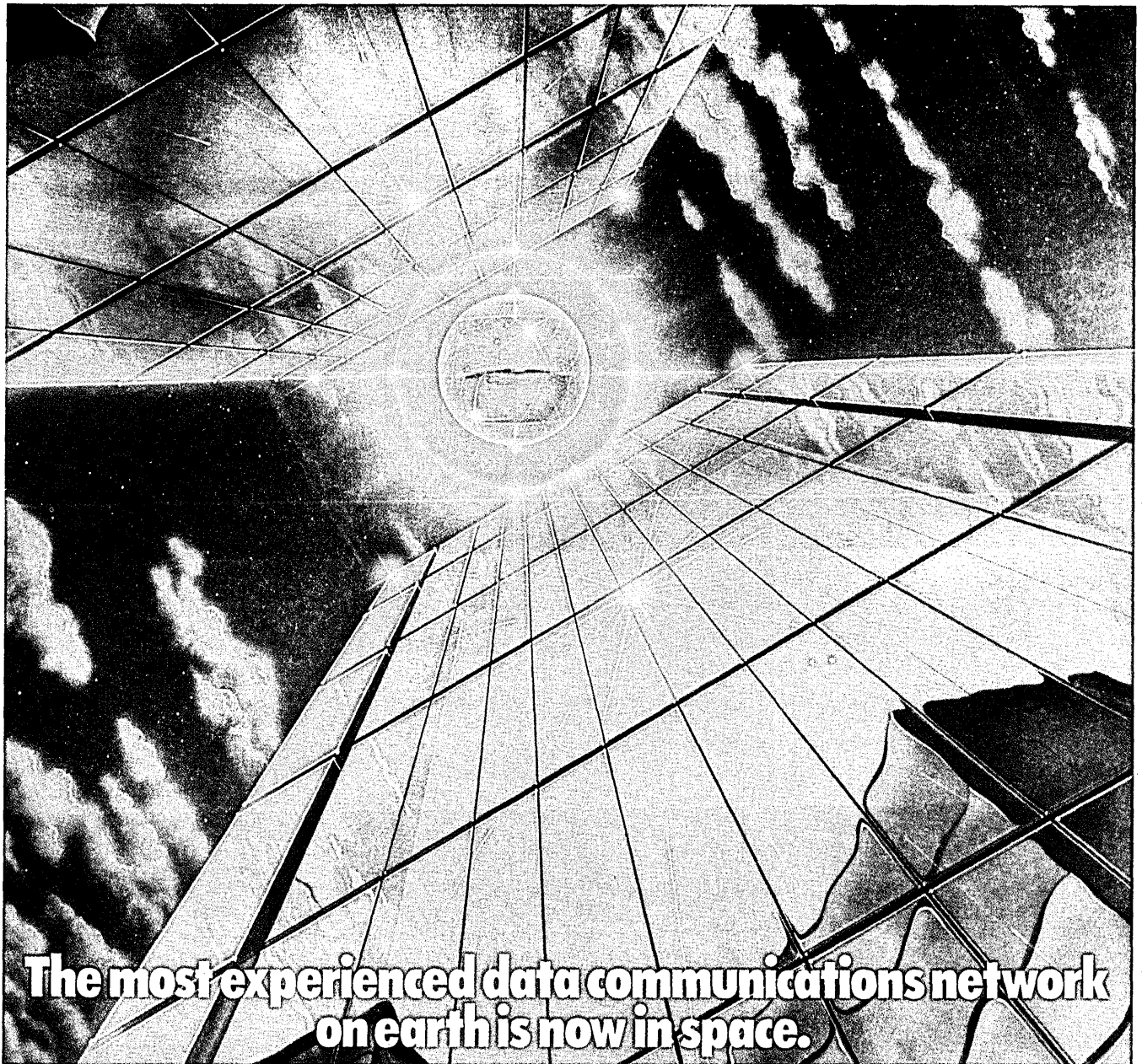
cate and time-consuming chore, had been necessary to set up the machine for different jobs. Now Hollerith could "reprogram" his machine for different jobs by simply unplugging and replugging wires in a panel. The rewiring of back panels was a task that would become familiar to generations of people who worked with tabulating machines over the years.

While he was drastically changing the appearance of the tabulator, Hollerith was also altering the sorter—almost beyond recognition. The railroads had complained that the horizontal sorter, designed for Census work, had taken up too much room in crowded stationmasters' offices. So the highly practical Hollerith literally stood the assembly on end. In his new "vertical" sorter, cards were fed downward from the top of the five-foot-high unit into a series of 12 chutes corresponding to the 12 positions in the column of a card. In addition, the machine was speeded by giving its feed mechanism a continuous rather than an intermittent action. Because it was difficult for women operators in tight-laced corsets to unload the bottom or "nine" pocket, the machine soon became known as the "backbreaker."

A MIX OF COMMERCE, INVENTION

Hollerith's actions in bringing out his new commercial line show a curious mixture of the cautious engineer and the bold entrepreneur. At times, one appeared to be at war with the other. On occasion, he was, once again, the inventor who in 1902 adamantly refused to disclose his work at the New York Central "until some experiments . . . in the way of feeding the machines, as well as running them by electricity, should reach greater perfection." At other times, stung by the loss of his Census business, he seemed almost overeager in his pursuit of commercial success.

A model of the new tabulator had been completed by June of 1905, when the inventor sent a photograph of his latest progeny to Swain. "I was glad to receive the cut showing your new machine," his friend replied, somewhat uncertainly. "It looks quite complicated." Hollerith labored over the prototype for another year and a quarter, at which point he received a letter from the general auditor of the Union Pacific Railroad. On Sept. 8, 1906, auditor Erastus Young had finally gotten around to reading the *Railroad Gazette* of July 4, 1902, describing Hollerith's application at the Central. It was the same article that had led Mr. Martin of Marshall Field to install a system three years earlier. Young wrote: "I would like to have you advise me if the machines can be adapted to our requirements and, if so, what the cost would be to install them and supply the cards. If adopted for the Union Pacific, and their use



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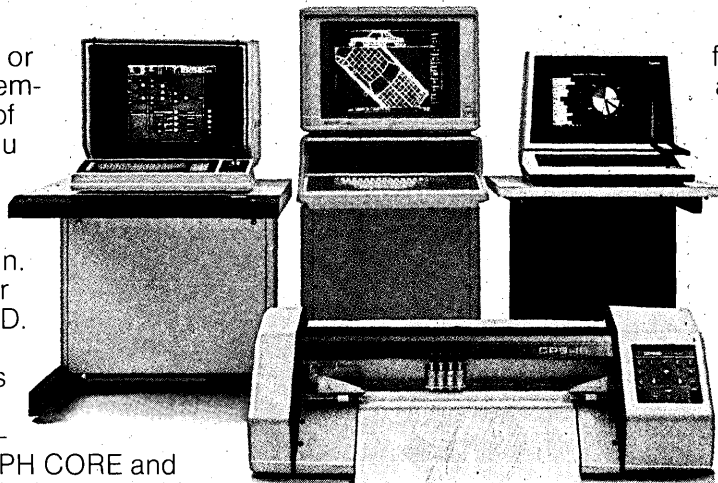
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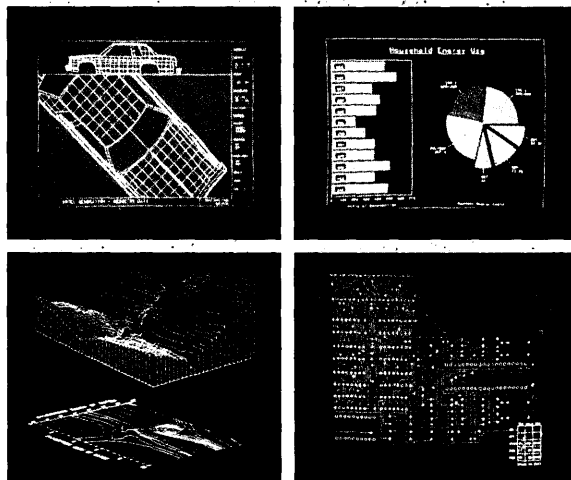


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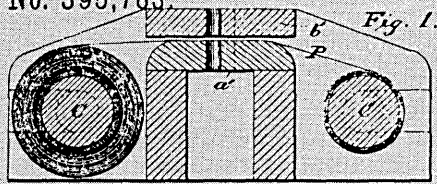


Fig. 3.

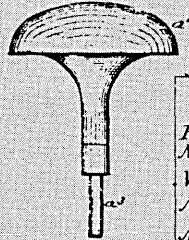


Fig. 4.

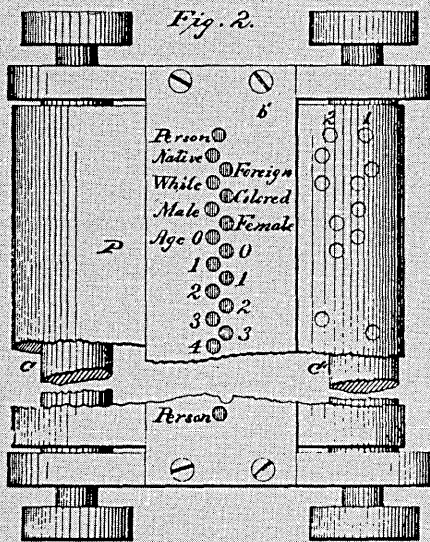
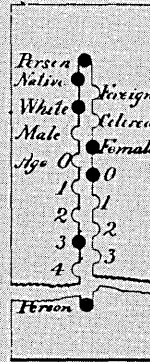


Fig. 6.

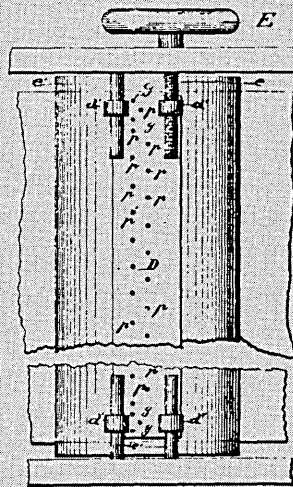
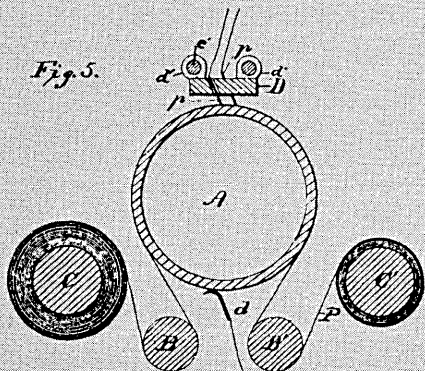


Fig. 5.



WITNESSES.

Chas. R. Burr
 A. Stewart.

INVENTOR

Norman Hollerith

product. On Dec. 12, the Western Electric executive replied:

“It is better to go ahead and get some new machines out than to wait for the last touch. We will probably never be able to get out a machine in which we will not see chances for improvement in a later lot. But . . . the difficult and important thing is to decide whether it is worthwhile to interrupt business in order to try to get perfection.

“On the kind of stuff that we make, we try to get it in as good shape as possible and get it into process of manufacture. Then, we periodically round up the thing in view of our experience and the experience of the people using the apparatus and make changes at the convenience of the shop. Of course [in] the case where we find that something is radically wrong . . . we have to make changes at once.”

It was good to be able to rely on the levelheaded and sensible Thayer, who had only recently been made vice president of the largest manufacturing company in the world. Thayer, Salt, and Metcalf, sitting as the Tabulating Machine Co.’s executive committee, approved and ratified the action of their general manager in ordering 25 automatic machines from Taft-Peirce.

The Woonsocket mechanics worked with care on the delicate new mechanisms. It was not a job that could be rushed. Jigs and patterns had to be made; new tools ordered; armatures for the magnets and other parts procured from Western Electric and a host of other suppliers. But nine months later, the demanding inventor wrote Thayer, apparently pleased with the progress. On May 24, Thayer replied: “I am glad to hear that the tabulating machine is coming out so satisfactorily.” Then, a few days later: “I would like to go to Washington to see that new machine, but have found it a little difficult planning ahead.”

Meanwhile, nearly a year after its inquiry, the Union Pacific was beginning to wonder about the new-style machines whose early completion Hollerith had predicted. And its freight auditor inquired of his superior: “Do you know in what shape that Washington Machine (Statistical) matter is at the present time?” Hearing from the line, Hollerith confidently announced on August 7 that the first shipments had been made. “Our preliminary tests satisfy us that we have finally perfected this machine and that the same will work satisfactorily. Unless we meet with some difficulties in the use of the machine . . . we will be prepared to furnish machines of this type about December 1st or January 1st.”

While Hollerith the engineer was bending all his efforts toward the mechanical

proved satisfactory, I would have them used by the other lines also.” The Harriman lines, as they were known, included not only Union Pacific but also the Central and Southern Pacific routes. It was a tempting prize for the small Tabulating Machine Co. With uncharacteristic confidence, Hollerith almost arrogantly prescribed his untried system for the important customer:

“Kindly allow me to postpone replying to your letter in detail until we have completed the experiment . . . in regard to the new style tabulating machine.

“I believe you have seen the machines at the New York Central Railroad and will probably remember that these machines

operate at a speed of from 50 to 60 cards per minute, and each machine requires an operator. The machine we are now building . . . is arranged with automatic feed, and tabulates cards at the rate of 180 to 200 per minute.

“In view of the vast improvement, and the probable early completion of this machine, it would . . . hardly pay to equip such a large railroad as yours with the old style machines.”

Only three months later, the cocky businessman was replaced by the cautious engineer. Reluctant to let his new tabulator go into production while any improvements could still be made, Hollerith asked Harry B. Thayer’s advice on bringing out the new

“Hollerith’s actions in bringing out his new commercial line show a curious mixture of the cautious engineer and the bold entrepreneur.”

perfection of his new tabulators, Hollerith the businessman had almost neglected to work out a suitable means of charging for them. It was a scant three weeks before the first customer shipment that the directors of the company got around to adopting a rental plan.

In offering his first automatics to commercial customers four years earlier, Hollerith had charged only for the number of cards ordered. The price had included a free license to use the machine for the application specified. In this way, customers paid for the amount of work actually done. The fairness of the old plan depended on the ability of each machine to handle the same amount of work. However, the new machines varied greatly in size and capacity, since each was practically custom built. Depending on the customer’s requirements, a tabulator could now be ordered with anywhere from two to five counters, or separate adding mechanisms, for totaling as many different classes of information. Within each field of information, the customer would, in turn, require a varying number of columns, depending on the number of digits in the figures to be added. Therefore, Hollerith offered the counters with from two to seven counterwheels—one for each column to be added. Because one of the new tabulators might do twice as much work as another, while using the same number of cards, the new rates were pegged to the size and capacity of the machine.

Each customer, Hollerith decided, would be asked to pay a standard fee of \$35 a month for the base, or mainframe of the tabulator. Each counter, or adding mechanism, was \$3 a month additional. And each magnet, which controlled a column or digit of an adding field, was 50 cents a month more. A typical tabulator, Hollerith figured, would rent for \$40 a month. In contrast, the sorters, which were all alike, rented for a flat \$10 a month.

RENTALS NOT HIGH ENOUGH

How did the rentals for his machines relate to their costs? Hollerith explained: “If we can build these machines in reasonable quantities, the outfit of a sorting machine and tabulating machine would cost \$700 to \$900 at the very highest. Out of this, the sorting machine would cost about \$300. We charge only \$10 per month rental for the sorting machine, but for the tabulating machine the average rental will be about \$40 per month, this being dependent upon the size of the machine.”

While today’s computers pay for themselves in approximately seven years, Hollerith’s tabulators would earn their keep in 20 months, while his sorter would pay its way in 30 months. It looked like a good paying proposition, though Thayer worried about the rel-

atively lower charge for the sorter. He wrote: “In regard to . . . sorting machines, . . . it is all right to get all you can for them until we can find out what they really ought to cost. It is evident that the present price is not enough in proportion to the present cost. Is Ford doing anything to get new estimates on the machinery?”

How would Hollerith charge for servicing the new machines? For his earlier automatics in 1903, the inventor offered free installation and service and repairs at cost after six months. Still more confident of his new machines—Hollerith built with the soundness of his German locksmith ancestors—the inventor promised “to make all necessary repairs and replacements” at his expense except where negligence was involved. But if the Union Pacific at Omaha and the Southern Pacific at San Francisco became his customers, Hollerith would have new costs to worry about as his business spread westward across the country. “The customer pays all the charges for transportation,” he now decreed, “and all traveling expenses in connection with our representatives.” His new policy would prove a sound one from a business standpoint, as Hollerith would later recall. “Always make a customer know that he is to pay the freight and all other details in connection with the order, and you will avoid a lot of trouble.” However, in 1907, some customers worried about getting any service at all. Before placing his order a few months later, the Union Pacific’s auditor would write to his superior:

“If it can be arranged to have repairs made at the Union Pacific Shops here in Omaha, I think it should be done. Mr. Hollerith may, however, object to this. If so, and it is necessary to return the machines to the factory for repairs, I think we should ascertain if they can be made promptly, as it would place us in a rather serious predicament to be without either an Assorting or a Tabulating Machine.”

There was some doubt whether Clarke Hayes, Hollerith’s man in Chicago, could make it as far west as Omaha. Fortunately, repairs to Hollerith’s machines, other than routine maintenance, would become virtually unknown. Asked in 1916 to tell a company sales convention how to handle repair calls at distant points, Clark Stoddard, Hollerith’s first representative in San Francisco, felt compelled to decline. He had made only two repair calls the previous year and these were for minor adjustments.

In 1907, as before, the supplying of cards remained an important and profitable part of the business. “Under the contract,” Hollerith explained, “the customer buys all of his cards from us.” Sulphite paper cards, printed in black ink and properly cut, came in

two lengths, 5 $\frac{1}{8}$ and 7 $\frac{3}{8}$ inches.

“These cards we sell at 85 cents and \$1.00 per thousand, according to size. The cards which we sell at \$1.00 per thousand cost us about 30 cents per thousand to make, and you will therefore see that besides the rental of the machines, we get a good profit on the cards.

“ . . . When you see that customers like Marshall Field & Co., Simmons Hardware Co., and others would use at least 10,000 cards per day, you can see that profit on the cards will amount to quite a considerable item.”

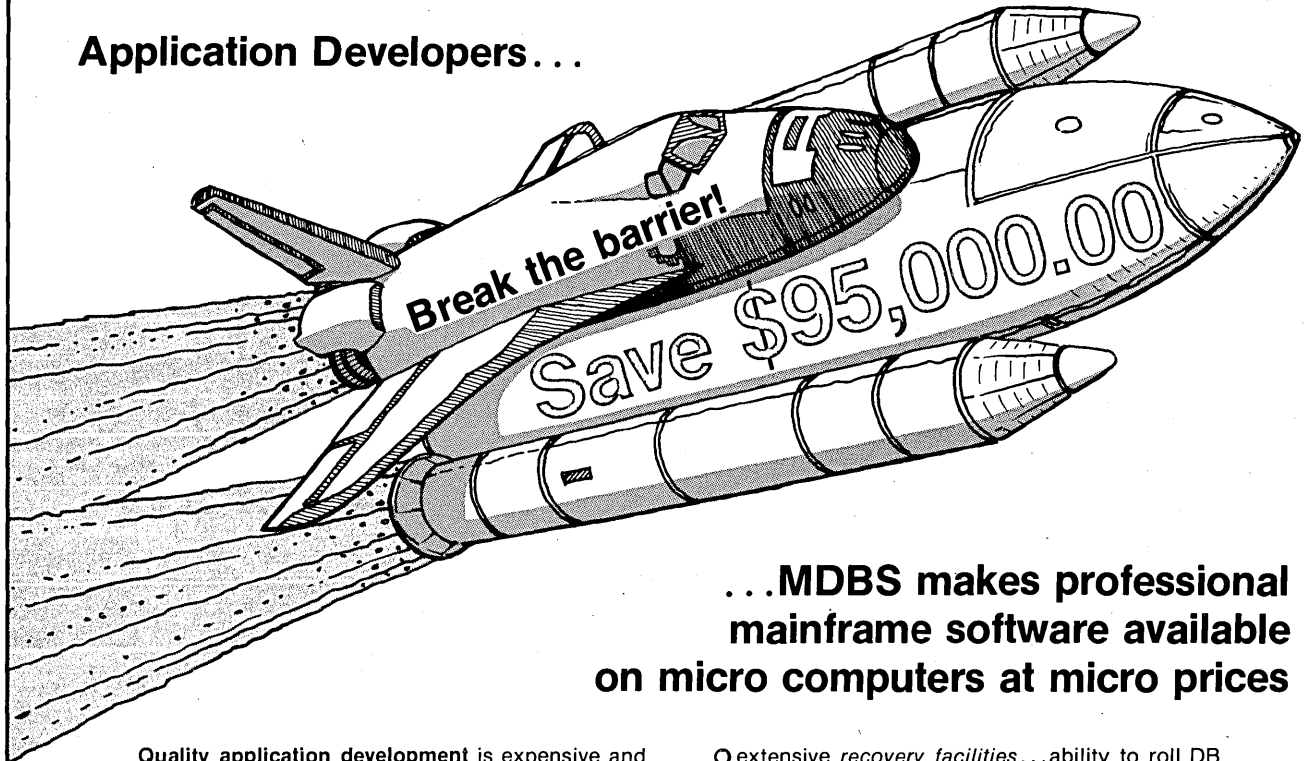
Since he had lost his Census contract two years before, Hollerith had been actively pushing his commercial business. Suddenly, in mid-1907, it was beginning to push him. While the railroads had been unimpressed with his earlier systems, the new automatics had apparently tipped the scale, as he reported to Swain:

“I have urgent requests for machines from the Southern Railway, the Chicago Great Western, the Chicago & North Western, the Great Northern and the Northern Pacific. The Union Pacific have asked me to send a representative to Omaha and the Southern Pacific have sent their chief statistician from San Francisco to see me and he is now in Washington.”

Having fought for the railroad business so hard, Hollerith was immensely pleased by the lines’ sudden interest. Having been kept waiting for so long, he was also content to let them cool their heels while he took care of his other customers. Perhaps untactfully, he informed the Southern Pacific’s auditor that since the railroads were so slow in taking up his system, he had commenced to develop the mercantile and manufacturing lines. Among his present customers, he informed the auditor, were Marshall Field, Eastman Kodak, National Tube, American Sheet & Tin Plate Co., Pennsylvania Steel, Western Electric, and Yale & Towne. Negotiations were also in progress with Simmons Hardware, Heinz Pickle, Regal Shoe, and Carnegie Steel. With no more machines in sight until after the first of the year, Hollerith might have done better to hide his evident satisfaction. Southern Pacific auditor Hathaway reported on his visit with Hollerith to Erastus Young, general auditor for the affiliated lines at Omaha:

“I found him quick, alert and apparently very eager to push his business. As evidence, he apparently took a great deal of pleasure in showing his letters and the increasing demands for his machines. But . . . in many cases, there was an urgent request for more machines or more supplies which he

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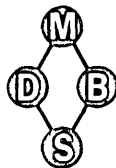
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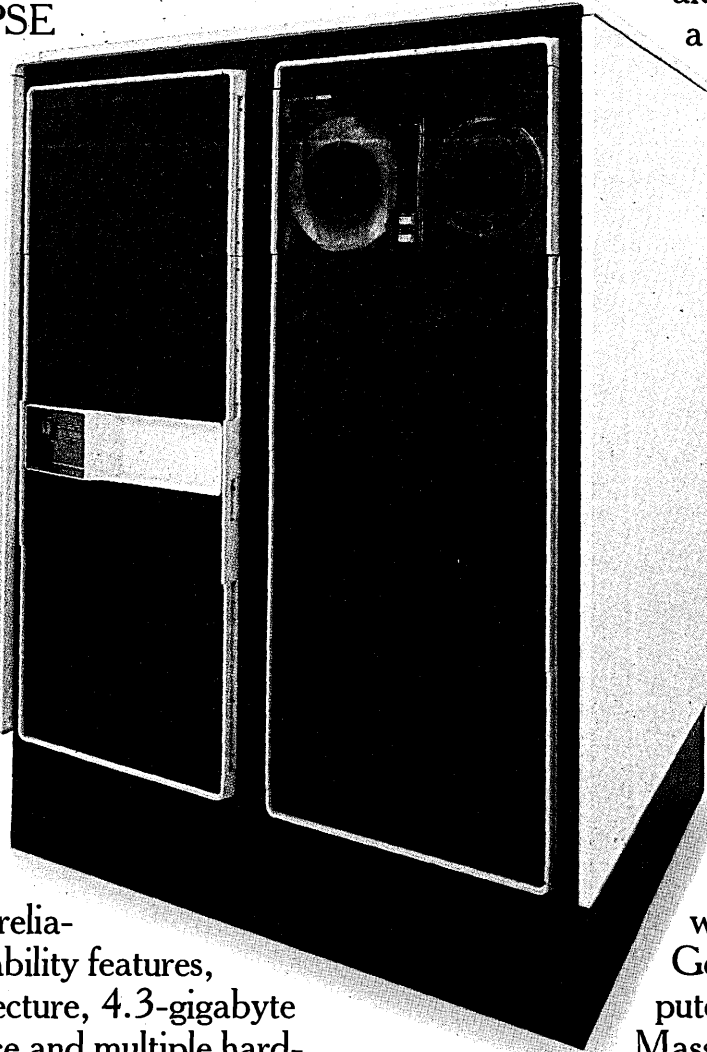
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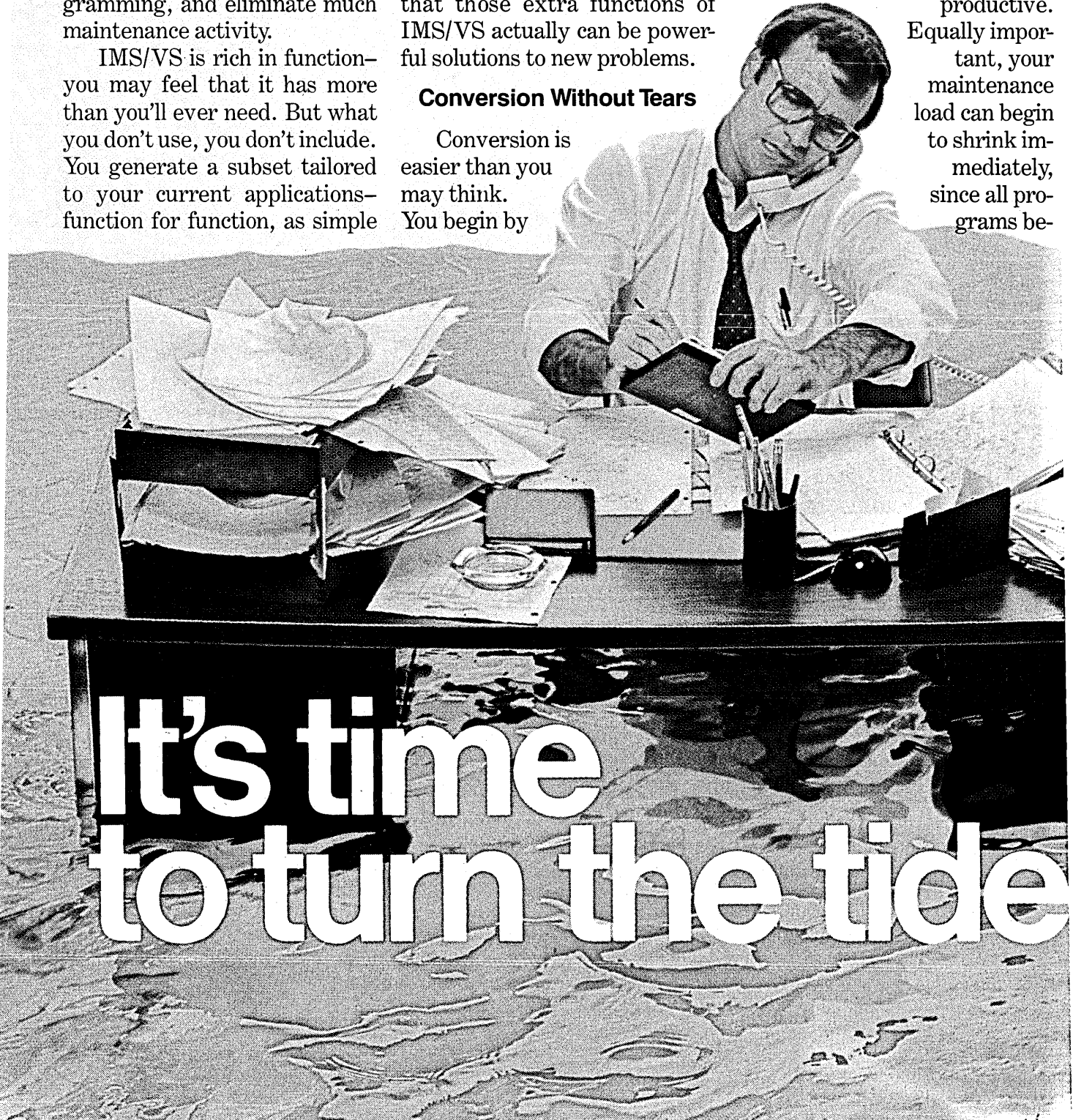
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was obliged to put off."

While in the East, Hathaway had dropped by at the Southern and at the New York Central. "... everyone using the machine," he found, "is more than satisfied with the results." But there were some doubts about the inventor's ability to stay on top of his business. Mr. Peabody, the Santa Fe's statistician, who had put his order in before his cohorts, was "making all of his statistics by four distributing and three computing machines." But "he was better pleased with the machines than with Hollerith." Mr. Peabody said that "a good-size stock company ought to take it and manage it and let Hollerith go on with his experiments." But, in Peabody's view, "Hollerith will not listen to any proposition that takes the management out of his hands."

In point of fact, Hollerith's success was reaching crisis proportions. Not only was he unable to deliver the new commercial line to his railroad customers in the summer of 1907, he was even hung up in finding enough of the old hand machines. The auditor of the National Tube Co. complained:

"We are up against a very nasty proposition at two of our mills . . . due to the non-receipt . . . of two of the four tabulating machines I ordered last December. At National Works . . . we are going to get into serious trouble in case we are unable to secure an additional machine of either the old style or one of the new design. The same conditions prevail at Lorain, although to a lesser extent.

"While we know you are being hounded all the time for machines, this is a special case and I would like to know when we may count on receiving one or the other of these machines."

While some customers were grumbling angrily, others adopted a plaintive tone. Auditor Frank Hewitt of the Heinz Pickle Co. would start factory cost accounting and stockkeeping "as soon as I can secure an outfit." He would not, he explained patiently, press Hollerith for that. In the meanwhile, he implored the inventor for a hand machine to analyze "all orders received, all shipments and sales made and every conceivable kind of entry touching customers' accounts. . . . for one Hand Tabulator, one Assorter and probably three keypunches, also one gang punch, we are in the position of simply 'throwing ourselves on the mercy of the court' and begging for early delivery."

DELAYS IN DELIVERY

Swamped by orders, Hollerith told the Union Pacific in December 1907 to expect a two- or three-month delay. On Feb. 15 of the new year, he again postponed delivery to July 1908. On July 21, he was obliged to write again after numerous

tracers from the company. "We have met with unforeseen and unexpected delays in getting the new lot of machines completed. The Taft-Peirce Company, who are manufacturing parts for us under contract, are behind in their deliveries, so that it is not entirely our fault . . ." But the fault went beyond Taft-Peirce. The Woonsocket company was in turn relying on Western Electric and other suppliers for parts that Hollerith was trying to chase down himself. Although he had become the head of a booming enterprise, the inventor was still acting as his own expeditor and getting Thayer—now president of Western Electric—to do the same! In a typical communication, Thayer wrote: "After hearing from you by telephone last Friday, I got promptly after the armatures and had 428 of them expressed that day by Adams Express to Woonsocket. I neglected to tell you but hope that the armatures were received in good shape."

Besides rushing delivery of parts, the two men were busily looking for new sources of production. Louis de Gaul, the president of the Rowland Telegraph Co., called Thayer. The Baltimore concern, he reported, did not have enough work for its 75 to 100 people. Thayer relayed the message to Hollerith. "From what he told me about his equipment, it occurred to me that it was the kind of shop which might be able to do some work for you to good advantage." Western Electric's Chicago plant might be able to take on some of the new sorters that Hollerith was developing for his larger capacity 45-column punched card. Union Pacific auditor H. J. Stirling summed up the situation after visiting Hollerith's shop on 31st Street:

"There are a large number of orders awaiting to be filled and Mr. Hollerith has had a great deal of trouble with parties to whom he has let out contracts for making of the different parts. . . .

"At his own works in Washington, he practically does nothing but print and cut the tags [cards]. . . . The setting up is also done at his shops in Washington, but the manufacturing of the parts is let out on contract elsewhere."

Though he was opening a major market for his machines, Hollerith was still running his business like the proprietor of a neighborhood store. The spectacle of the world-renowned inventor and the Western Electric president scrambling after parts might have been amusing, if it hadn't begun to hurt. On May 8, 1908, the Bullard Machine & Tool Co.'s treasurer wrote: "It is true we are anxious to install a Hollerith machine but unfortunately are unable to get any satisfaction whatever that the makers can supply us."

The production bottleneck was not the only problem. With the rush of orders,

Hollerith's company did not have the capital to pay for building more machines. He was already aware of the problem, and trying to solve it, when he wrote to Swain in August 1907:

"In view of this extraordinary demand for machines, I would like to go ahead and build quite a number of them. This would take additional capital, and I do not want to lose control of the company, and I, myself, have not enough money to furnish my share of the additional capital.

"Therefore, it may be that we shall issue some preferred non-voting stock, 7% or even more, if necessary. . . .

"One stockholder of the Tabulating Machine Company (not Ferdinand Roebbling or anyone of exceptional means) virtually agrees to take \$10,000 worth of such preferred stock. If we can get the money, it will undoubtedly pay us to build these machines and put them out just as quickly as possible."

With the market sinking on Wall Street—1907 was the first bad year in a long time—Thayer was not nearly as sanguine as Hollerith about floating the preferred stock issue. Few of the directors, he believed, could take up the issue. And, under present conditions, it could not be made attractive enough to attract outside capital.

"So many good stocks and bonds . . . can be bought at prices now which seem reasonably sure of large returns . . . so that any one buying pretty near anything on the stock market would be comparatively sure of getting a good return and a chance to sell later at a profit."

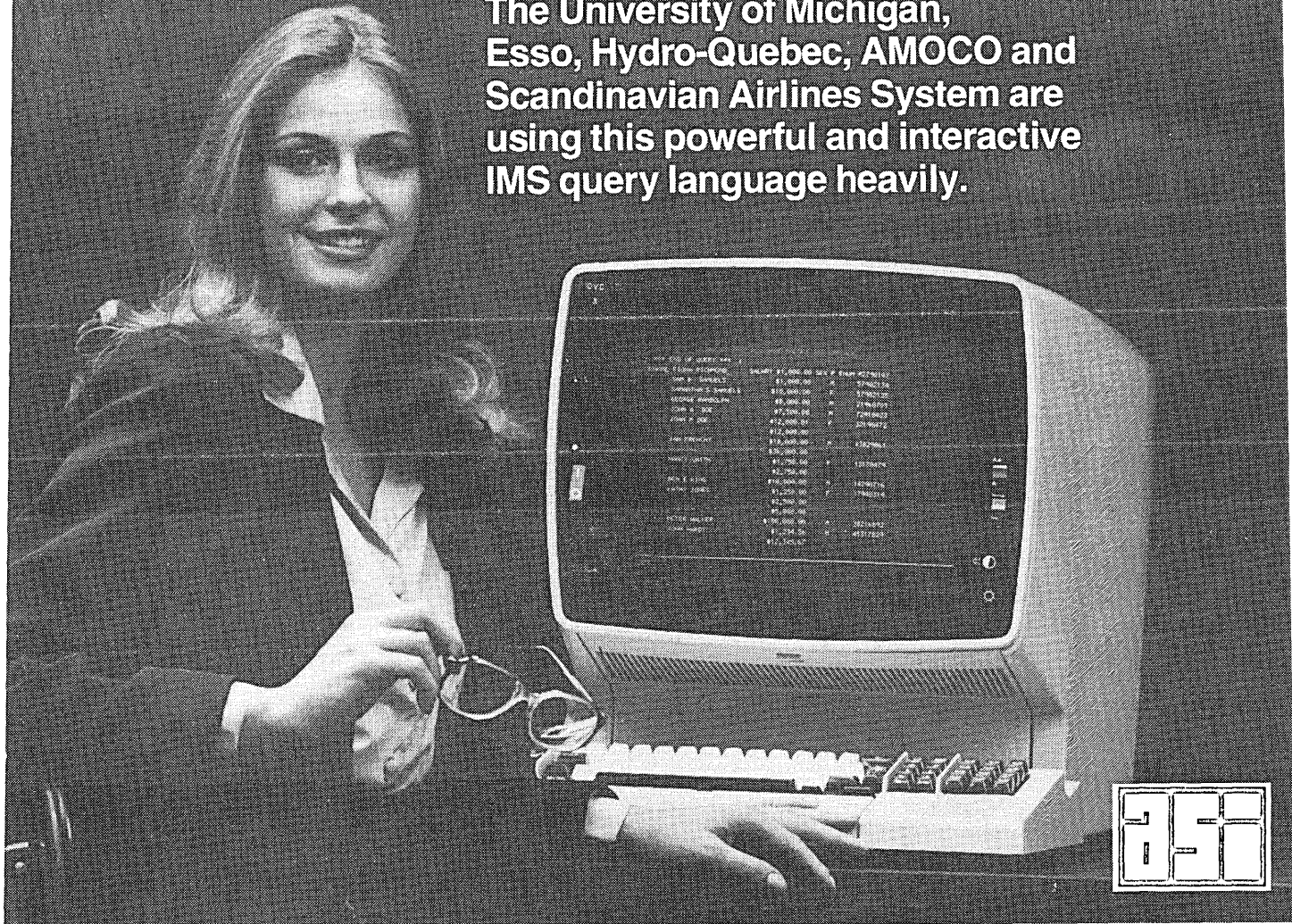
Besides, Thayer pointed out, there was no need for getting in even as much as \$100,000 in advance of requirements.

"We do not want any money immediately. All that we want is to . . . have it available when there is machinery to be paid for . . . by the time we will want money for a lot of 50 or 100 machines, we could probably borrow what we need to pay for them. And, having got them into service, we could make some earnings that would, perhaps, take care of further extensions of the business."

Perhaps Thayer was right. Who would want to invest in a small company, with no solid earnings record and not even a public market for its stock? There were, as Thayer suggested, other ways of raising money.

"If you or Eaton or any other stockholders have money that you would put into preferred stock, would you not be equally willing to lend it to the company at a higher rate of interest? Considering the prospects of large profits . . . I would not hesitate to vote in favor of paying stockholders 10% on mon-

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CIRCLE 141 ON READER CARD

“Despite the dire economic crisis, the Tabulating Machine Company’s orders held firm, and on Jan. 16 the directors declared a 400% stock dividend.”

ey that they would lend to the company.”

Between August and December, the market panicked; banks went under; and brokerage firms closed their doors. Only J. P. Morgan seemed able to stem the rout. President Roosevelt, who did not know what to do, stopped railing at businessmen long enough to invite Morgan to the White House to dine. But despite the dire economic crisis, the Tabulating Machine Co.’s orders held firm, and on Jan. 16 the directors declared a 400% stock dividend. The capital stock of the company was increased from \$100,000 to \$500,000 to correspond more neatly with the value of its assets. Two days later, the directors authorized the issuance of 2,500 shares of nonvoting preferred stock at \$100 par, increasing the company’s total capitalization to \$750,000. However, on Feb. 7, the board decided that \$100,000 of preferred would be ample. The company had acted to raise the funds to “purchase the new machinery now so imperatively needed.”

No sooner was the financing complete than the general manager was instructed forthwith to place an order not exceeding \$40,000 with the Taft-Peirce Manufacturing

Co. for 80 automatic sorters and 90 tabulating machines.

While in June of 1908 Hollerith was “not placing any machines as the new lot are not yet finished,” by the start of 1909 his business was back in balance. There was, Hayes informed the long-suffering Union Pacific, only a two-month order backlog. Having waited two years for its order, the railroad discovered that its requirements had grown. It now requested three, rather than two, tabulating machines and three improved sorters at \$30 a month each in place of two older machines at \$10 each. With time to attend to his customers, Hollerith would soon inquire “if the Southern Pacific at San Francisco is any longer interested in tabulating machines.” He wrote:

“My object in asking for this information is that I have a request for a machine from an insurance company in San Francisco. . . . The point is, we would have to send some one to San Francisco, and, while the insurance company is willing to pay a considerable portion of this expense, we hardly feel warranted in undertaking this one proposition alone. . . . if the Southern Pacific was still

interested, this might be an opportune time to consider the matter.

“Hoping that I am not troubling you too much . . .”

Less than four years after losing his Census contract, Hollerith had bounded back to create a solid commercial base for his business. He had turned the once-reluctant railroads into enthusiastic users of his equipment. In enlisting the leading companies of the day as pioneers in applying his new methods and relatively untried line of commercial machines, he had released new forces that would propel his business forward at an increasing velocity. Emerging from the cyclone he had kicked up, the inventor who disdained to hire salesmen recalled the words he had written to Swain on an August day two years before: “I started in to create this demand for machines. At first, it apparently would not go at all. Now, it comes with a rush and I am simply taken off my feet.”*

After graduating from Harvard College, Geoffrey Austrian spent six years as a newspaper reporter. With IBM since 1960, he is an editor of *Think*.

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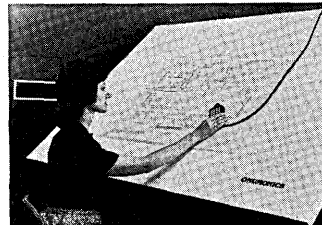


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CIRCLE 138 ON READER CARD

IN-HOUSE DP TRAINING

by Mark Johnson
and Jim Murchison

It is a problem for most dp installations to develop good training programs, recruit dp staff, and educate and train the people in the user departments.

At Blue Cross/Blue Shield of North Carolina, we carefully analyzed these needs, and realized we could develop a coordinated training program that would benefit, if not solve, all three components of the problem.

We developed and implemented an after-hours dp training program with the primary objective of recruiting new dp staff from within the company. We expected that the program would prepare people for transfer into the dp department as entry-level programmers. A secondary objective of the program was to provide training to the people working in the company's user departments in order to increase their level of understanding of the dp environment.

One of the most important considerations in developing such a training program is to allow sufficient time for appropriate planning of the course curriculum, student selection, and post-training follow-up.

At Blue Cross/Blue Shield, we had as training coordinator an experienced systems analyst who assigned over 50% of his working time to the functions of that position. He was assisted by two other members of the technical staff who devoted a substantial portion of their time to the development, administration, and delivery of dp training.

This is a significant commitment to training. Still, the philosophy of the company does not limit the teaching of all classes to this training staff. Outside experts in particular subjects such as assembler, database use, operating system concepts, timesharing, are called upon to teach classes as needed.

The selection of students is also an important consideration. We posted notices throughout the company of the planned course, and a programming aptitude test developed by IBM's Systems Science Institute was used as an aid in selecting students.

We recommend that a properly conducted interviewing process be used in recruiting and selecting students. This interview aids the applicant's understanding of the course's objectives and content.

The interview also gives the potential student some ideas about the many benefits of the course. For example, the course will improve the opportunity to transfer to the dp department, increase understanding of dp that will aid in performing current or anticipated job assignments, and prepare the student for further study.

We made no promise or guarantee of transfer to the applicant (and the applicant was not required to commit to a transfer) before acceptance in the course; however, a high level of interest on the part of the applicant was sought during the interview.

OUTSIDE TEACHER EMPLOYED

In our case, we decided to contract for an instructor from a nearby university, rather than use in-house staff. One important reason was to allow the instructor to concentrate on the development and delivery of the course, while the company's training staff performed the non-classroom tasks related to the program. Failure to recognize the necessity of these non-classroom tasks will decrease the success of the program. These tasks include:

Selling the Idea. Some effort may be required to sell the concept of the program both to potential students and to corporate management. Much of this must be accomplished before the course begins; however, continuing attention during the program may prevent a high level of dropouts from the program.

Student Selection. The company must allocate personnel to assist in the student selection process. Some of the activities, such as the administration of the programming aptitude test, may be assigned to the personnel department, but other activities will require the involvement of the dp coordinator or dp management.

Contract Negotiation. When a person outside the company is used for instruction or

some other part of the program, appropriate attention must be directed to the necessary contract provisions. In our case, this Introduction to Data Processing course was conducted not only as a standalone project but as part of a more comprehensive training program conducted by the company. This has included steady use of the participating university's continuing education program. It proved that commitment to such a program and attention to cost and contract analysis can result in a lower cost per contract hour of instruction per student than paying tuition costs for enrollment in a regular course offered on campus.

Counseling/Tutoring. In some cases, the counseling and tutoring of students during the course may be necessary. This may be accomplished best during working hours outside of the classroom environment. It should be noted also that these activities do not have to be performed solely by the classroom instructor, and that some of the activities may warrant the use of a private office or conference room.

Examination/Student Conference. We recommend that such a program include some type of examination and evaluation. In all probability, this can be most effective when a review, often in a conference setting, is conducted with the student. Management should be concerned with the student's performance and should request some type of grade report. A policy on grading and disclosure of grades should be defined before the course begins.

The curriculum placed emphasis on dp concepts, COBOL, MVS, JCL, and utilities. This resulted in a more specific orientation to certain hardware and a certain operating system than would usually be included in an introduction to dp course in most colleges.

We felt this was an acceptable decision because our objective was to introduce the students to the specifics of the dp environment at our company.

As the accompanying course outline shows, the course also included "hands on" experience with programming development and execution.

"Our objective was to introduce students to the specifics of the dp environment at our company."

The classes were held after regular working hours two nights a week for three hours each night. The course, presented over 16 weeks, resulted in 96 contact hours of instruction, and 9.6 continuing education units of credit (the approximate equivalent of two regular undergraduate courses) from the sponsoring university.

In the course, emphasis was placed on business dp, rather than computer science applications. We recommend, for example, that typical exercises focus on report production, file updating, transaction processing, and control totals, rather than on such subjects as simulation, modeling, compilation, etc.

In practice, it is undesirable to try to present and discuss all products in use in a large dp installation. In our course, we gave no detailed attention to database management systems, report generator packages, or text editor products, although these products are in common use in the installation.

In the development of the curriculum and the presentation of the course, it is important to view the program as part of a larger training program conducted by the company on a continuing basis.

In our company, the overall training program includes more advanced training for experienced members of the dp staff, and, in addition to the university programs: courses taught by the training staff, courses from vendors, and special seminars.

Our training program was designed to meet the specific needs of our company, and the real success of this effort may not be measured for another year or so, as graduates of the course are considered for programming staff positions. However, a preliminary review of the course was quite favorable. Of the 30 people who began the course, 28 had completed it satisfactorily (and one had withdrawn because of a promotion). This is an extremely successful retention rate. Also, we have completed some recruitment of graduates in the dp department, and others have been assigned duties in user departments that require a high level of dp understanding.

Mark Johnson is a systems analyst with Blue Cross and Blue Shield of North Carolina, where his primary responsibility is the development and coordination of dp training programs. He has a BA in economics from North California State University.

Jim Murchison, a systems analyst also with Blue Cross in North Carolina, has current assignments that include the development of application systems for the health care industry. He has an MS in the technology of management from the American University, Washington, D.C.

THE COURSE AS OFFERED AT BLUE CROSS/BLUE SHIELD OF NORTH CAROLINA

1. Introduction to Data Processing and Programs

1.1 The Computer Environment

Introduction and overview
Computer model
Computer arithmetic
Card equipment
Paper equipment
Magnetic recording equipment
Summary review

1.2 Computer Programs

Introduction and overview
Flowcharts
Nesting and hierarchy
Structured constructs
Instructions/statements
The shape of programs
Subroutines/subprograms
Summary review and exercise

1.3 Special Programs

Introduction and overview
Assembler (and linker)
Compiler (and interpreter)
Editor
The operating system
Summary review and exercise

1.4 Computing Systems— summary and exercise

2. COBOL

2.1 Division Statements

Identification
Environment
Data
Procedure

2.2 Procedure Verbs

Add, subtract
Multiply, divide
Open, close
Read, write, accept, display
Compute, perform
Goto, if
If-then-else, do-while
Examine, search
Move, stop

2.3 Debug Aids

Entering a program
Editing a program
Trace, exhibit
Abends, dumps

2.4 COBOL Programs

Syntax
Structure

Running COBOL
Examples and exercises

3. OS/370 and OS/370 JCL

3.1 OS/370

Operating systems
OS structure
Systems and application programs
Access methods
Job control
Service and utility programs

3.2 Job Control Language (JCL)

Overview
JOB statement
EXEC statement
DD statement
Special DD assignments
Cataloged procedures
The job stream

3.3 System Control from Terminals

Batch and interactive systems
Creating a dataset
Editing a dataset
Submitting a job
Controlling job activity
Other TSO capabilities

3.4 Utility Programs

Sort/merge
Dataset management
Language translators

4. Disk Files and Their Use

4.1 DASD Devices

Disks and drums
Tracks, cylinders, heads
Track/file formats, capabilities
Latency/performance

4.2 File Types

Sequential
Indexed sequential
Partitioned
Direct
VTOC, system directories

4.3 Specifying Disk Files

Allocation
Disposition
Finding files

4.4 Interfacing Files and COBOL

File definition
Open, close
Read, write
Formats and data definition
Summary example, exercise

3 SOFTWARE LIST
 COMPATIBLE WITH MY HARDWARE
 COMPATIBLE WITH MY CRYSTALLOGRAPHY DEVICES
 WON'T OBSOLETE MY UNLIMITED RANGE OF CAPABILITIES
 AFFORDABLE



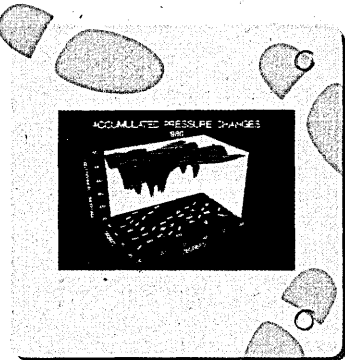
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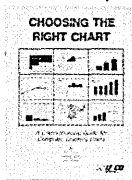
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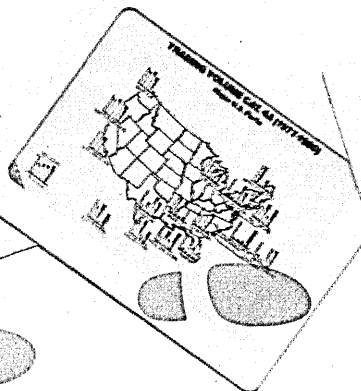
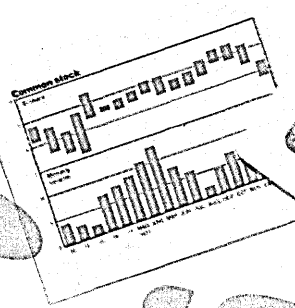
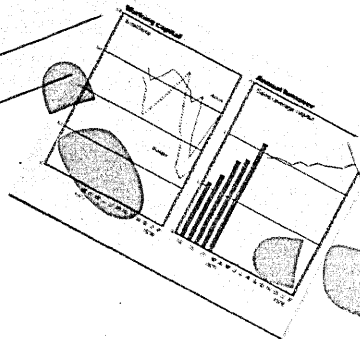
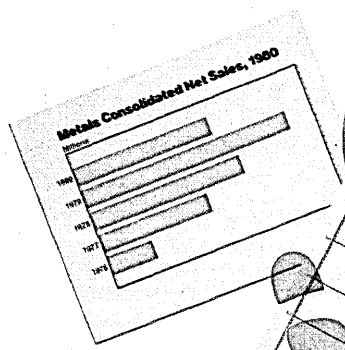
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CIRCLE 139 ON READER CARD



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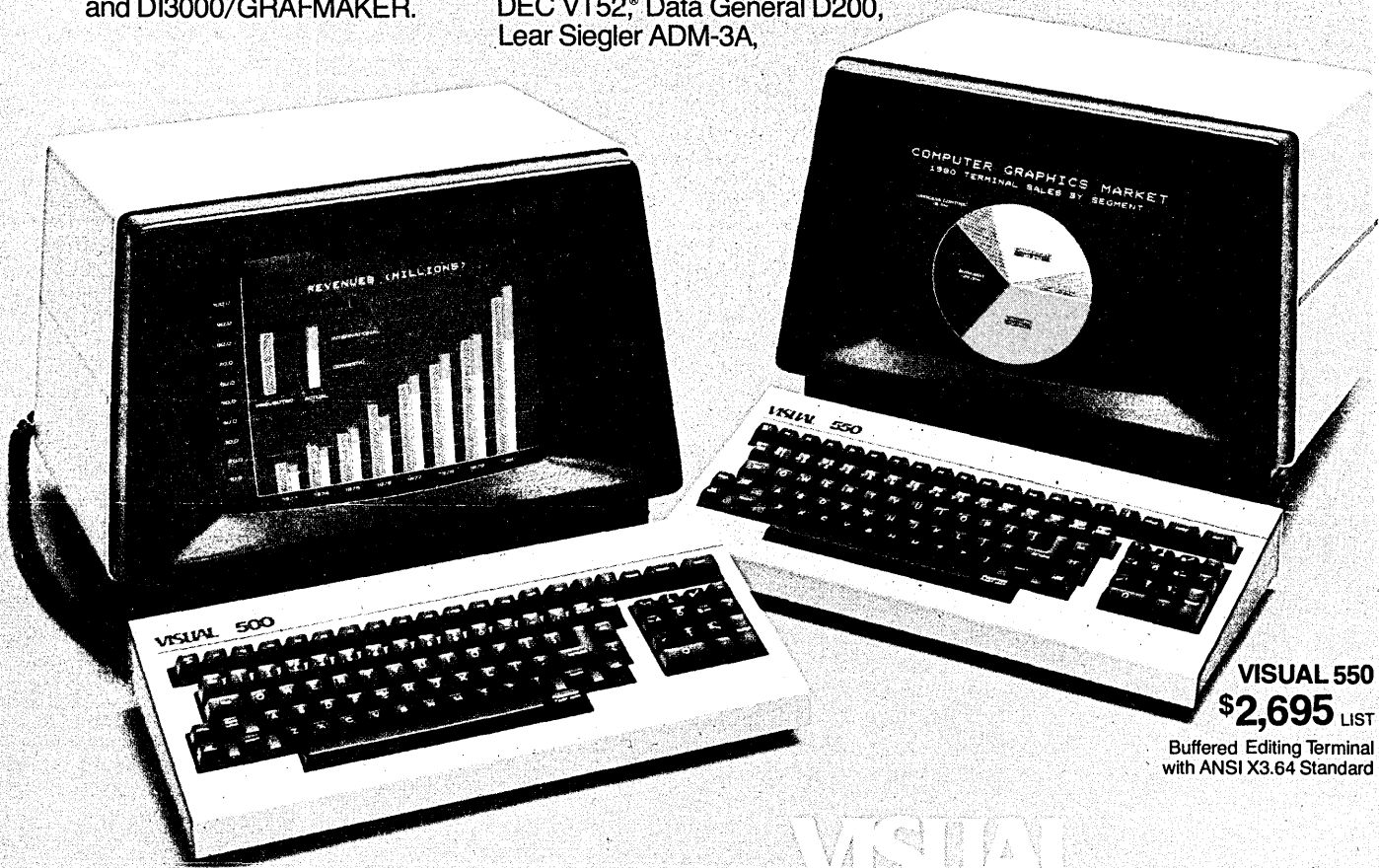
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CIRCLE 140 ON READER CARD

PEOPLE

THE JIM AND FRANK SHOW

The opening of *The Jim and Frank Show* did not play to rave reviews.

"We didn't leave our previous jobs very smartly," McCormack & Dodge chairman Jim McCormack admits. "When most people leave to start their own business, they have customers lined up."

Not Jim McCormack and company president Frank Dodge. They were convinced they had all the necessary evidence to become instant tycoons in the outside world.

"People we knew had left IBM and started consulting and programming shops," Dodge says. "They were all doing well. We had different assessments of each person, but we thought we were at least comparable in ability. So we figured if they could do it, we could."

They almost didn't. In its first year, the corporation neared extinction several times. The ledger sheets were awash with red ink. The principals' savings accounts were approaching zero. Their heads screamed for liquidation. Their hearts begged for another chance.

Score one for their hearts. The *Jim and Frank Show* played on, and now receives plaudits at home and abroad. McCormack & Dodge has become the world's second largest seller of financial and accounting software systems. It grew at an 88% compounded annual rate between 1976 and 1980. Last year's rate was expected to be "only" 65% (from \$15.6 million to \$26 million in sales). This year the company purposely plans to slow down to 40% to catch its collective breath and digest the previous expansion.

"I never dreamed it would be this big," Dodge acknowledges. "Neither did I," McCormack agrees.



JIM MCCORMACK: "One of the reasons we've done so well is that we agree on goals."

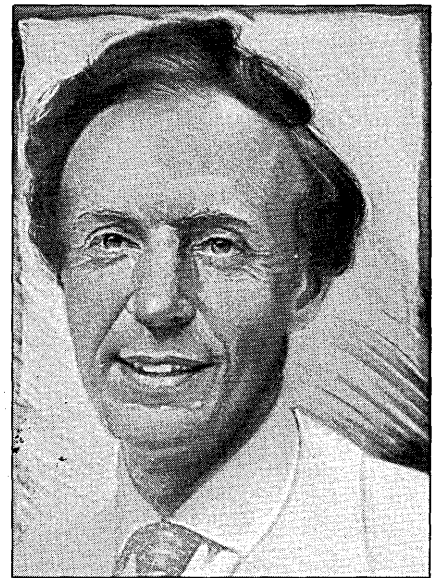
But the chairman knew he wanted to answer only to himself. He just thought he would own and operate a beach club, similar to the one to which his parents had belonged while he was growing up.

After getting bachelor's and master's degrees in accounting from Boston College, McCormack went to work as an accounting trainee at General Motors in Framingham, Mass.

When the company needed programmers to install an IBM 1401 in its Chevrolet plant, GM administered a dp aptitude test. No one in the dp department passed, but McCormack and two others in the accounting department did. Because he was the youngest, McCormack was offered the two-year position as plant programmer.

"I was resented by everybody because that job was the one everyone wanted," McCormack says. "They didn't want to listen to someone younger who hadn't been there that long. I had some real difficulties for a while."

After two years he returned to the



FRANK DODGE: "We probably have a better relationship than 95% of married people do."

accounting department as a supervisor. He then moved to Coopers & Lybrand as an auditor, an environment as pedestrian as GM had been. After several discussions with himself, he saw it was time for a change.

"It wasn't the jobs. It was the content," McCormack says. "I didn't want to be an accountant. I wanted to get back into dp and eventually start my own business."

"So I called a guy I had gone to school with who was in the placement business. He asked me if I had thought about IBM, and I said I hadn't. I figured if I sold effectively and saved some money I might have some sort of cache to start my own business."

No partners, thank you. But plans changed after he met Dodge, who was a systems engineering group leader for a team that supported McCormack's territory.

Dodge's route to the juxtaposition had been less circuitous. After receiving his BS in math from Harvard, he taught high school in Needham, Mass., for six years. He took off the next year to study for his MS

PEOPLE

at Rutgers, his final fling with academia.

"I came back to a situation where the job was 85% discipline," Dodge says. "I had a master's in math, a wife and two kids, a mortgage, and I wasn't making any money at all. I hadn't planned to be a teacher, but I hadn't planned to be much of anything else. I took the job without much concern about what would happen next. But it was no longer challenging.

"In my senior year at Harvard, I had taken a dp test for John Hancock. I scored high, so I knew I had an aptitude for it. I knew IBM was a big name in computers. So I looked them up in the phone book, called, and asked for a job interview. I didn't know if they had a job. I had never seen a computer or punch card and knew nothing about either. I had absolutely no idea what I was getting into."

Somehow, there's usually room for a Harvard man. Dodge was told he was getting into a technical job where his math background would be invaluable. But he was placed in sales support, where his MS wasn't worth two cents. On his first call, his partner was one Jim McCormack.

"I asked him what I was supposed to do," Dodge recalls. "I was scared as hell."

"You certainly were," a laughing McCormack agrees. "I was going to drop you off and leave you, but I felt sorry for you."

By the fall of 1968, the pair had had their fill of selling to line others' pockets. Encouraged by the success of their former colleagues, they started discussing ways to seek their fame and fortune outside IBM's walls. On June 6, 1969, the 25th anniversary of D-Day perhaps being coincidental, McCormack & Dodge was born.

"We both thought we had some talent," McCormack says. "If we got out there and survived long enough, we were sure we could do something."

The first thing was eating. As would any smart company without clients, they turned to the want ads. Their first job was converting Star Market's financial system from a 1401 to a 360, courtesy of the *Boston Globe*. There were a few other odd jobs, but hardly enough to make ends meet. By De-

ember, they had exhausted all their invested capital of \$5,000 and borrowed their entire \$10,000 line of credit.

But in the many hours between consulting jobs, they were conceiving a system which eventually would prove their ticket to ride. While Dodge was at IBM, he had been asked by a customer if the company had any programs for fixed assets accounting. He couldn't think of any, and the company catalog confirmed his assessment.

"I was calling on Gorton's of Gloucester, where the guy I was seeing always made you wait 10 minutes," McCormack says. "I was thumbing through *Data Processing* magazine and saw a story about a company that had automated a fixed assets program on a 1440. It struck me as strange that neither GM nor Coopers & Lybrand nor any of their clients had ever automated their accounting. Here was something everybody in the world needed but nobody had done."

What better way to fill that made-to-order vacuum than with a math-accounting combination? By the spring of 1970, the struggling company's Fixed Asset (FA) system was ready. But the 20 Boston companies to which it was offered were not. Great stuff, they told the creators, but don't call us. We'll call you.

"We didn't even know how to price it," Dodge says. "Somehow we settled on \$3,600. I don't know how we got there. I do know nobody moved on it."

No one had eagerly sought many of the company's other offerings. With M&D now on the critical list, Dodge used his 360 experience to land a job managing Texas Instruments' conversion of accounts payable from a 1401 to a 360. That eased his and his partner's payroll burden by one \$200 per week salary. It did nothing to ease FA's entry into the market.

"Our only strategy was to go back and lower the price dramatically," Dodge says. "We were pretty much down and talking about packing it in. We saw this as a way to recoup our losses and pay back the bank. So we dropped it to \$595."

"That's almost as ridiculous as \$5.95," McCormack chuckles. "We called each company and made the offer,

which had a time limit of 14 days."

To the pair's astonishment, 10 companies bought the package. The ensuing \$6,000 was almost equivalent to the entire first year sales. But it still wasn't close to what they needed to stay solvent.

"Cash was so tight I thought we probably wouldn't make it," McCormack admits. "We even talked about splitting Frank's salary from TI, although we never did. I had a nauseated feeling for a month. I figured we would bring in what we could and shut it down.

"I didn't see any way we could get in enough in time to save it. I didn't quite give up to the point where I got a job, although I was really tempted. I had an offer from Viatron to be their Boston branch manager at a great salary. [Viatron is no longer with us, so McCormack obviously chose wisely.] But I had cut the ties and made the break, and I was going to ride it down to the pits before jumping off."

He had nearly finished the journey when a "sharpie" friend suggested they try mail orders. Promising their potential savior 12% of the action, the two mailed 1,000 offers at prices not available even in Filene's basement. The FA package could be had for \$355 on a 360 model or \$485 on a larger one.

With 18 solicitees responding with checks, more than half at the higher price, the *Jim and Frank Show* was able to extend its run—by popular demand, if you will. The pair then mailed 35,000 offers beginning in May 1970. The next six months generated \$90,000 worth of revenue.

"By early October it became obvious this thing was really going to do it," Dodge says. "One Monday morning—that was always the big time—\$6,000 worth of orders came in. That brought the total to \$35,000; then we knew we could do it."

Next it was time for them to fly. Dodge, who had been returning to the office on weekends, finished his task at TI and came back in mid-November. It wasn't a moment too soon for McCormack, who had grown punchy shipping the FA program cards. Through enhancements and the transition to software, the price rose to \$5,000 with a major new version in 1973. The *Jim and Frank Show* then took to the suddenly friendly skies, because "\$5,000 seems to be the price where people want to see your face across the desk and have a personal presentation," McCormack says. At the original prices, a potential FA customer had to pay for a personal sales pitch. Now listing at \$35,000 retail, the FA package is no longer a basement bargain.

From FA it was on to Accounts Payable (A/P PLUS) the same year, General Ledger (G/L PLUS) in 1977, Capital Project Analysis (CPA PLUS) in 1979, and Purchase Order (P/O PLUS) in 1980. Accounts Receivable (A/R PLUS) and Human Resource Management (H/R PLUS) systems are expected



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CARTOON BY MALCOLM HANCOCK

How to take the strain off your mainframe with Electronic Filing from Kodak.

Storing original-document information in the Kodak IMT-150 microimage terminal can take the strain off your computer. Here's how.

The IMT microimage terminal has its own intelligence—a built-in microprocessor that tells it exactly where to find the document you need.

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The IMT terminal is so fast that it performs these on-line lookups in seconds. At the push of a button. And it can produce dry, ready-to-use paper prints in seconds, too.

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PEOPLE

shortly. M&D is also developing HiLite, an on-line query system which will provide access to databases within all M&D systems.

Not too shabby for an organization that spent its first two years in an office which McCormack freely concedes "wasn't nearly as good as a storefront legal or free health clinic." The company now has seven regional offices and seven international affiliates.

"I don't think you stop and say 'great, we've done it,'" Dodge says. "You're still too much in the trenches grinding along. That one Monday when we knew we could make it was a great lift, but there never seems to be time to really enjoy it. But at times like our users meeting, when you walk into the room and see all those people, you think, 'God, this is really something.' Then you get an appreciation of what this thing has turned into."

"When I walked into that room [at the users meeting in New Orleans last October] and saw that monstrous group of people, I really felt intimidated," McCormack confesses. "All of a sudden there it is. It's all present, right in front of you—800 people who are your customers. It gave me a perspective that I didn't have before."

He may be in for further sobering if the organization responds to the current trend of service companies going public.

Based on M&D's phenomenal growth rate and impressive history, venture capitalists are anxious to sink some of their available dollars into what appears to be a very solid investment. But the potential beneficiary has yet to lay down the welcome mat.

"Last year, going public was the uppermost thing in our minds," McCormack says. "We didn't do it because we didn't think we were ready. We didn't feel we had the internal control we should have to attempt that. We might go out next spring or fall, if we're ready. Then again, we might not."

"I enjoy running the business as a business. Right now we're not representing ourselves to a bunch of stockholders or analysts who are curious what our stock is doing. I'm not sure I'd enjoy that role. All of a sudden the job content really changes. Instead of working for the business, you're representing the business to the public."

What's so far been publicized has been impressive. Revenues, a modest \$1.2 million in 1976, are expected to reach \$40 million this year. With the introduction of A/R PLUS and H/R PLUS, as well as a possible acquisition or two, M&D forecasts sales of \$100 million by 1985.

"That's our next milestone, and I think we can do it," McCormack says. "But it would be irresponsible to keep growing at 88%. We can't manage it well

enough. It could turn on itself at that pace.

"One of the reasons we've done so well is that we agree on goals," McCormack continues. "We might not agree on how to reach them, but we've always been able to talk about the problem and work it out before it becomes an obstacle. Our communication is excellent. When you see what's there and what potentially could be there, you can find a lot of rationale for not letting every ego blip that comes along get you off the track. What's happening is bigger than any individual."

"It's a marriage between two big egos," Dodge says. "And we probably have a better relationship than 95% of married people do." Most arguments between the 44-year-olds occur when they discuss the academic and athletic merits of their alma maters.

"Our secret is delivering quality products and supporting them," Dodge says. "I know how we're regarded in the industry, and I feel it's justified. But I don't think we've done anything superbrilliant. We've just done something using common sense. I never can understand why our competitors don't see what we're doing and react. But they don't. To us the business is so simple. And yet we seem pretty unique."

That's certainly what the customers' reviews indicate.

—Willie Schatz

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It's hard enough to imagine getting sophisticated graphics at such a low price—let alone getting an integrated printer to go with it. But then again, you've never seen anything like the HP 2623 graphics terminal.

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The HP 2623 gives you more than just an extremely sharp screen image. With its advanced graphics features, you can shade different areas of a chart or graph with different patterns, or even draw entire pictures in a matter of seconds.

You can vary the size of the text, rotate it, or make it italic—in any of seven languages. And with a variety of software packages available (including PLOT 10 from Tektronix), you get a remarkable degree of flexibility in such a low-cost terminal.

The 2623 has two independent memories—for graphics and alphanumeric—so you can talk to your computer without disturbing your graphics display. And if you need hard copy, the thermal printer can dump it out in less than 40 seconds.*

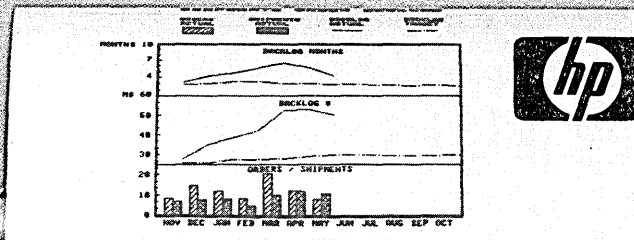
The HP 2623 works with computers from most major manufacturers. But no matter what system you use it with, HP's worldwide service organization can provide you with the advice, documentation and support you need.

If you'd like to see an eye-opening demonstration, contact your local HP sales office listed in the White Pages. Or just return the coupon.

Get a clear picture of what business graphics can do for you at Productivity '82. Watch your newspaper for more details.

*The HP 2623 is available without hard copy for \$3750.

When performance must be measured by results.

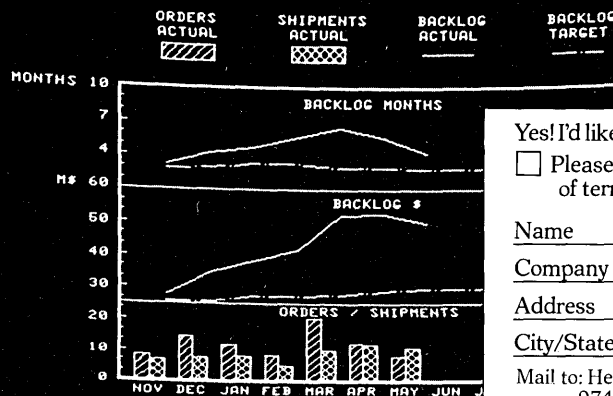


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At Northern Telecom, we believe that you shouldn't have to wait for tomorrow to get the technology you need today. So we're not only offering you on-line systems with SNA/SDLC (PU-2 level) compatibility, we're offering them to you today. You can have them working for you within 45 days. No long wait for delivery.

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at the flick of a switch you can switch protocols. Both models feature a special dual adapter, so you can use either protocol without extra hardware.

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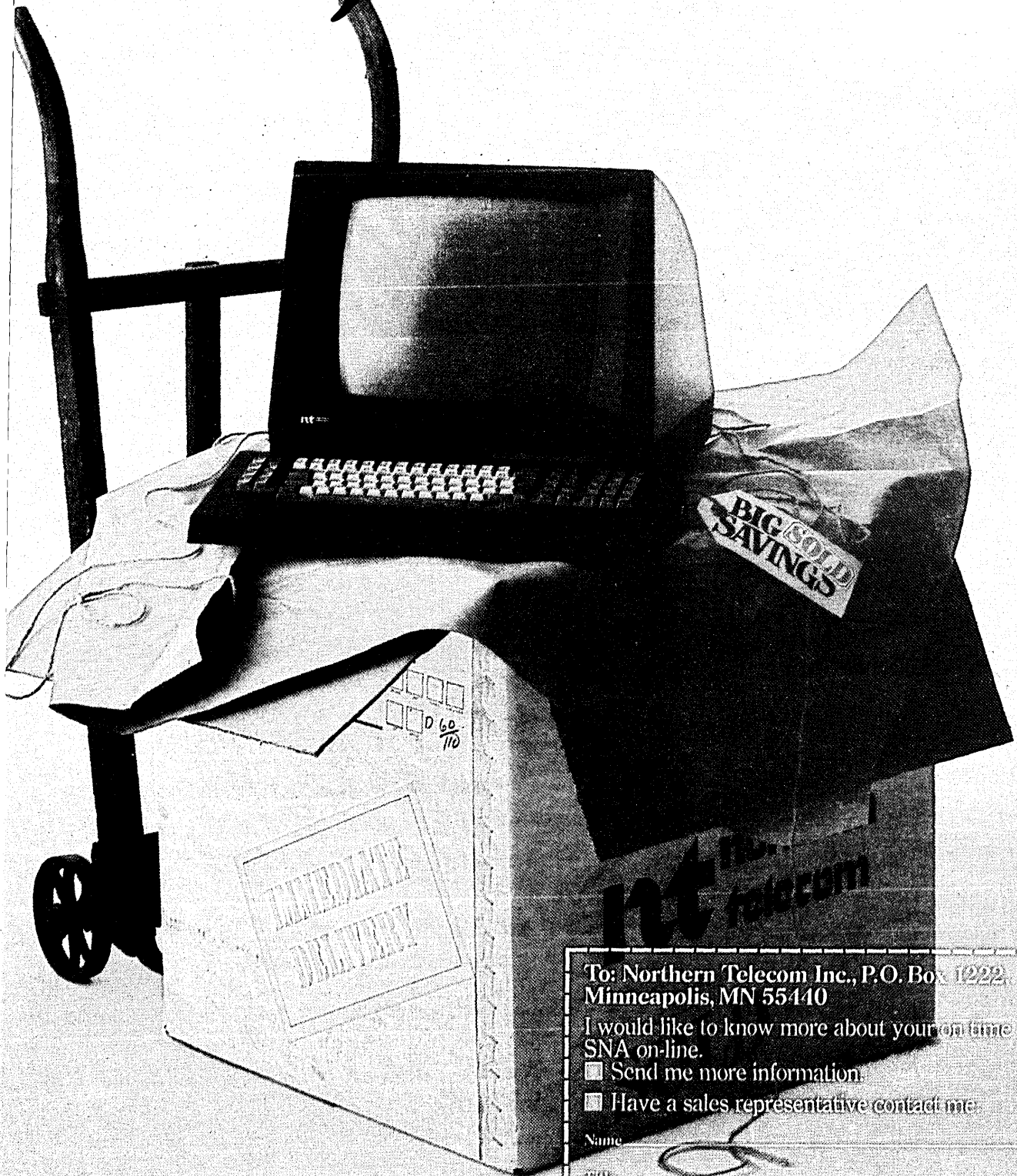
To top it all off, these systems are designed for the people who use them. Both are human-engineered with features like a special non-glare display, with an adjustable stand and a keyboard where you can feel the difference.

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CIRCLE 145 ON READER CARD



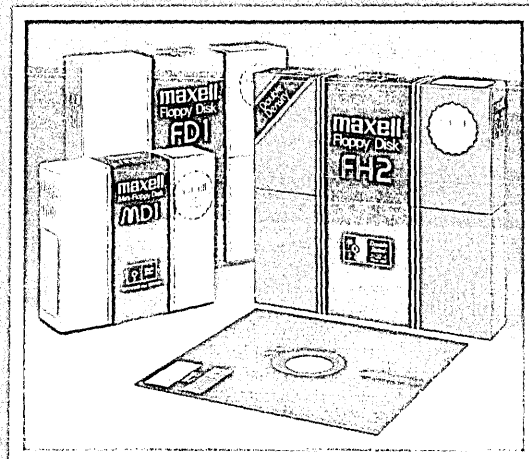
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HARDWARE

OFF-LINE

Tandem Computers, which this month finds two new companies jumping into its NonStop, fault-tolerant computer market, has arranged for construction of a new 140,000 square foot building to house 400 employees working on product development, new product marketing, and manufacturing. Scheduled for occupancy by the end of this year, the new building in Tandem's home town of Cupertino, Calif., will be its 16th in Santa Clara County, bringing the company up to 1.24 million square feet in the county. The firm recently closed its 1981 books up 91% from the year before, with record operating revenues of \$208,397,000.

Why do some people persist in calling the MC68000 a 32-bit processor? "It's partly a marketing ploy, but often a strategy for getting venture capital," says one observer of the battle for the bucks. "Thirty-two bits has become one of the phrases startups have found to separate capitalists from their money."

Sperry Univac has ordered an electron-beam lithography system for its new \$50 million semiconductor facility currently under construction in Eagan, Minn. The machine, manufactured by Varian, will be used to make VLSI devices using both bipolar and MOS technologies. Sperry LSI Photomask operations manager Nicholas Garaffa says, "We are moving to in-house semiconductor design and manufacturing because our computers require custom component technology not readily available on the commercial market." The machine will also let Sperry Univac try out direct-wire, submicron geometries.

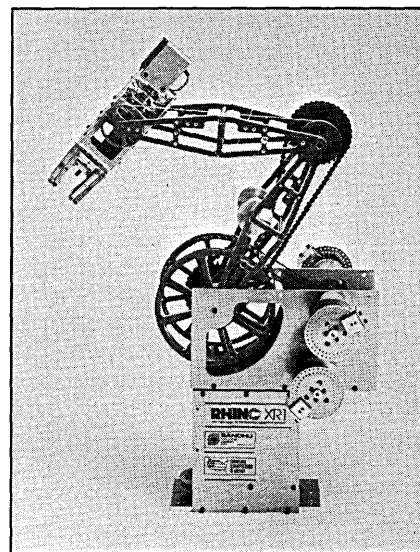
C MACHINE

With Unix becoming one of the most popular small computer operating systems these days, it was inevitable that a machine optimized for the C language would come along sooner or later. BBN Computer, a subsidiary of Bolt, Baranek Newman, the firm that specializes in networks and such, has added a mid-range model to its C Machine series, the C/60. Designed to support up to 16 users and up to a full megabyte of main memory, the C/60 is designed for program development using C and Unix. It can also run FORTRAN 77 and communicates over the BBN-Net packet-switched network scheme. Included are an 80-megabyte fixed disk, a 1,024-register cache memory to speed I/O throughput, and an instruction mapper to match C intermediate instructions with appropriate microcode op codes. The latter is said to boost performance of certain routines as much as 20 times over standard methods. The basic eight-user C/60 system, including a quarter-megabyte of main memory, the 80-meg disk, IBM-compatible streaming tape drive, and BBN-Unix software, carries a purchase price of \$50,000 in single quantities. Deliveries are set to begin early this year. BBN COMPUTER CORP., Cambridge, Mass.

FOR DATA CIRCLE 307 ON READER CARD

RHINO THE ROBOT

You've been reading about robots for years, but now you can own your very own mechanical servant, provided you have a computer with RS232C port to control it. This company has designed the Rhino XR-1 robot arm for educational or light industrial use. Said to be fashioned after the human arm, the XR-1 stands 32 inches high and contains six motors that move it through six axes. The machine has been designed to be controlled by four basic commands and can be observed in its operation because its workings are uncovered (leaving open the



question of protection from harsh working environments). It is said to reach out up to 32 inches from base to the tip of its "fingers," and can lift and grip approximately 16 ounces. Available for immediate delivery, the device has a purchase tag of \$2,400 in single quantities. SANDHU MACHINE DESIGN, INC., Champaign, Ill.

FOR DATA CIRCLE 303 ON READER CARD

POWER MONITOR

If your small computer or word processor suffers intermittent failures, there may be problems on the power line. Inmac's Power Line Monitor can tell you if you are getting clean, 120VAC power from your utility company. It has six red LEDs that indicate power failure, low voltage, high voltage, spikes, voltage drops, and high frequency noise; an audible alarm can be triggered if the user so desires. One monitor sells for \$295; two to four cost \$265 each; and five to nine run \$250. INMAC CORP., Santa Clara, Calif.

FOR DATA CIRCLE 304 ON READER CARD

HARDWARE

LOCAL NETWORK

The idea of a local network, nurtured in the public mind by Xerox and its Ethernet, has spawned several low-end networking schemes, the newest of which is this manufacturer's InfiNet product. Designed to support up to 32 CP/M machines sharing file resources, the network relies on dedicated application processors which communicate

with each other over a 1.25-megabyte bus. Similar to Ethernet, the system sends packets of information which occasionally collide, but a mechanism is included to detect those collisions and retransmit the affected packets. A minimum configuration consists of a file processor, 10 megabytes of disk, a floppy disk, two RS232 ports, a parallel port and a proprietary network operating sys-

tem. The firm described the file processor as a 64Kbyte, Z80-based machine which can be used as a standalone computer system or can be shared between many application processors. Those processors are also Z80-based and are designed to be compatible with the popular CP/M operating system. Two markets, small businesses with two to four users and distributed processing

HARDWARE SPOTLIGHT

HIGH RELIABILITY

The market that Tandem Computers essentially defined, cultivated, and maintained unto itself for the past five years or so has grown to the point where others want a piece of the action. In the course of a single month, two companies—Stratus Computer and DOSC—introduced systems for the Continuous Processing or FailSafe markets, to use the terms respectively selected by the two new kids on the block. Both have taken approaches different from Tandem's and from each other.

CONTINUOUS PROCESSING

Stratus takes an approach that John von Neumann was aware of more than 25 years ago: duplicate every piece of hardware and tie the twins together with comparators. But 25 years ago that was economically out of the question and, as von Neumann pointed out, with the technology of that day, you'd have twice as many parts—particularly vacuum tubes—which would most likely result in more failures. We've come a long way since then; our components are orders of magnitude more reliable than John's, and, more importantly, their costs have fallen to the point where redundancy isn't an economic impossibility. According to Stratus, "Continuous Processing is achieved by having a partner for each circuit board, power supply, and disk, operating in parallel on the same information. When a unit fails, its partner continues processing uninterrupted, and without any loss in performance." The basic building block of the Stratus/32 system is the Processing Module, of which there may be from one to 32 depending on the user's processing requirements. Each module has a 20-slot chassis, dual power supplies, dual system buses, and battery backup. Each circuit board has self-checking logic for fault detection. The processor boards contain four microprocessors—two for user application processing and two for I/O and page fault handling. Comparators check the results of each micro at every tick of the system clock. If the paired micros don't agree, the board drops out of service with a lit LED error indicator; Stratus says that a board that has experienced an intermittent error will return to service, while a board that has suffered permanent failure requires a swap, which can be done by user personnel. Since two processor boards run each application, processing continues

when one board drops out. Each processing module can handle up to 8MB of duplexed ECC memory, 64 terminals, and 16 disk drives (30MB, 60MB, and 143MB drives are available). Multiple processing modules can be connected in a ring topology via a high-speed StrataLink, up to 32 modules.

To run herd over the system, Stratus has developed its Virtual Operating System, VOS, which received a "thumbs up" response from a DATAMATION staffer who had had the opportunity to see the system. VOS gives each user a 12MB address space for his or her program. VOS is screen oriented, prompting a user for the arguments required for each system command; users who know what parameters are required can simply issue a complete command with arguments, bypassing the system's prompting. The system supports COBOL, BASIC, PL/1, and assembly language programming, although assembler is discouraged. (Stratus says it wants to protect its users from any reprogramming should it decide at a later date to offer a follow-on machine using a new micro). Transparent networking, a multikey data manager, IBM and X.25 communications, word processing, and an interactive symbolic debugger are also available. Owing to the multiple processor module nature of the Stratus/32, languages are priced in both development and execution versions. COBOL is \$9,000 for each module to be used for development, and \$1,500 for each module that will only be used for execution; FORTRAN is \$6,000 or \$1,000; and BASIC is \$5,000 or \$1,000. Assembler is discouraged: it carries a \$10,000 price tag.

An entry-level configuration, priced at \$123,350, includes central processing unit, communications controller for 32 asynchronous or 16 synchronous lines, 2MB of memory, 60MB of disk, a terminal, remote maintenance modem, streaming tape drive, VOS, and COBOL execution software. STRATUS COMPUTER, INC., Nattick, Mass.

FOR DATA CIRCLE 300 ON READER CARD FAILSAFE

While DOSC uses redundancy—buses, disks, controllers, etc.—it protects users by giving each a 64KB independent application processor. In the event of a failed applications processor, the user simply moves over to a terminal connected to a standby processor and restarts the job. The redundant database managers and smart disk controllers detect the failed applica-

tions processor, and back out any partially completed update in process at the time of the crash. DOSC uses coaxial cables to connect its terminals to the applications processors, for high-speed screen updating.

DOSC also addresses the problem of software reliability by providing the Fail-Safe Software Development System (FSDS) with each system. An applications generator, FSDS enforces structured programming concepts and constructs code based on validated templates. When changes are made, it automatically checks their effects on the remainder of the program. In addition to protecting the user from coding errors, FSDS has the obvious productivity benefits of program generators in general: faster development, easier maintenance, and ease of use. Users go through a functional specification phase, describing all inputs, outputs, variables, data edits, function keys, system messages, and data files. During the detailed specification phase, users describe their processing requirements in "Structured English." From this, FSDS produces P-code for execution and up-to-date documentation. As a test, DOSC says it took two computer science students from a local school, gave them the rough sort of specs end users are famous for, then set them to produce an inventory system. During the development, the students made all the mistakes DOSC expected, but in six weeks they produced the system DOSC wanted.

For users who would rather do it themselves, DOSC also provides a Pascal compiler and an assembler. The FailSafe Operating System is provided to manage the database manager computer, controlling access, ensuring data integrity, preventing database contention, and handling spooled output for the up to 32 applications processors in the system. Each application processor has its own copy of an operating system based on the UCSD Pascal system.

A basic system, including all software, consists of two 80MB disks, two 16MB cartridge disks (for backup), two database manager computers, two intelligent disk controllers, two 200cps printers, dual power supplies, one supervisor workstation (which also can function as an applications processor), and one workstation. The price for this package is \$79,400. Additional applications processors, with terminals, sell for \$5,000. DOSC, INC., Albertson, N.Y.

FOR DATA CIRCLE 301 ON READER CARD

Our story begins in the middle.

Introducing BBN Computer's New C/60. It's right in the middle, for those who don't need a \$100,000 mini but need more than a \$20,000 micro. What a story it is. At under \$50,000, the new C/60 is the price/performance leader in the UNIX marketplace.

The C/60 is a mid-priced, mid-sized machine but it's a giant in systems programming capability. The C/60 is the newest member of BBN Computer's growing family of C Machines, the first machines optimized to execute the C programming language and the UNIX operating system. BBN has been a pioneer in the computer field since 1961, and the new C/60 incorporates the best of our advanced technologies.

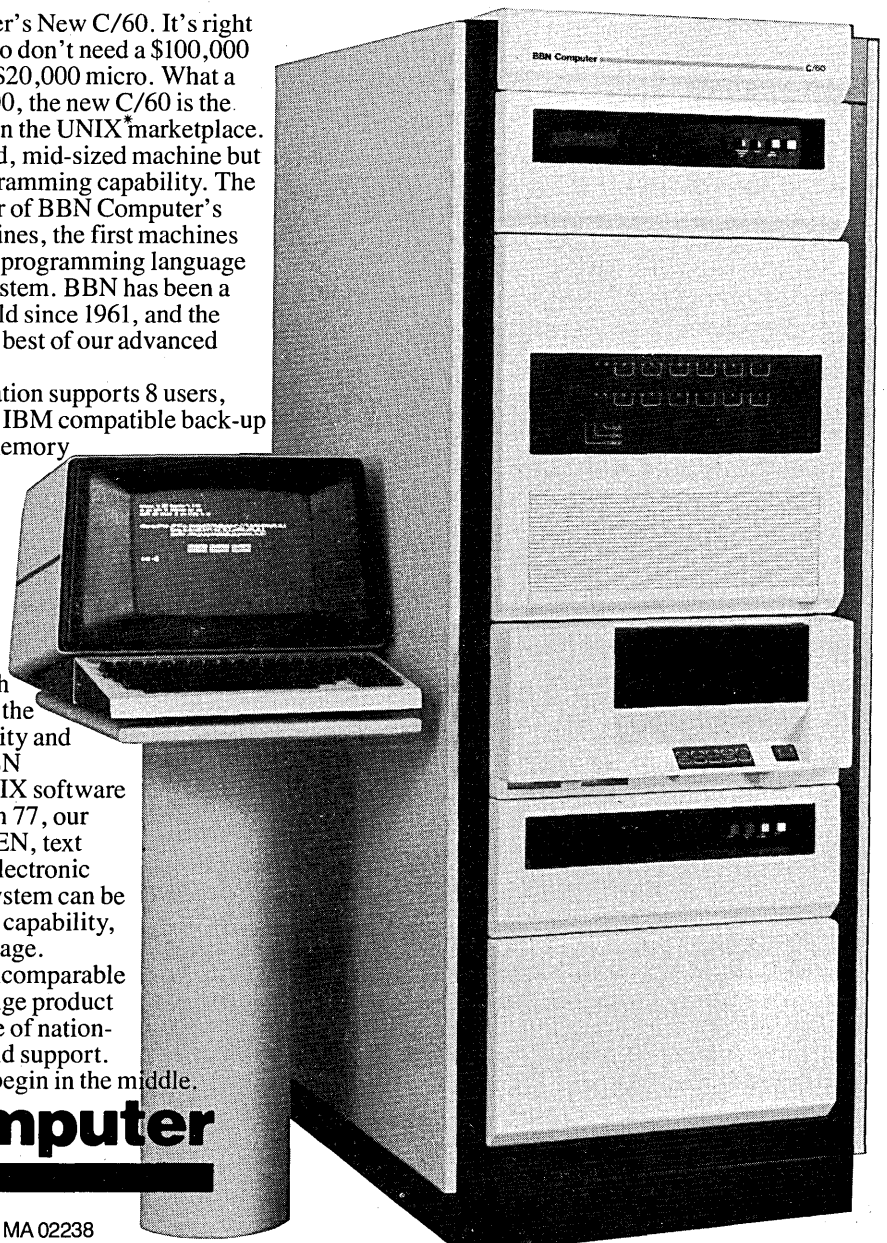
C/60 standard configuration supports 8 users, with 80 Mbytes fixed disc, IBM compatible back-up tape, a 1/4 Mbyte of main memory and BBN-UNIX software. And the system is readily expandable to 64 users, with 600 Mbytes mass storage and 2 Mbytes of main memory.

The C/60 fully supports UNIX, the growth operating system of the 80's. With UNIX and the C language, the highest software productivity and portability is achieved. BBN Computer's full line of UNIX software includes UNIX V7, Fortran 77, our innovative screen editor-PEN, text processing software, and electronic mail. And of course, our system can be enhanced with networking capability, BBN-Net, our unique heritage.

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*UNIX is a trademark of Bell Laboratories.

CIRCLE 147 ON READER CARD

HARDWARE

with 24 or more users, have been targeted for the system, according to a spokesman. Pricing starts at \$7,995, while a typical 10-user system is said to go for \$28,000. Deliveries are set for the first quarter of this year. MOLECULAR COMPUTER, Cupertino, Calif.

FOR DATA CIRCLE 302 ON READER CARD

212-TYPE ACOUSTIC COUPLER

Anderson Jacobson says it has solved a problem that's been baffling many for years: how to make a Bell 212-compatible acoustic coupler. The problem stems from Bell's choice of send and receive frequencies. Bell specs 1200Hz for transmit, and its second harmonic, 2400Hz, for receive, leading to interference problems, particularly in the carbon microphone found in a standard telephone handset. AJ's approach relies upon a patented method using a digitally synthesized signal that linearizes the carbon microphone's response; this signal is inserted into transmissions, allowing acoustic coupling.

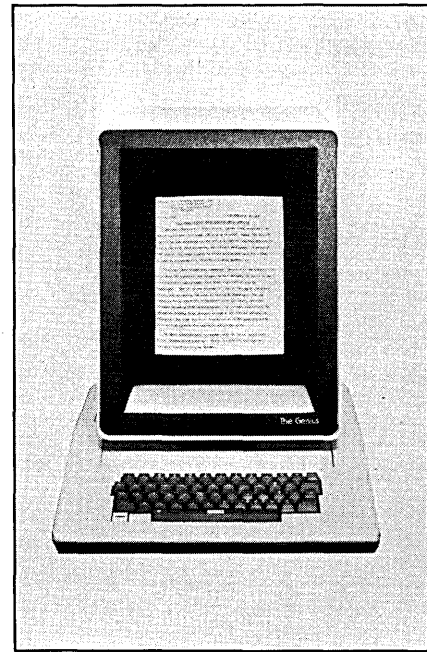
The company is selling two versions of the coupler—which also has FCC certification for direct connection as a modem, bypassing the handset altogether. One version is only 212-compatible (the AJ 1232), and one has additional compatibility with Bell 103/113 and Racal-Vadic 3400s (the AJ 1233). The 1233 is an originate-only, full

duplex modem and acoustic coupler that can communicate, according to switch setting, at 1200bps synchronously or asynchronously, and at 0bps to 450bps asynchronously. The 1232 simply omits Vadic and 103/113 compatibility. Both are due for deliveries commencing next month. The 1232 lists for \$945, and the 1233 carries a \$995 price tag. ANDERSON JACOBSON, INC., San Jose, Calif.

FOR DATA CIRCLE 306 ON READER CARD

BIG APPLE

From its introduction several years ago, the Apple personal computer has appealed to users who want word processing at a low price, but a limiting factor has been the machine's lack of a full-page display. This company has come to the rescue with The Genius, a 15-inch-high screen designed to display 57 lines of 80-character-wide text (or optionally, 66 lines by 80 characters). Claimed to be compatible with the popular WordStar word processing software package from MicroPro, the crt requires an Apple interface card which plugs into the Apple card frame. Although its main application is expected to be word processing, the vendor said it has seen interest from customers doing data processing and software development with its crt, which rests comfortably on top of the Apple machine's case. Large sections of code can be dis-



played at one time for debugging and editing. The display offers an 87MHz bandwidth and 6Kbytes of buffer memory to refresh the screen. With the interface card, the display lists at \$1,795 in single quantities. MICRO DISPLAY SYSTEMS, INC., Hastings, Minn.

FOR DATA CIRCLE 305 ON READER CARD



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CIRCLE 149 ON READER CARD

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There is an art—and a considerable amount of science—to designing and delivering data communications products that meet the rigorous demands of today's 3270-compatible marketplace. Products such as display stations, printers and controllers that more dynamically and productively interact with each other, with compatible system equipment and with the people who use them. Products that save more energy, space and money. Products that perform more reliably. Products that are more readily available and more fully supported. These three products, for instance.

Product Set: Memorex 2078 Display Station; Memorex 2087 Matrix Printer; Memorex 2076 Remote Cluster Controller.

System Interfaces: IBM Systems 360, 370, 303X and 43XX.

Compatibility: IBM 327X plug compatible; Bisynchronous; SNA/SDLC (2078/2087).

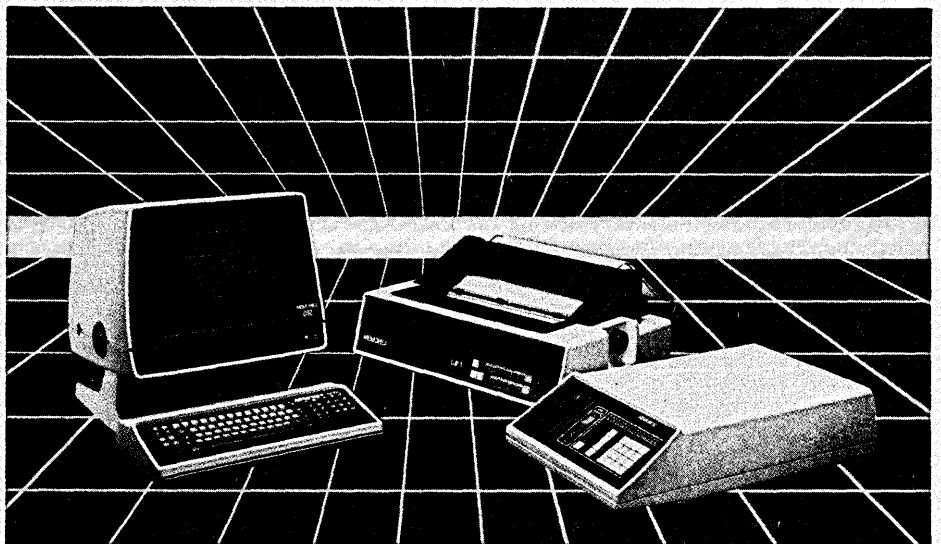
Product Specifics: The 2078 Display Station is built for flexibility, operating in bisynchronous as well as SNA/SDLC environments. It is built compactly to conserve space and even features a monitor that detaches for shelf placement. It is built to conserve energy, with efficiency features that allow the 2078 to operate on 58% less power while generating 47% less heat than its IBM equivalent. It weighs just 55 pounds, some 41% lighter than the IBM competition. And above all, the 2078 is built for people. The monitor is tiltable and the screen recessed. That screen, the keytops and all moldings are non-glare. The keyboard is movable for comfortable positioning.

The 2087 Matrix Printer also features SNA/SDLC protocol compatibility in addition to bisynchronous operation. It is both fast and quiet. A microprocessor-controlled print mechanism delivers high quality printouts at speeds up to 50% faster than the IBM equivalent. A bidirectional matrix print head seeks the shortest path to the next line, backwards and forwards, maximizing throughput. Acoustical engineering reduces noise levels, while a membrane switch panel, controls and LED indicators, all located on the front panel, provide the operator with local control and printer status.

The 2076 Remote Cluster Controller is a lightweight 30-pound package that accommodates up to eight printers and/or terminals in a bisynchronous environment. It measures a streamlined 6.5" high x 14" wide x 26" deep. While the 2076 can be located as far away as 4920 feet from its attachments, its dimensions allow for convenient placement just about anywhere, singly or stacked. Standard power-on, off-line and on-line diagnostics contribute to increased uptime.

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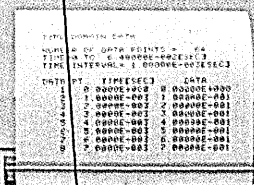
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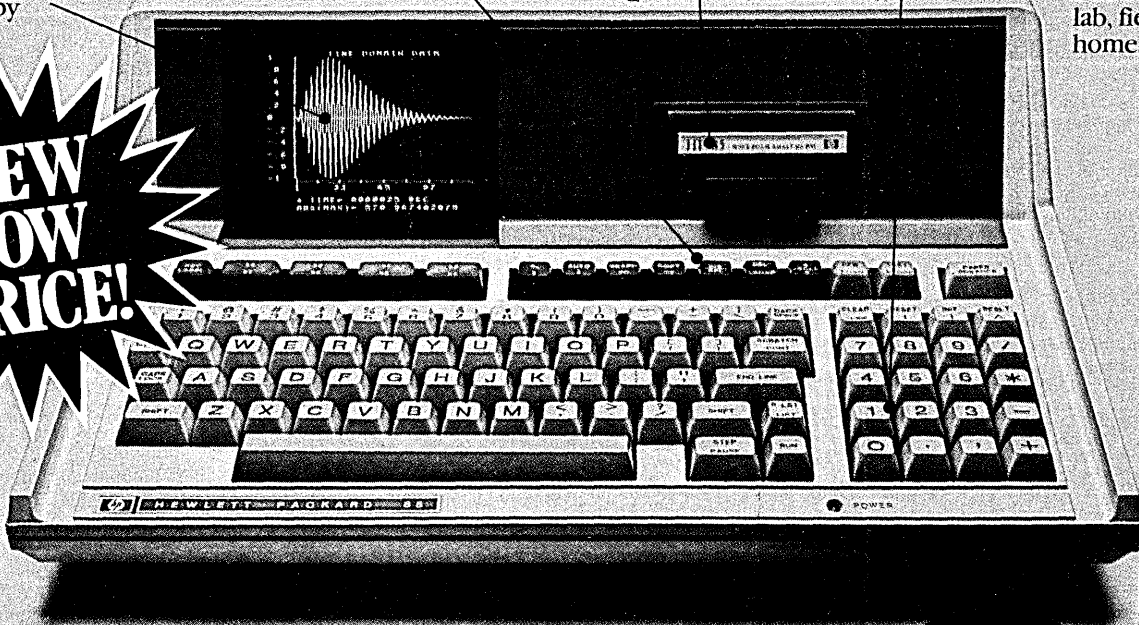
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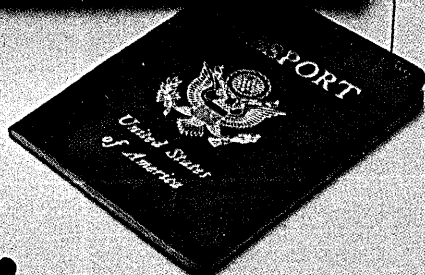
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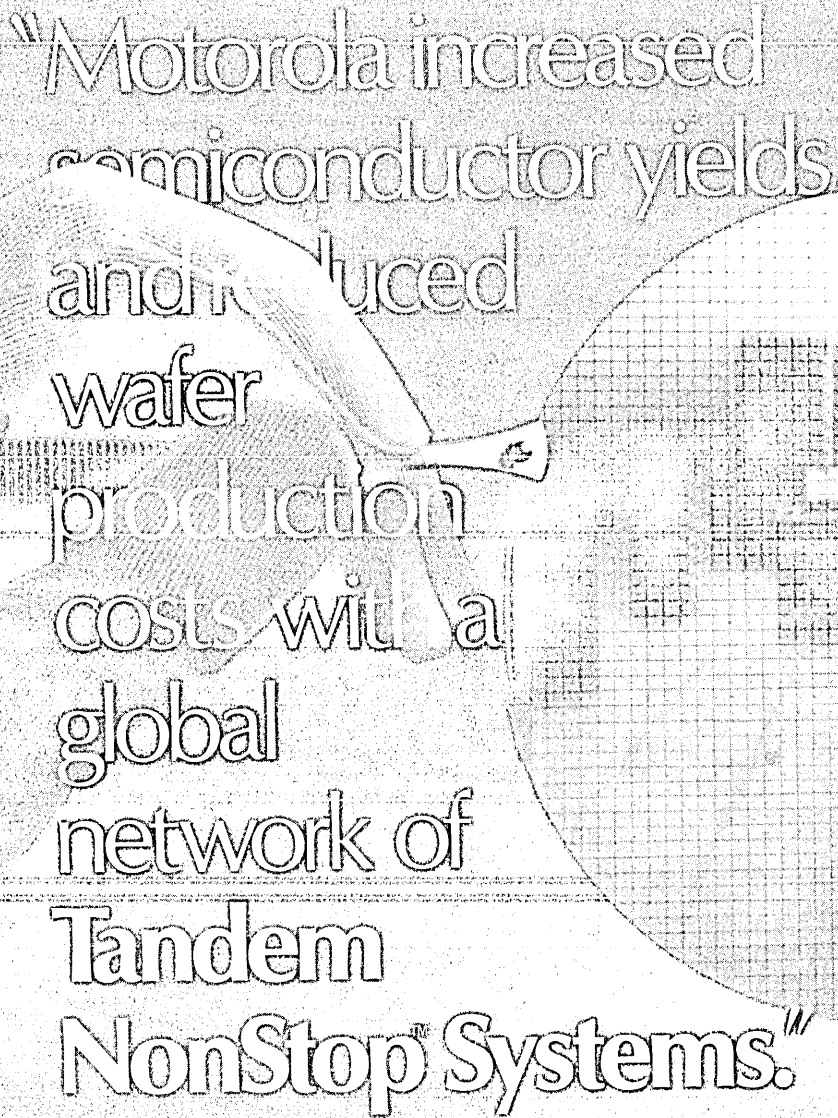
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Dick Solar, Manager, Strategic Manufacturing Applications
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SOFTWARE AND SERVICES

UPDATES

AURA, the Automatic Reasoning Assistant, is a general purpose reasoning program developed by the Department of Energy's Argonne National Laboratory and Northern Illinois University. Its applications include detecting flaws in computer programs, designing electronic circuits, and attempting to solve previously unsolved problems in advanced mathematics. Larry Wos of Argonne, leader of the AURA development team, says, "Scientists normally use computer programs to store and analyze data, solve complicated equations or perform lengthy calculations. But AURA is already being used as an intelligent colleague in several areas."

With AURA users describe their problems in an input language. AURA then interacts with the user, who directs the program along promising paths of inquiry -- hence Wos's reference to an "intelligent colleague."

The program has already helped engineers design a number of circuits that proved more efficient than any previously known. It is also possible to use AURA's input language to describe other computer programs. To date this has been done a few times. After describing the programs and their intended purposes, AURA used logical arguments to prove the programs' correctness. In some cases, AURA found counterexamples pinpointing cases in which programs failed to meet their specs.

Argonne is willing to work with outside researchers, including those from the commercial sector who want to extend AURA's applications into their areas of interest. Inquiries should be directed to Wos at the Lab in Argonne, IL 60439.

FINANCIAL MODELING

Hot on the heels of the second coming of the Apple III is an enhanced version of Desktop/Plan designed to take advantage of the Apple III's larger main memory, graphics, and Profile hard disk subsystem. Dubbed Desktop/Plan III to differentiate it from the extant Apple II version (Desktop/Plan II), the package allows users to create models nearly three times the size allowed by the Apple II version: models can contain up to 8,000 row and column entries. The program allows consolidation of data from submodels into master models, a useful feature for problems such as combining profit center budgets into an overall company budget. Written in BASIC, the modeling tool features graphics, flexible report formatting, and the ability for the user to add up to 20 "custom calculation rules" (BASIC subroutines conforming to the Desktop/Plan line numbering and variable naming conventions). The program can also accept data prepared by its sister product, VisiCalc, although it cannot pass values back to VisiCalc. The menu-driven program is said to be easier to use than the Apple II version, owing to the Apple III's 80-column upper and lower case display screen, larger memory, and keyboard. The package comes with two example files: a PERT chart and a capital investment model. Also included is a set of sample files for a fictional company, Top-notch Manufacturing, used to illustrate examples in the documentation. Desktop/Plan III lists for \$300. PERSONAL SOFTWARE INC., Sunnyvale, Calif.

FOR DATA CIRCLE 326 ON READER CARD

TI 99/4 BUSINESS APPLICATIONS

Creative Discount Software has picked up the exclusive distribution rights to three small business applications developed for the Texas Instruments 99/4 home computer by Personal ComputerSoft. The applications, each priced at \$80, include a spreadsheet package dubbed BDB, a small business

payroll system and financial management program. BDB allows creation of spreadsheets containing both character and numeric data for such purposes as forecasting and generating income statements. The program can create a database of up to 80KB.

Up to 100 employees can be handled by the payroll system. It will automatically compute a payroll for weekly, biweekly, semimonthly, or monthly pay periods. An audit trail is maintained, and the system provides reports for monthly payments, quarterly reports, and W-2 preparation.

With the financial management system, the user can define custom charts of accounts, fix budgets, accumulate costs, and estimate fund requirements. The system provides a number of management displays and reports. CREATIVE DISCOUNT SOFTWARE, Beverly Hills, Calif.

FOR DATA CIRCLE 327 ON READER CARD

OFFICE AUTOMATION

Data General is moving into the fertile field of office automation, with the introduction of its CEO Comprehensive Electronic Office systems for its Eclipse family of 16- and 32-bit minicomputers. Citing forecasts that the office automation market will, by 1985, grow to the size of today's mini market, DG said that the announcement of CEO is even more important to the company than its debut of the MV/8000 (its first 32-bit machine). CEO comprises Information Management (electronic mail, electronic filing, and administrative support functions), Present software (Jan., p. 164), a new word processing package, and a local networking capability. CEO systems are patterned after the "office process," which DG defines as the synergistic interaction of personnel within an organization and the flow of information within and between departments.

The components of CEO are customizable: department managers can specify which resources—from conference rooms to corporate jets—are to be scheduled, as well as which days are office holidays. At

SOFTWARE AND SERVICES

the user level, "personal profiles" determine how the user interacts with the system, what the person's working hours are, default print and format parameters, etc. A "help" function is available at any point in any function, and an "interrupt" key allows a user to stop in the midst of some task to handle a more urgent, time-sensitive function, and then return to the point of interruption.

CEO Word Processing replaces AZ-Text as DG's word processing offering; those participating in the software subscription service will receive the new package at no charge. In addition to offering the usual editing functions, the new word processing program includes a view mode that displays a document on the screen as it will appear when printed, an "annotation" capability that allows users to add notes—printing or nonprinting—to text, an "index" function to generate printed document indexes, and a "placemark" facility to make it simple to return to specific points in the text. CEO Spelling is an optional proofreading tool based on the 75,000-plus word *American Heritage Dictionary*. Users may also define their own dictionary of words specific to their jobs.

Word processing is a prerequisite for Information Management. The facility provides electronic filing using the familiar office concepts of keeping documents in

SOFTWARE SPOTLIGHT

MICRO REPORT WRITER

MicroPro International, the northern California software house best known for its WordStar word processing system, is on the verge of releasing InfoStar, a report generator and file processing system for micros running under CP/M. The package will run on a system with as little as 48KB of memory. While InfoStar is intended for use with files created by the previously announced DataStar (\$350) data entry program, it can also process files created by BASIC programs. InfoStar is specification (as opposed to procedure) oriented: users specify the format of the data file or files, design the report's layout, and answer a series of questions about data relationships. The package

"folders," folders in "drawers," and drawers in "file cabinets." A single user has a private file of unlimited drawers, each capable of holding unlimited folders containing unlimited documents. There is also a public cabinet, allowing authorized users to share information. Electronic filing also includes a "wastebasket," where discarded documents go (and can be "uncrumpled" if needed) until an "electronic janitor" comes around dumping the trash; the janitor's schedule can be set by the department. Documents may be retrieved by name, location,

then generates a report program, including documentation. Multiple files may be processed by InfoStar. MicroPro cites an example of using a customer number to look up the corresponding name and address in a customer file, retrieving invoices from an invoice file keyed on customer number, and payments from a payment file. While InfoStar can be easily exploited to its fullest by those with knowledge of dp, the program is designed so that those with little or no previous experience can use it, learning as they produce increasingly complex reports. The package is slated for availability this spring; it is priced at \$1,000. MICROPRO INTERNATIONAL CORP., San Rafael, Calif.

FOR DATA CIRCLE 325 ON READER CARD

or summary contents, and conditions such as "display all documents received from Mr. Jones since Dec. 25, 1981." Electronic Mail lets users send messages, documents, and graphics to other system users, both locally and at remote systems. Certified mail (sender receives notification of receipt) is offered, and mail can be returned if the addressee opts to refuse it. Urgent mail and confidential mail are also supported. Administrative support provides each user and corporate resource with a calendar for scheduling. A person can block out specific

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SOFTWARE AND SERVICES

hours as private work time. Automatic scheduling compares the calendars of all attendees and resources requested for a meeting, selecting the first time slot when all will be available. Individuals will be notified, and the time blocked out on their calendars.

To interconnect up to 32 systems within a mile of each other, DG has developed its own local area network, dubbed the Xodiac Network Bus (NBS). NBS uses co-ax cable as its communication medium; systems connect to the cable through Network Bus Adaptors (NBA).

All the pieces of CEO can operate under the AOS or AOS/VS operating system. Respective pricing for AOS and AOS/VS systems are \$4,500 and \$6,000 for word processing; \$1,000 and \$1,500 for the spelling checker; \$10,000 and \$15,000 for information management; and \$19,500 and \$25,750 for a combined package of word processing, spelling, information management, Present, Trendview, and INFOS II. An NBS node comprising wall box and controller unit sells for \$3,400; separately, the wall box is \$2,000 and the controller unit is \$2,500. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 329 ON READER CARD

PDP-11 UTILITY

With a reported speed advantage over DEC's

REORDR disk utility, RDR is Software Technique's fast disk directory utility program for RSTS/E or CTSS500 systems. Written in MACRO-11, the utility is said to be able to reorder an RM02 disk in less than a minute. Use of RDR should improve system performance by reducing the number of disk accesses required to locate files; because of its speed, RDR can be included in the standard system startup procedure. The utility's dialog with the operator is said to be quite similar to that of REORDR, making it easy to use with little or no training. The program also includes safeguards against clobbering a disk inadvertently: each account is checked for consistency prior to reorganization, and four independent checks are made for open files before RDR rewrites each directory. RDR can also sort directories by date of file creation or date of last access (in either forward or reverse order), file name or type. The utility sells for \$150 for a single copy, with oem and quantity discounts available. SOFTWARE TECHNIQUES, INC., Los Alamitos, Calif.

FOR DATA CIRCLE 328 ON READER CARD

WINDOWED EDITOR

A multiwindow, full-screen text editor has been introduced by this vendor for CP/M microcomputer systems using the Z80 microprocessor. The Electric Blackboard, as it's called, enables the user to divide the crt

screen into horizontal and vertical windows, each of which can be manipulated separately as if it were a full screen. Windows can be moved freely about the file in four directions: up, down, left and right. Each window has its own tab settings, page sizes, and cursor, so text in different windows can be worked on concurrently without interference from other windows. In addition, a "picture cursor" can be used to help draw diagrams, flowcharts, and graphs. Standard text editing functions are available in the software package which requires at least 48K bytes of main memory, a floppy disk drive, and crt with cursor addressing. Deliveries are under way with single quantity packages retailing for "under \$200," according to the vendor. SANTA CRUZ SOFTWARE SERVICES, Ben Lomond, Calif.

FOR DATA CIRCLE 331 ON READER CARD

HIGH-LEVEL PROGRAMMING

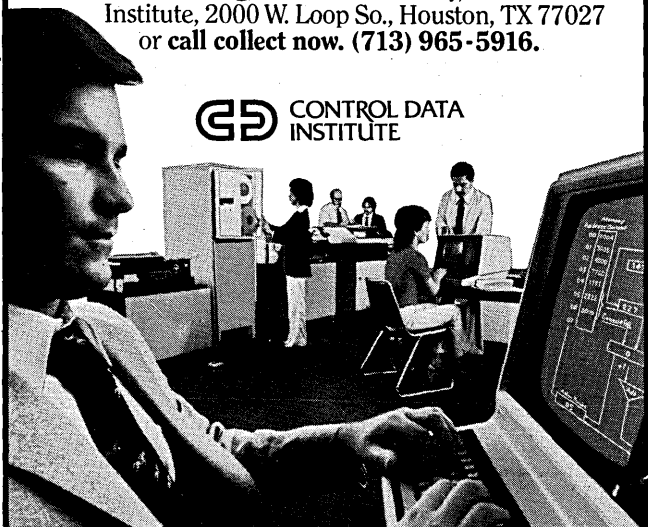
This package, designated Formula, is claimed to combine the facilities of a database manager, word processor, and compiler language for developing business applications. Free-format reports can be generated from a visual description of the report, and file maintenance and data entry routines are automatically constructed from a description of the data. An indexed sequential access method makes for efficient execu-

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CIRCLE 159 ON READER CARD

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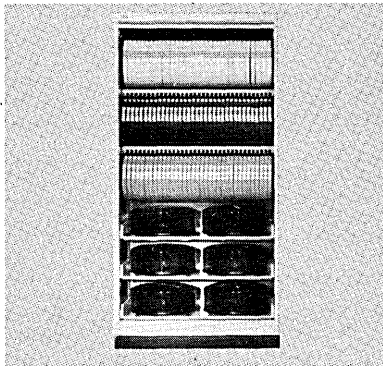
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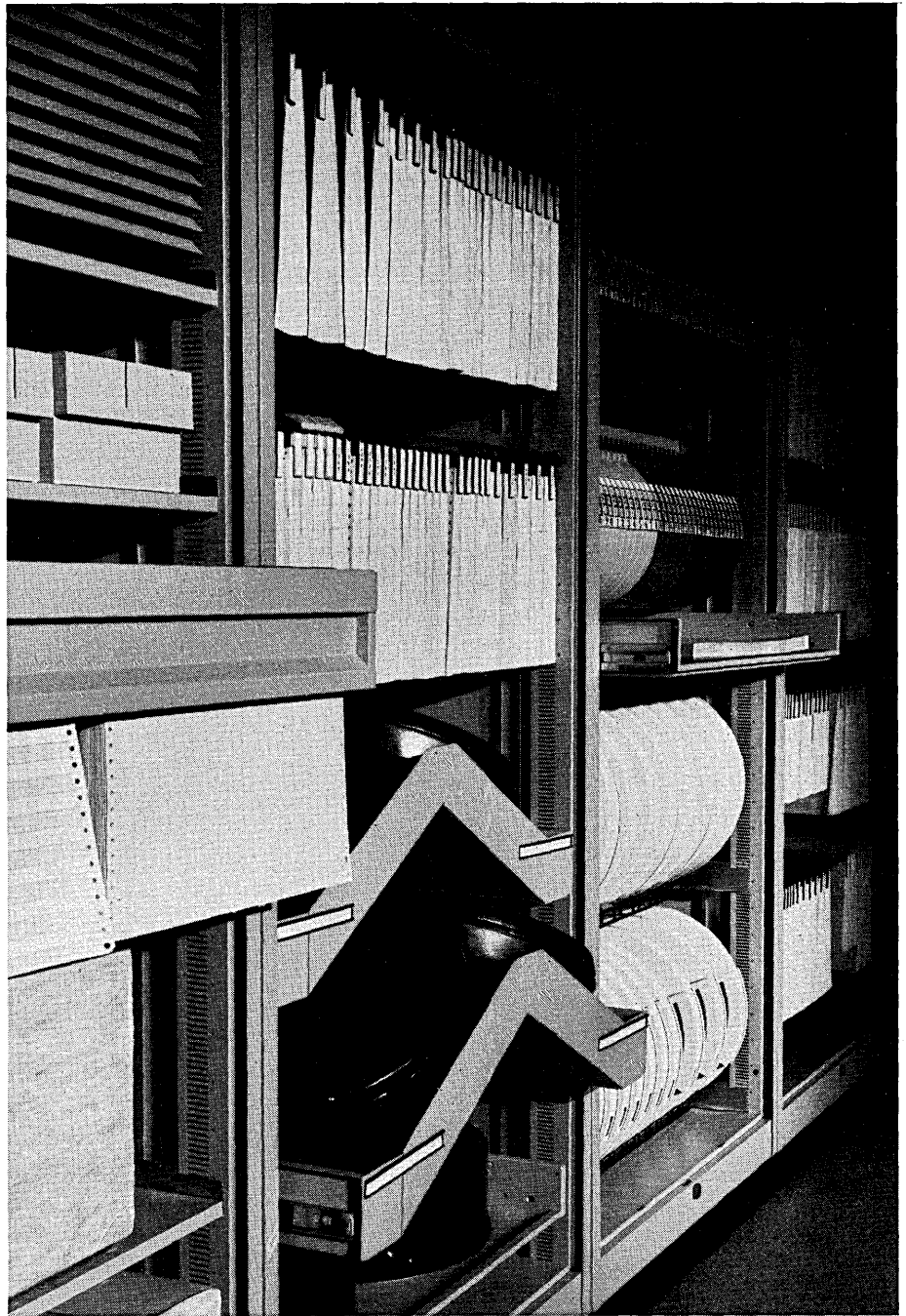
1972 Bought first Optimedia cabinets to file remaining punch cards, 1316 disc packs and reels of 1600 BPI tape.



1975 Media changed to include 3336 packs in addition to tape. Cabinets reconfigured, new cabinets added.



1978 New system required 3348 disks but no tape. Manuals and run books added. Cabinets again adapted to needs.



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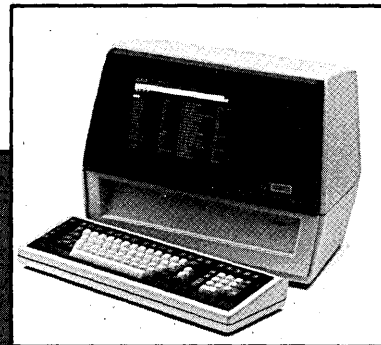
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To select a new option, enter the number(s) in front of the option wanted or use cursor right or left keys.
*FUNCTIONS*
-----
A LOCAL COPY ON
B SCREEN WIDTH 80
C CURSOR TYPE BLOCK
D CURSOR BLINK OFF
E STATUS LINE ON
F BACKGROUND DARK
G BRIGHTNESS 8
H CONTRAST 15
J MARGIN BELL ON
K 3 KEY SHIFT # SYMBOL
L VOLUME MEDIUM
M AUTO REPEAT ON
N AUTO REPEAT TIMEOUT 0.5 SEC
O AUTO REPEAT RATE 30 CPS
-----
S PRINT LINE LENGTH ACTUAL LENGTH
T WRAP AROUND ON
U SEND WITH V ON
V DO (L) WHEN V RECEIVED (ANSI NL) OFF
W DESTRUCTIVE BACKSPACE OFF
X DISPLAY CONTROL CHAR NONE
Y COMM PROTOCOL NONE
Za COMM TRANSMIT SPEED 300
Zb COMM RECEIVE SPEED 300
Zc COMM PARITY & BITS/CHR EVEN (7 BITS)
Zd AUX COMM PROTOCOL NONE
Ze AUX COMM TRANSMIT SPEED 300
Zf AUX COMM RECEIVE SPEED 300
Zg AUX COMM PARITY & BITS/CHR EVEN (7 BITS)
Zh COMPATIBILITY ANSI
  
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CIRCLE 162 ON READER CARD

SOFTWARE

tion of menu-driven object code modules on Z80 and 8080-based micros running the CP/M operating system. The complete system, including selected accounting modules, costs \$595. DYNAMIC MICROPROCESSOR ASSOCIATES, INC., New York, N.Y.

FOR DATA CIRCLE 332 ON READER CARD

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This report generator/cross-tabulator package is designed to help relatively untrained office workers extract files from a large database on an ad hoc basis. Access/80 is said to be derived from a system called GRSP and subsequently renamed SYNTAX, which was developed for the State of California's IBM and Univac computers. Using what is claimed to be a virtual machine concept, the new package runs on CP/M systems with at least 48K bytes of main memory. The vendor says it will accept a wide range of sort variables and produce reports from virtually any ASCII data files. Variable record lengths, multiple reports from a single pass over the file, and direct access to CP/M system functions are several of the features the firm hopes will make its package successful against competition from other report generators available for micros.

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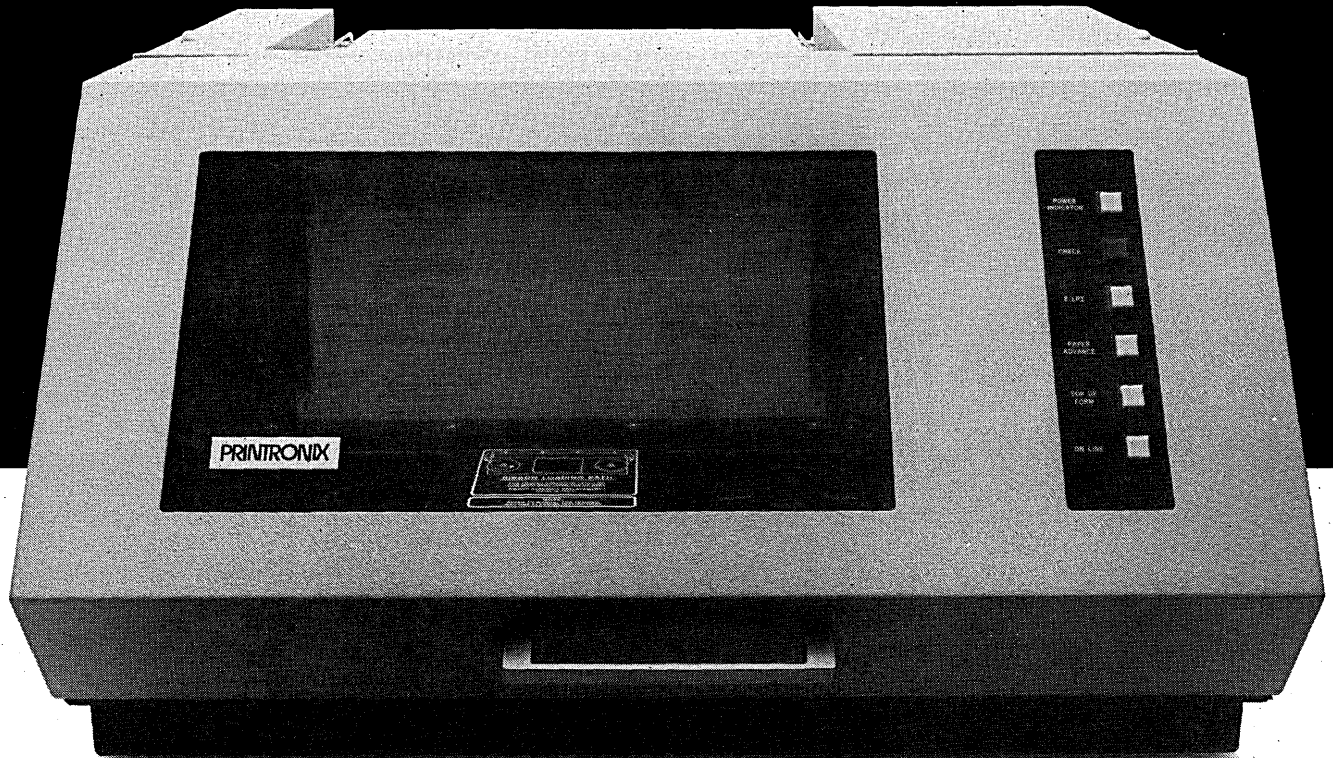
SOFTWARE?

That CP/M is bound to be the most popular operating system for micros is an assumption that's hard to argue with, especially since IBM chose it for its personal computer. Intel, the semiconductor giant, has now teamed up with Digital Research to bring out the latter's operating system on a chip. The CP/M-86 chip, designed to work with Intel's 8086 and 8088 micros, is expected to help designers come out with diskless machines aimed at networked applications new part contains 16K bytes of read-only memory plus timers and logic.

Intel hopes to use the device in its new iAPX-86 and iAPX-88 machines which are aimed at business and commercial applications. It will also offer the chip to others, beginning with samples in mid-1982. In a related development, Intel has said its recently established Software Distribution, under an oem agreement signed with Digital Research, will provide custom versions of the CP/M and MP/M operating systems for use on Intel boards and systems. Prices have not yet been determined. INTEL CORP., Santa Clara, Calif.

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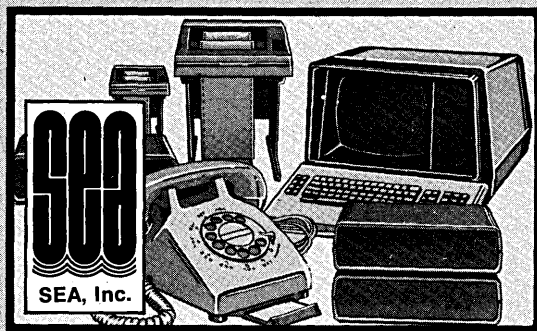
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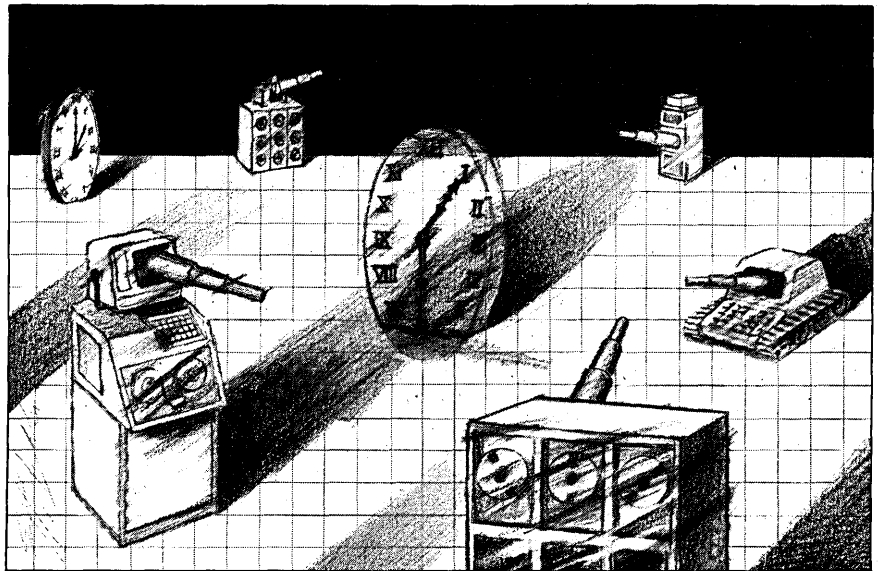
IBM: COLOSSUS IN TRANSITION by Robert Sobel **THE COMPUTER ESTABLISHMENT** by Katharine Davis Fishman

Much history is best related as biography. The central character provides a focus; his life is a paradigm of or a counterpoint to the larger trends. For the history writer, trying to explore the expanse of an epoch—all the causes of a war, all the preludes to a revolution—can be an impossible task. It is this problem that confronts Robert Sobel, author of *IBM: Colossus in Transition*, and Katharine Davis Fishman, author of *The Computer Establishment*.

Robert Sobel takes the sensible approach and produces an interesting, coherent biography of IBM with carefully measured forays into alien territory (Control Data, NCR, etc.). For all that it is presented as the story of IBM, Sobel's book provides a fair perspective on the industry as a whole. As an experienced business writer, Sobel ties IBM's progress to that of the U.S. economy in general (although I would have liked tables comparing the growing company with, say, Ford and U.S. Steel, as well as with Burroughs, NCR, and others).

True to his title, Sobel presents IBM as a corporation in continual "transition." From a company T.J. Watson Sr. could wield against a respected yet ultimately faithless boss (in his drive to outdo the man who fired him from NCR), IBM has gradually grown to resemble the machines it creates: the ascension of John Opel to chief executive this past January was as smooth "as if a section of a large computer system had been replaced by another, almost identical one," says Sobel. How much impact can one man now have on this colossus? To some extent it's at the mercy of currents it helped to create.

These currents, mind you, are not so much technology as market forces. Sobel rightly traces the history of IBM with more attention to business machinations than to technology. He stresses the importance of



marketing, leasing practices, management, and financial strength, with references to technology only where they are warranted.

Besides technology and business, there is, Sobel aptly points out, a third thread: litigation. "IBM emerged from the interwar period a powerful, well-entrenched corporation, with a powerful lead in what even then was recognized as a major growth industry: office equipment. It had outdistanced all competitors and had not been seriously damaged by Justice Department actions. These would be the two fronts on which IBM's wars would be fought in the future. . . . And the other companies knew this. If unable to defeat IBM in the marketplace, they might always turn to the courts for satisfaction."

From time to time, of course, technology does matter, as in the transition from vacuum tubes to transistors, the new architecture and technology of the 360, and the current ascendancy of minis and micros. But for a business writer, Sobel is curiously silent on the impact of this last upheaval. He points to the profusion of small-computer companies as evidence that competition is alive and well (without denying IBM's distress at this fact) but neglects to discuss the changes in distribution as well as the

products this shift is causing. "The small machines may bring IBM into previously untapped markets, but they won't alter the corporation's direction or orientation," Sobel blithely asserts at the end of a book devoted to illustrating how IBM has shifted its orientation from gaining to keeping its leadership in a progression of rapidly changing fields. Perhaps the fog hasn't cleared enough yet; books are inherently out of date in an industry in transition.

While Sobel may fail to grasp the sea change now overcoming IBM, Fishman never manages to develop a coherent view—a biographer's view—even of the past. Her title, *The Computer Establishment*, promises the definitive work on—what? If there is a genuine computer establishment, she fails to characterize it convincingly.

What we get is a long, discursive printout of everything the author learned in the 10 years it took her to prepare this book. To be sure, much of it is fascinating: the early days of IBM, complete with character sketches; the demise of RCA in the computer business, once published separately in the *Atlantic Monthly*; a whole half-chapter devoted to Charles Lecht which both his enemies and his friends should find on target;

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a discussion of artificial intelligence that moves the book from the marketplace back into the university; another excursion into business with a recitation of some of the evidence from the IBM trial (the current one); and, finally, a chapter on "social issues." The book is all data in discrete files, with no unifying system to manage the database.

There is, however, no discussion of Data General (surely it rates as part of "the establishment" by now), no analysis of the increasing importance of software, little sense of the ferment in the small business and microcomputer markets except for a couple of citations from IBM trial documents. The files are incomplete.

Although the book has a conclusion of sorts—that every citizen ought to know something of the workings of computers (at least that's what it says on the last page)—the rest of the book in no way leads up to it. The early tales of invention, the later accounts of business machinations, and the concluding look at "implications" fail to connect. Even within chapters, we start in one year, fall suddenly back into events that happened 10 years earlier, then lurch back to the present. While this may be appropriate for magazine articles, which are supposed to be colorful, discursive, and complete by themselves, a history requires a theme.

Indeed, any of the historical chapters (pick your topic: IBM, the leasing companies, RCA, Automatic Data Processing) makes a fairly good sketch if you enjoy lots of character study and know enough about the industry to understand the competitive dynamics that are never really made clear amidst all the anecdotes. It's not that Fishman doesn't always understand what's going on; some of her comments are fairly incisive. My favorite: "The question of whether a new product will work is only half the data processing manager's worry; the other half is what happens when it doesn't." And another: "At best, IBM closed its eyes to the probability that a long-term lease plan would put competitors out of business; at worst, it set out to do just that."

Further, she describes the typical Burroughs customer (circa 1970): "A Burroughs user was a buff, with that air of self-

congratulation buffs always have. He was pleased that he had the perspicacity, sophistication, and daring to appreciate a really superior piece of equipment and to find Burroughs, because God knew the Burroughs salesmen, who were scarce as hen's teeth anyway, weren't astute enough to find *him*." Elsewhere, a former RCA computer salesman relates his adventures fixing a television set for the chief financial officer of a large corporate customer.

On the other hand, there's an analysis of leasing economics (page 257) that just doesn't make mathematical sense: "They would show a 6% jump in annual income for each invested dollar [a questionable assumption in the first place]; if you multiplied that 6% by the 10-year life of the machine, it meant that any given computer could earn 60% more than it did before." Good thing Fishman didn't go into the business!

Her assessment of the future of the industry is strictly IBM-colored: "The question remains whether adequate competition will survive even if no action [against IBM] is taken." Even IBM has acknowledged the changing environment with its overtures to software houses, retailers, and others skilled in reaching the customer without going through the dp department (which some customers don't even have!).

Disinterested observers wonder aloud whether the IBM suit is still relevant. Despite their protests to the contrary (why give up a preemptive lawsuit on its merits?), most small firms will fail or flourish on their own merits, not by the actions of IBM. As hardware gives way to systems targeted at specific functions or markets, the vast computer market is turning into a widespread, variegated array of submarkets in which tiny companies can become as dominant as IBM once was in the single large market. Any book published in the year 1981 must take some note of the demise as well as the rise of the so-called computer establishment.

What both books make amply clear is how quickly things change. To anyone unaware of the business 25 or 50 years ago, it may be something of a revelation that IBM wasn't always first. IBM's recent slowdown in earnings and seeming loss of momentum are not unique in its history. In business

machines, upstart IBM took several decades to establish itself in a world dominated by Burroughs, NCR, and Remington Rand. (Conversely, NCR, once the unquestioned leader of its pack, is now an also-ran.) In computers, IBM lagged well behind Univac and kept its business machine customers only with a combination of a stopgap computerlike electronic calculator and the subsequent 702, a genuine computer announced a year before it was actually shipped in 1955. Almost 10 years later IBM again came from behind with the 360, although by this time its business (as opposed to technological) leadership was unquestionable.

The question now is, Can IBM pull off a recovery again? Is the company's ability to change unchanging? As Sobel explicitly states and Fishman at least indicates, "The computer wars [never end] . . . [P]articipants hope to win skirmishes and even major battles, but not total victory" (IBM, p. 255). Although Sobel is referring here primarily to the dampening effect of the antitrust laws, the shifting territory being fought over also renders each victory only temporary. It's no good being the leader in a slow-growth market such as mainframes when the action is in minis, micros, software. What's happening, to some extent, is the bypassing of the dp department. Computers are now being sold to end-user departments, to small businessmen, to professionals. That implies changes not only in the kinds of products being sold, but in the distribution channels needed to reach these new customers.

Recent rumblings from Armonk (and Atlanta and Boca Raton and elsewhere) indicate that IBM is indeed rearming for an assault on this strange new world. New products and new kinds of products—minis, distributed data processing systems, and now even micros—are proliferating. So are new attitudes. An IBM Personal Computer man, speaking at the Boston Computer Society on the marketing of IBM's PC, told his audience (in paraphrase): "The marketing of this thing will be a cinch compared with what we went through to market it internally." Ten years ago, he would have never had the chance.

The Personal Computer is significant not only for what it is but for how little of it really comes from IBM: It has innards from Intel; peripherals from Tandon, Epson, and others; software from Microsoft, Digital Research, Personal Software, Peachtree Software, and others; and is being sold by outsiders—Sears and ComputerLand.

This matter of selling is key. Suddenly IBM is turning to third parties to do its selling, not only of the Personal Computer and such products as terminals and printers (through seven industrial distributors including Arrow, Wyle, and David Jamison Carlyle), but also of entire systems such as



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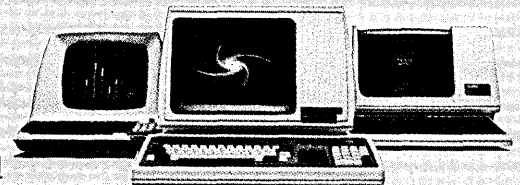
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CIRCLE 165 ON READER CARD

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its 8100 and 4300 lines. In November, it announced discounts to "Value-Added Remarketers" of these systems. This is the first time that discounts, relatively new at IBM, have spread to 370-architecture equipment (the 4300s).

IBM doesn't yet have the sales force, the applications software and easy-to-use application generators, or the mentality to reach this non-dp department marketplace directly, so it is relying—for now—on outside distributors, "value-added remarketers," and retailers. But it is starting to develop them—just as in the past when it used others' concepts and inventions, superseded with strategies and products of its own.

The Computer Establishment: Harper & Row, New York (1981, 437 pp., \$20.95); *IBM: Colossus in Transition*: Times Books, New York (1981, 346 pp., \$17.95).

—Esther Dyson

THE MANAGEMENT OF INFORMATION SYSTEMS

by Kenneth L. Kraemer, William E. Dutton, and Alana Northrop

The Management of Information Systems is the result of a large-scale, interdisciplinary research project of the Urban Information Systems (URBIS).

The first phase of the study involved assessing the state of the art of local government computing in more than 700 cities. The second phase, on which the book is based, concentrates on 42 cities selected by use of an "innovative sampling design". This "variation on disproportionate stratified sampling techniques" selected cities which the authors felt provided them with the best subset for their research.

Part I of the book describes the goal of the analysis, which is to present a systematic empirical study of the organizational impact of computer-based information systems in municipal governments. The improvements that local governments expect from the utilization of data processing were also examined.

These expectations include improved information gathering for decision making, improved management control, improved control over decision making, and improved operations. Six tasks were selected for study: 1) traffic ticket processing, 2) patrol officer support, 3) detective investigation support, 4) police manpower allocation support, 5) budget control, and 6) policy analysis.

The second part describes the use of computers in local governments, with specific regard to the six areas described above. In this section, the authors contend that while computers have increased the technical quality of information used by government officials, this information is only somewhat helpful in making decisions, and that much of the information

needed for governmental decision making is still not available.

For each city studied, the authors provide the reader with an explanation of the applications, impact of automation, implementation strategies, and their assessment of those strategies.

Part 3 compares the findings for each city described in Part 2, using nine criteria for each of the six tasks.

Although the authors' stated intention was to provide a scientific assessment of the impact of computer-based information systems on local government decision making, several flaws in the study design render their conclusions questionable.

First of all, most of the cities selected were relatively small and many had poorly managed data processing shops, so that their experiences show a history of failure and frustration. Had the sample encompassed some cities with larger populations and data processing budgets, a more representative and constructive picture might have been developed.

In addition, the authors tried to address too large an audience. Students and professionals in the fields of public administration, business administration, and information and computer science present too diversified a group to be well served by one book. The statistical techniques developed in the study may, however, warrant further study by statisticians and those involved in the social science analysis of urban data.

Because the data were collected between 1973 and 1976, much of it is now out of date. Reference to the expense of moving from second to third generation because of poor vendor support provides good historical background but not current information. Government admittedly moves slowly in changing its data processing environment, but a five-year lag in publication is significant.

Another serious flaw of the study is that four of the six tasks analyzed are police related. Although law enforcement applications usually form an important part of the data processing environment of any municipality, they certainly are not representative of a city's total data processing picture. Such systems as complaint processing, correspondence tracking, health records, and personnel systems might have provided a wider scope for the study.

Although many of the findings, such as they are, support the authors' basic contention that "the benefits of advanced technology are far less dramatic than suggested by promoters," they all but ignore the issue of the quality of the data processing management.

One example cited shows how a data processing project that was supposed to cost \$1 million ended up being scrapped five years later after city officials had determined it would cost at least \$4.5 million more to complete. The authors conclude

that this is an illustration of how "the computer as a problem solver can turn into a problem generator." In my opinion, any such problem was a result of poor planning and poor management rather than a failure of data processing per se.

Another questionable point put forth by the authors is that performance is generally better in cities that have implemented advanced technology. This is usually true but not always. Jumping at every new technological advance is not only expensive but potentially dangerous, particularly if the new technology has not undergone sufficient testing in the marketplace.

As a college text, this book provides a good source for further reading. The city executive may find the last section interesting, and data processing managers may consider Part 3 thought provoking. Unfortunately, it is hard to believe either will receive an accurate view of data processing in today's government from this book. Columbia University Press, New York (1981, 416 pp., \$25).

—Thomas A. D'Auria

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The 1982 edition of the Sherry Says data-com calendar, featuring the famous Sherry, is available from Racal-Milgo. The calendar also displays industry conferences, exhibitions, and significant events in the history of data communications.

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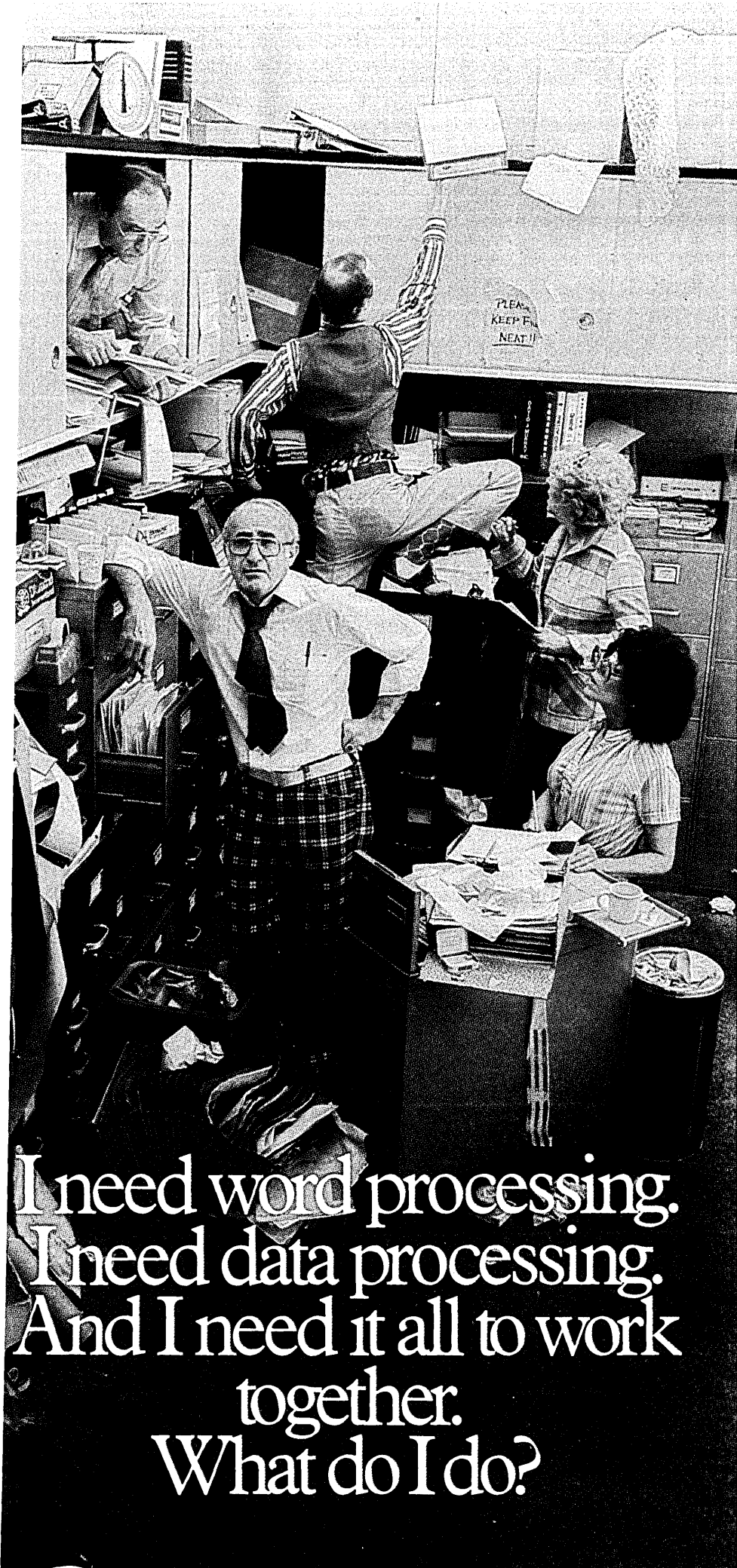
COMPUTER PHILATELY

Robert V. Boos of Plainview, N.Y., has compiled an extensive list of stamps from around the world with computer themes. Included are the 1973 "punched paper tape stamp" from Papua New Guinea, the 1972 "control console for Apollo XII" issue from Ras al Khaima, and the 1978 "Elka 55" stamp from Bulgaria. For a free copy of the list, send a self-addressed No. 10 envelope (with 54¢ postage on it) to Mr. Boos at 34 Santa Barbara Dr., Plainview, NY 11803.

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BASF is offering a six-page brochure on its FlexyDisks product line. Care and handling tips, a product catalog listing, and a description of how the disks are manufactured are included in the free folder. BASF SYSTEMS CORP., Bedford, Mass.

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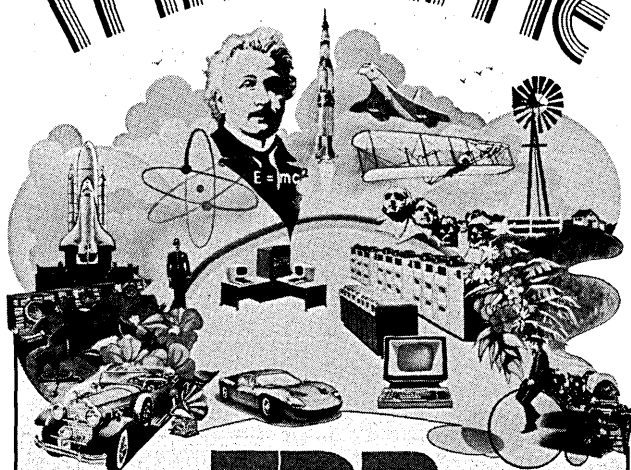
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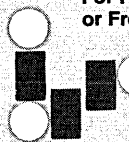
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ADVERTISERS' INDEX

Adage.....	105
Agile.....	71, 89
Alanthus Data Communications Corp.....	83
Alfamerics.....	144
Altoona Enterprises.....	4
Anderson Jacobson.....	200
Ann Arbor Terminals.....	173
Applications Software.....	181
Applied Data Research.....	9
Ask Computer Systems.....	62-63
AT&T.....	36-37
Auerbach Publishing.....	79
Aydin Controls.....	121
*BASF.....	192-13
BBN Computer.....	189
*Bell Telephone.....	192-17
Boole & Babbage.....	12
CACI.....	137
Calcomp.....	43
Centronics.....	66
Codex.....	149, 150, 151, 153, 154
*Columbia Data Products.....	192-5
*Contact.....	192-22
Computrend.....	41
Control Data Institute.....	198
Cullinane.....	116, 117
Cylix.....	159
DASD.....	224
Data Controls.....	80
Data General.....	166, 167
Digital Communications Corp.....	84, 85
Digital Equipment Corp.....	98, 99, 124, 125
Digital Equipment Customer Service.....	53
Digital Equipment Field Service.....	54
Digital Equipment Education Service.....	55
Digital Equipment Software Service.....	56
Digital Engineering.....	205
Drexel, Burnham, Lambert.....	108
Eastman Kodak.....	171
Electrodata.....	50
EPS.....	215
*L.M. Ericsson.....	192-8, 192-9
Franklin Electric.....	88
Frequency Technology.....	65
*Gandolf Data.....	192-10
Gejac.....	182
General DataComm.....	216
General Electric Terminus.....	107
Genisco Computers Corp.....	97
Glasgal Communications.....	42
Gould Deltec.....	123
Graham Magnetics.....	109
Hazeltine.....	39
Henco.....	51
Hewlett Packard Business Computer Group.....	68-69
Hewlett Packard Corvallis.....	193
Hewlett Packard Terminals.....	183
Hewlett Packard.....	145
Hi-G Incorporated.....	44-45
HMW Enterprises.....	92
Honeywell.....	207
Hughes Aircraft.....	106
Human Design Systems.....	8
IAAIC.....	24
IBM.....	168, 169
IBM - series 1.....	20-21
Informatics.....	15
Information Builders.....	196
Innovation Data Processing.....	208
Intel.....	10-11
International Systems, Inc.....	64
Intertec.....	29
ISSCO.....	177
C. Itoh.....	19
ITT Worldcom.....	76, 77
Kennedy Co.....	Cover 2

Laminex	16
Lear Siegler	32-33
Lee Data	75
Lifeboat Associates	221

*Maxell	192-18
Maxell	186
McCormack & Dodge	49
Megatek Corp.	162
Memorex Communications	191
MFE Corp.	87
Micom	1
Micro Data Base Systems	165
Moore Business Forms	17
MSA	102, 103
MTI	82

National Advanced Systems	2
Network Systems	86
Northern Telecom	184, 185
Northrop Data Processing	223
Numonics	174

Omnitex Data	61
On Line Conferences	135
On Line Software International	197

Paradyne	129
Perkin Elmer	67
Precision Visuals	93
Prime Computer	22
Printacolor	4
Printek	94
Printronix	201
*The Purchasing Agent	192-23

Quality Micro Systems	192
-----------------------------	-----

*Racal Milgo	192-7
Racal Vadic	100
RCA	81
Ross Laboratories	209

SAS Institute Inc.	27
Science Research Associates	133
Scientific Software	52
SEA, Inc.	202
*Siemans	192-14, 192-15
Siemans	130, 131
Software AG	30
Sotheby's	190
Source EDP	72, 73
SPSS	218
SRI International	190
Sysed	61

Tab Products	143
Tandem	194
T Bar	115
Technology Transfer	28
Technomart	95
Tektronix IDD	6-7
Tektronix	198
Teletype	Cover 4
Televideo	60
Texas Instruments	5
Three M	160, 161
Timeplex	91, 220
Toshiba	78
Trans Net	95
TSI International	138

University Computing Co.	58-59
-------------------------------	-------

Vector Automation	172
Victor Systems	70
Visual Technology	178

Wang Institute	222
Wild Hare	139
Wrightline	199

Xerox Computer Services	25
Xerox Printing Systems Division	Cover 3

zBK Telecomputers	182
-------------------------	-----

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ADVERTISERS' INDEX

SOFTWARE & SERVICES

Amcort Computer Corp.....	211
B I Moyle Associates, Inc.	211
Dataware, Inc.....	210
Dataware, Inc.....	210
Dataware, Inc.....	210
Duquesne Systems, Inc.	211
EEC Systems.....	211
Federated Consultants Inc.....	210
Mitchell & Gauthier Associates, Inc.....	211
Plycom Services, Inc.....	211
RSTS Professional.....	212
S-Cubed Business Systems	210
Software Design & Development .	210
Software Marketing Inc.....	211
Telecon Systems.....	212
Viking Software Services, Inc.....	211

DP MARKETPLACE

Columbia University Press	212
---------------------------------	-----

PERSONAL COMPUTING

Micro Management Systems, Inc.....	212
Pan American Electronics, Inc.....	212

TIME & SERVICES

Electronic Interface Associates, Inc.....	212
--	-----

BUY, SELL, LEASE

Electrocon, Inc.....	213
Genstar REI Sales Company	213
C.D. Smith & Associates, Inc.	213
Thomas Business Systems, Inc.....	213

JOB MARKETPLACE

Exeter Associates.....	213
Federal Energy Systems, Inc.....	213
RSVP Services	213
Wilkinson & Associates, Inc.....	213

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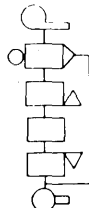
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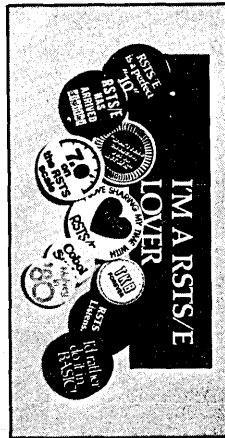
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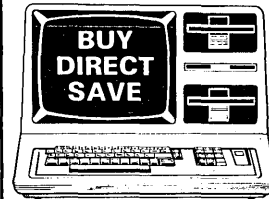
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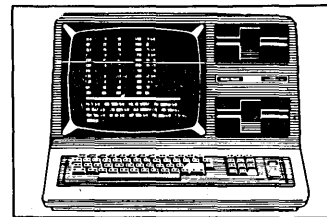
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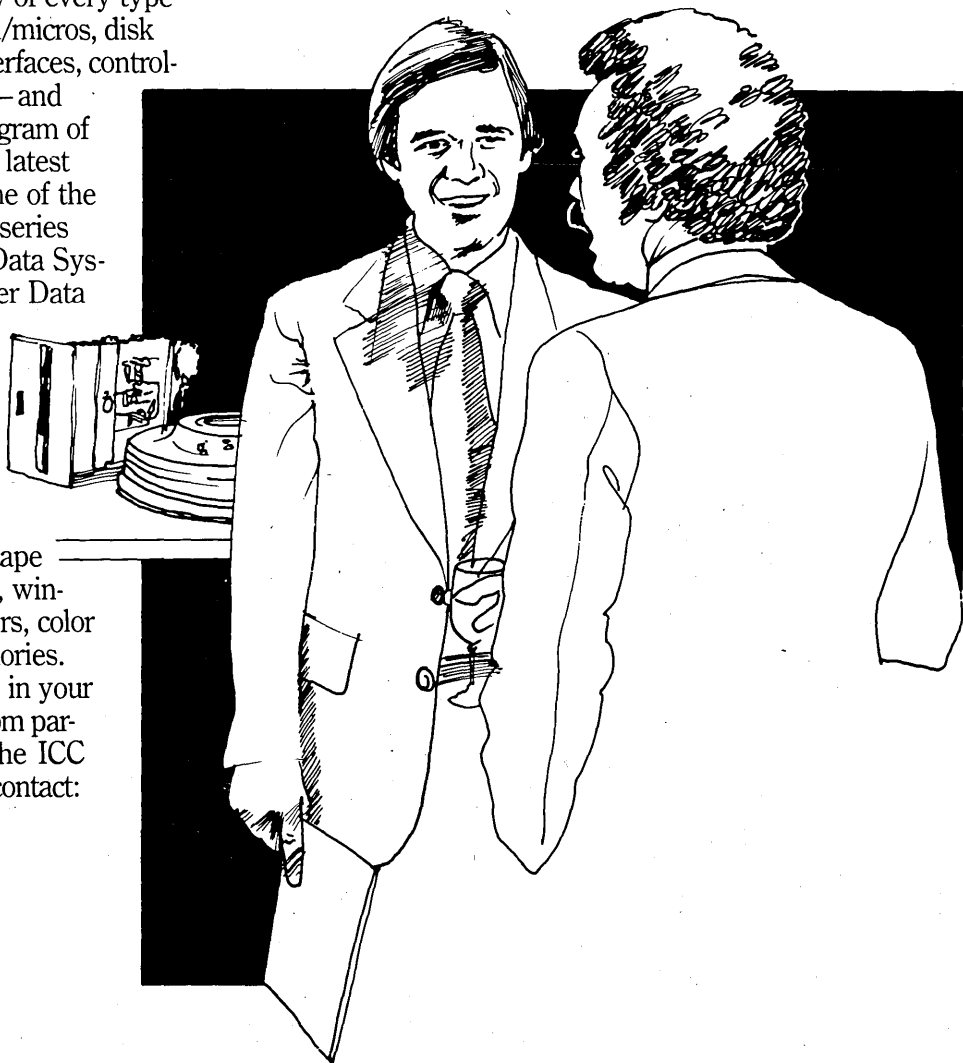
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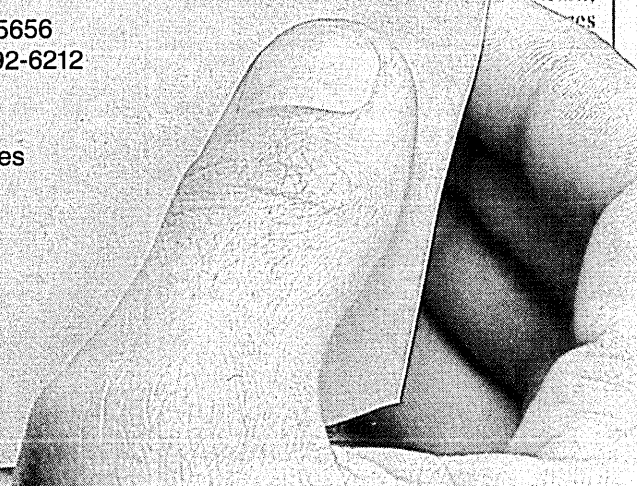
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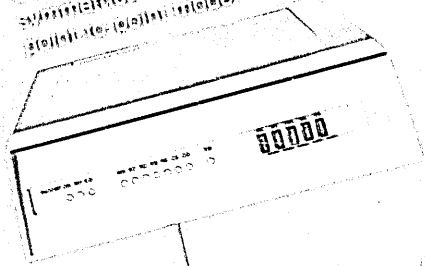
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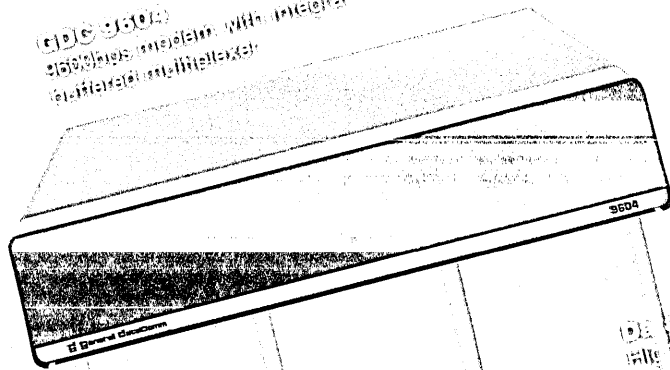


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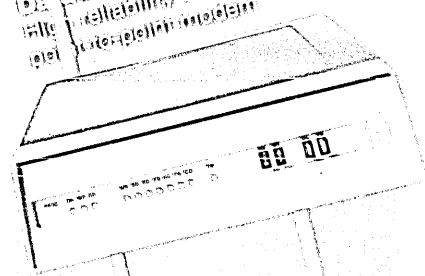
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CIRCLE 171 ON READERCARD

READERS' FORUM

OBVIATING OS

After reading the well-organized introductory thoughts in October's Editor's Readout, my first perusal of the OS panel's comments left me disappointed. I had expected the group to have a more definitive grasp of OS shortcomings. It wasn't until I reached Mr. Welke's closing comments that I fully realized the problem: we, the user community, really don't know what we want IBM to give us as a replacement for the Operating System (OS). Sure, we all have our pet gripes and suggestions for improvement, but I don't think any of us have seriously considered a wholesale replacement of the environment that has given us TSO, DL/I, CICS, and a host of other products. I've got this nagging feeling that if IBM is looking to us, the user community, to present it with functional requirements for a replacement for OS, then we're going to be stuck with OS for a long, long time.

First of all, I'm not sure it's appropriate to single out IBM OS as the subject of this discussion. While one might argue that IBM Job Control Language is harder to use than another vendor's or that CICS is more cumbersome than some other transaction processing package, all large-scale systems have the same problems. Operating systems have grown into monsters that are unacceptable to the kind of user we can expect to see in the future.

Next, I wonder if we should even call OS the culprit. While it does embody much of what we are talking about, it wouldn't do any good to take it out of the picture and look for something else to take its place. It would be like taking a piece out of a puzzle. Pieces around it would still dictate that you replace it with something shaped and colored like the original. Mr. Welke hinted at this by questioning the need for upward compatibility. In fact, what may be necessary is a rethinking of everything we have done since we first learned that the bigger the central processing unit is, the more "bang for a buck" you can get. I still remember how hard it was for me to accept the fact that it was significantly less expensive for four users to share a multiprogrammed cpu with an operating system soaking up 10% to 50% of the available cpu cycles than for them to use four separate systems offering only an eighth to a quarter of the horsepower but without the overhead of a complex operating system. I guess it's time to forget this and other lessons we learned back then. I'm not writing off 20 years of systems and application programs; I am merely suggesting they were developed under assumptions that are no longer valid. Of course, whatever the final solution is, it will have to include provisions for emulating the monsters we now have.

Mr. Michlin suggests that since users have now found they can have word processing, standalone personal computers, and other capabilities without the tremendous costs and overhead of an

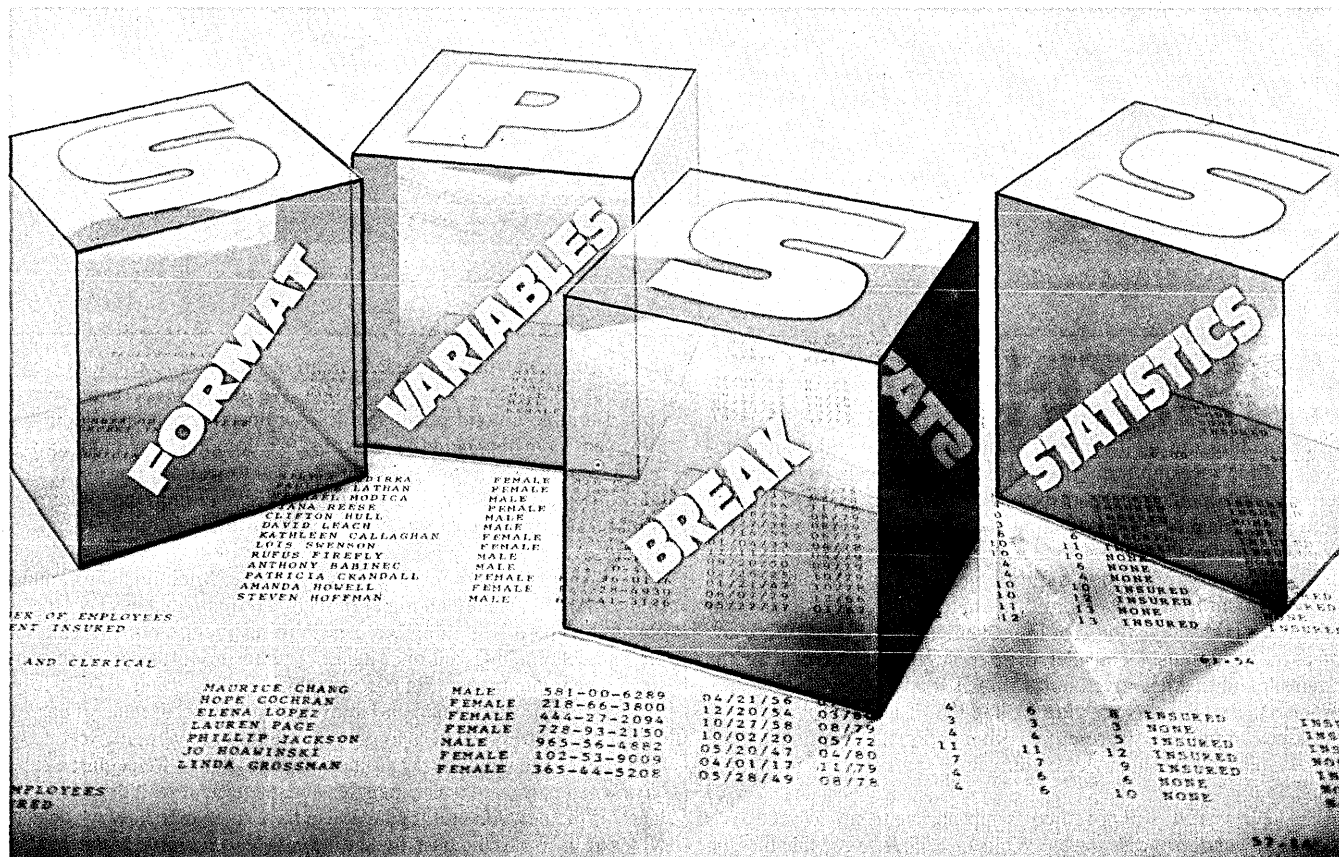
OS environment, they will question all of the other restrictions we have placed on them. He may be right. We in data processing have built a temple around our machines. Ordinary people are finding they can have the benefits provided by computers without our mumbo jumbo. I only wonder why we had to wait for our users to question our restrictions. Why didn't we discover mini- and micro-computers ourselves and take command of the revolution when it began?

There are two possible answers to Mr. Michlin's warning. In the first one, we are all high priests of a religion that has become obsolete. There is nothing we can do to restructure our little empires to become relevant once again. There is no further need for a specialized data processing bureaucracy. The best thing we can do is to commit ritual suicide and allow the future to continue unburdened by our ilk. Needless to say, I prefer to believe in the second alternative: We have to learn to take the knowledge we acquired in days when hardware was expensive and integrate it with the advantages of the new technology. We also have to change how we deal with our users. In the past we had been able to mumble a bunch of incantations and convince our users that certain things "can't be done." After they had left us alone with our machines, we figured out how to give them what they wanted. Now, on the other hand, every user has a child in high school who can tell him how to do all the things we can't do. I personally welcome this change. I consider it superior to an environment in which we were treated as demigods and expected to provide all the solutions.

All of this brings us to the key question: What is it about our software that is so complex that we can't do things fast enough to please our pseudosophisticated users? Sure OS is complex, COBOL is verbose, CICS is unwieldy. But it's not any one of these factors that causes our problem. Instead, I think our problem is that we have a large host of specialized tools and there is no inherent compatibility among them. To illustrate: IBM's TSO can be used quite effectively and inexpensively to implement a low volume on-line application. But heaven help you if your single user blossoms into 300 users who want the same capability. There is no simple way to upgrade an interactive TSO-based system into an efficient transaction-based system. Similarly, we have all had a lot of experience designing 80 column sequential files, but think of the painstaking effort it takes to convert one of them to a relational database.

Given these problems I think it may be necessary to rethink our entire approach to data processing. I personally believe that OS in all of its complexity really isn't needed. For a starter, the cpu is no longer a high-priced resource that needs to be used efficiently through multiprogramming. In fact, much shared remote computing no longer makes sense because the cost of communications equipment and line charges is getting to be more than the cost of installing local processing nodes.

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READERS' FORUM

I see a need to create three different classes of computers: 1) message switching computers, 2) application computers, and 3) database computers. Let's discuss these individually.

Message switching computers would be responsible only for receiving and forwarding packets of information. They would not contain any application-related custom code. They would be "configured" to support any type of network or combination of connecting devices, including the other two types of computers or input/output peripherals. Customized backup, transaction journals, or accounting functions should not be supported by these devices. Instead, they should have standard interfaces that allow data to be sent in packets to one of the other two types of computers for processing. The only function of these message switching computers would be to transfer information between the other two types of computers, utilizing some simple scheme for rerouting messages when necessary.

Application computers would be structured very much like the personal computers of today (or the IBM 650 and its immediate follow ons of yesteryear). All multiprogramming would be eliminated and these application computers, ranging from the smallest personal machines to the largest number crunchers, would work on only one program at a time. They would support a user friendly OS, allowing users to perform the following functions:

1. Create and maintain local files. All computers would support standard menu-driven utilities to allow data entry and retrieval without the need for programming. Any type of local file under any access method would be supported by these utilities. These files and utilities should be record oriented and fully compatible with the next two points.

2. Create, compile, and run local programs written in any of several languages. All languages must be upgraded to support fully compatible file access capabilities. For example, BASIC must be expanded to allow access to ISAM, VSAM, and other file structures. The language a person selects may dictate the program's efficiency, but it should not place any other restriction on his capabilities.

3. Transmit and request standard data packets from other computers. Such data packets should be identified by a routing code and a key. These packets must be accessible via standard utility programs or any of the programming languages on the system. Naturally, these packets could contain either data or programs. Information could be sent or received via message switching computers. For example, it may be appropriate to store certain programs that are maintained by a common organization on a central database and down-loaded to the application computer when needed. Alternatively, a program could be developed on a small application computer and sent to run on a much larger number crunching application computer.

Like the message switching computers, the database computers would also be nonprogrammable devices. They would be responsible for storing shared files of data and would be accessed via the message switching computers. Depending on price they would support varying amounts of storage and different accessing or retrieval techniques, but would not require any programming.

Another way of looking at the environment I have described is to think of the whole world as a large multiprocessing computer, with application computers serving as the cpus working on dedicated tasks; message switching computers functioning as queuing software, interprocessor communications paths, channels, and buses; and database computers functioning as mass storage devices. The simplicity of the idea is that any application can be brought up in a prototype mode on a single computer without complicating considerations. It can then be converted into a multi-user application by merely transferring the program to a database computer and installing additional application computers to down-load and run the application when needed. Similarly, if required, it could be rewritten from a less efficient language to a more efficient language without changing the files or interaction with other systems.

—Julius Z. Nadas
Chicago, Illinois

LEARNING FROM DINOSAURS

The sad state of IBM mainframe operating systems almost sounds like a broken record that's been playing for 15 years. In the mid- to late 1960s it was reported that users couldn't process their applications reliably because of thousands of operating systems bugs. In the 1970s, users complained about IBM's dropping support of older operating systems and about IBM's operating systems monopoly. And now we're again asking what can be done to extricate users from a very expensive situation. I call it expensive because it's an undeniable fact that IBM's operating systems use excessive machine resources, require high-priced personnel for support, make applications development exceedingly difficult, and lock users into IBM hardware and software.

The IBM operating system problem, however, is just the tip of the iceberg. It's symptomatic of a much larger problem—IBM's monopolization of the software industry. But it represents an important opportunity to examine the past and avoid mistakes in the future. Users around the world have spent tens of billions of extra dollars using and maintaining IBM's operating systems. What's to say they won't spend hundreds of billions extra dollars in the 1980s and 1990s with the next generation of computers?

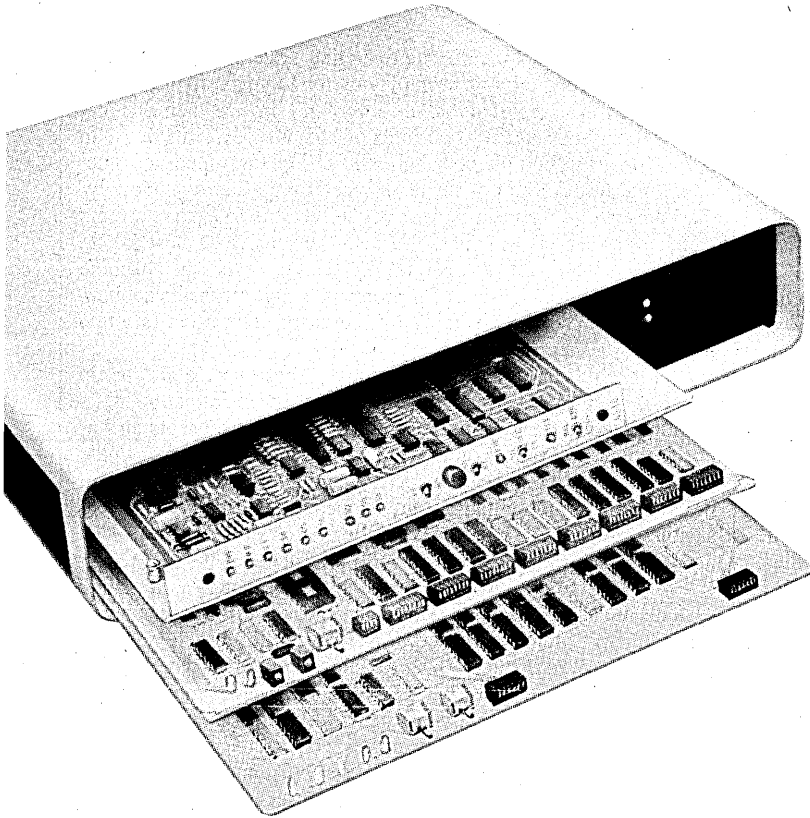
There's no question that IBM's DOS, OS, and VM operating systems are an abomination. DATAMATION stated it in a nutshell by calling them "bloated monsters." Left unsaid, however, was why for the last 15 years there was no viable alternative; whether IBM violated the law in 1965 when it eliminated all competition by bundling the IBM 360 operating systems with hardware; why SHARE, GUIDE, and the user community encouraged IBM to continue to give away the operating system in the 1960s, 1970s, and into the 1980s; why so few companies, publications, and users supported the Justice Department's antitrust suit which addressed IBM's monopolization of operating systems; and why IBM unbundled all its system



"What say we tell them the source of the Nile
is rain and let it go at that?" ©DATAMATION

Minicomputer users:

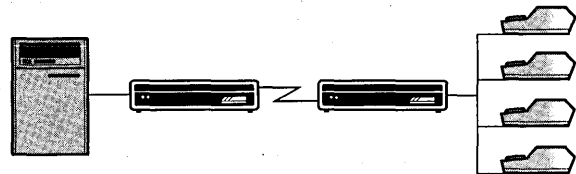
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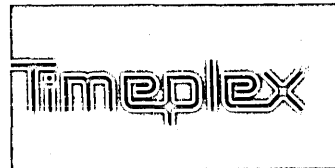
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READERS' FORUM

software except for the operating system software in January 1970.

When IBM unbundled, it was obvious to many industry watchers that IBM's operating systems were inefficient, resource hungry, and difficult to use. (Remember the outcry when MVS memory requirements were announced in 1975.) It was also apparent that IBM's decision not to unbundle the operating system was a tactical and strategic move. Seven years ago in DATAMATION (July 1974), I stated it this way:

"Competition does not happen spontaneously—especially in the area of operating systems. Sure, some software companies can 'pick up the crumbs' and try to sell support and enhancements to IBM's 'free' operating systems. But the harm is already done—there is no effective or economical way for a would-be competitor to break into the field. New operating systems are being planned and most users won't stay with current 'free' operating systems if they have to buy support from some non-IBM firm. Besides, soon there will be that new IBM state-of-the-art free operating system and it'll solve all of those problems of the past. . . . Wanna bet?

"Competition and antitrust laws made IBM cut the price of its peripherals and memories. But there is no operating system software competition so far, because the monopoly has not yet been challenged.

"Consider this hypothetical situation: in 1964 IBM announced the 360 at an average cost of \$10,000 per month; IBM also announced an operating system software package at \$1,000 per month. With IBM predicting sales of 20,000 computers, and third party leasers predicting 10-year life spans for 360 computers, the total 10-year revenue for the 360 hardware line was predicted to be \$24 billion. During the same 1965-1975 period, the operating system software package market alone was predicted to be \$2.4 billion. By 1967, three software companies had developed compatible operating systems to sell for \$750 per month; they were compatible, operated in half the space, and provided faster throughput. IBM responded by announcing a new version of the operating system. The wheels of competition keep turning, and the needs of the user community—as well as those of the industry—are served.

"But look at what we have in 1974: IBM locking in its customers with free VS operating systems and IBM users facing obsolescence of their 360 hardware and current operating system and no competition in sight."

Matters have only gotten worse since then. During the last several years, I have advocated an overall solution to IBM's dominance in the software products industry—that the government should require IBM to form a separate software products subsidiary (DATAMATION, March 1981). Opponents argue that a hardware company should design its hardware along with its operating systems software. They reason that tradeoffs can be made between hardware, firmware, and software in the design of an operating system. It's ironic, however, that IBM is again accused of having the worst operating system software—when it has had the opportunity to have the best. Let's face it: IBM monopolizes the operating system software. Market conditions make it virtually impossible for software product companies to compete. By giving the operating systems away, IBM costs users in private industry and the government billions of dollars. And unfortunately, there still is no relief in sight. The few companies that tried to compete against the free software operating systems in the 1970s, such as Nixdorf with EDOS and Software Pursuits with DOS/MVT, were only marginally successful. It's obviously hard, if not impossible, to compete when IBM's operating systems are free to the user and when hundreds of systems programmers are assigned to enhance them. So again, it's a case of IBM eliminating even the possibility of competition.

What can be done about it? In my opinion, nothing, as far as today's operating systems are concerned. It's simply too late. But it's not too late to look at other potential problems IBM users may face in the future. What if IBM eliminates competition in the system software market in a similar fashion? What if by 1990 IBM monopolizes all database management systems, TP monitors, library systems, program development systems, compilers, sorts, utility pro-

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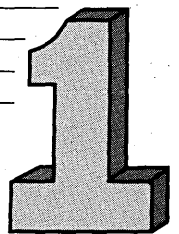
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READERS' FORUM

grams, application development systems, performance monitoring systems, text editing systems and so on? I don't necessarily believe it will happen. But IBM currently has about a 50% share of that market—and it's getting a larger share every year. The current independent software companies should survive nicely, but will there be an opportunity for new companies? IBM's market share may stop at 70%—even they would be afraid of 100%—so there always will be a semblance of a competitive marketplace. But that's all there may be.

Again, I suggest that industry leaders, users, and the government consider the merits of forcing IBM to form a separate software subsidiary. And, above all, that they apply the principles of "maximum separation" to that company: principles that were applied in the 1956 Consent Decree to IBM's Service Bureau operation, that are being fostered by the FCC and the Justice Department regarding AT&T's entry into data processing, and that are fostered by ADAPSO should IBM enter the timesharing or data center business.

A separate software company would foster competition of operating systems and all other forms of software. It would be beneficial to everyone—users, independent software companies, and perhaps even IBM. A separate IBM software company may not solve today's problems with IBM's operating systems, but it would prevent those problems from occurring with future generations of computing systems. "Never again" should be the credo of the user and data processing community. But, where are the voices?

—Martin A. Goetz
Princeton, New Jersey

TIME TO TALK TOUGH

Me and a couple of other information processing pros were sitting around in a cocktail lounge the other night, watching *Dallas* on the wide screen, when one of those IBM commercials came on. We got a kick out of watching the Chaplin character come to terms with computing—the ad was well done, there's no denying—but when it was over one of the guys remarked that there was something about it that made him uncomfortable.

We all knew what he meant, but we couldn't put our finger on it. Then a while later they showed that heartwarming Data General spot about delivering Guinness Stout to the citizens of Dublin, and it hit me. Who the hell would ever have expected Data General to become cute? I mean Apple, I can understand, but Data General? And IBM?

After another round we agreed that the industry is charging off in a new direction without any awareness of what's at risk. Obviously we're not going to be able to get by forever with the giant brain image that served us so well for so long, but if we start promoting cuteness I think we're all in for a cut in pay. After all, good systems analysts are hard to find, but Charlie Chaplin imitators are a dime a dozen.

They were closing the lounge when we finally decided what we'd like to see, which is this: a good old-fashioned hard sell, something on the order of what they do for Dodge trucks. We picture an earnest, gray-haired guy in an expensive suit sternly thumping a mainframe's hood and announcing, "It's the Information Age, America. Wise Up!" Then, with "Pomp and Circumstance" playing in the background, he could do a rapid-fire run-down on cycle times and MIPs rates. The commercial could close with a warning about foreign competition, possibly augmented by a male chorus humming "America the Beautiful."

We figure this pitch, if handled with dignity, could do a lot for the industry in general and for us in particular. That's why we're offering it free of charge to any company bold enough to want it.

—V.S. Baud
Los Angeles, California



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PEOPLE/PRODUCTS/RESULTS

READERS' FORUM

FRIENDLINESS

Today the term "user friendly," as applied to edp systems, has become fashionable in many circles. Considering some of the bad press given computer systems in recent years (e.g., "To err is human but to really foul things up takes a computer"), the suggestion that systems can actually befriend their users is attractive.

Over the last decade a change has been occurring in users' expectations of the services that edp systems should provide. Many users have come to believe that data processing should be more than a passive tool for the solution of predefined problems. They want systems to provide the kind of active support that encourages new ways of solving problems. This can't happen without a new, comfortable, even friendly, relationship between systems and their users.

What exactly is this elusive quality and how can one determine which systems have it and which do not? There is no precise definition of user friendly since the features that a system can offer its users vary widely depending on the system's environment—online or batch—and its application—technical, financial, administrative, etc. Nevertheless, experience suggests that user friendly systems typically share some or all of the following characteristics:

1. *Operational clarity:* The purpose and the operational logic of the entire system and each of its component parts should be clear and unambiguous. The complexity of the systems should always be less than or, at worst, equal to the complexity of the task.

2. *Functional flexibility:* The system should be able to handle all or most problems in certain well-specified classes, not just those individual problems that the systems analysts happened to specify during system development.

3. *Error prevention:* The system should preclude or minimize the possibility of user error.

4. *Error tolerance:* When the user does make mistakes, the system should minimize their adverse effects. It should require only that the erroneous data or commands be reentered. Potentially costly mistakes (such as file deletion) should always be reversible.

5. *User skill accommodation:* The system should allow users at all levels of skill and experience to work effectively.

6. *System unity:* All system components should be based on the same design principles, and the system should be implemented so that it appears to all users as a single system, not as an ad hoc collection of related parts.

7. *Task completeness:* The system should be subdivided into reasonable units of work or tasks as viewed by the end user. If it cannot handle all steps of a basic, practical task, it probably should not handle the task at all.

8. *Task security:* The system should not lose work that has been successfully completed (even if a subsequent task fails).

In addition to these features, user-friendly systems must provide good performance, be reliable, and be available when the user needs them. User-friendly systems should also be well documented. A clumsy system, however, cannot be improved simply by documenting all of its idiosyncrasies.

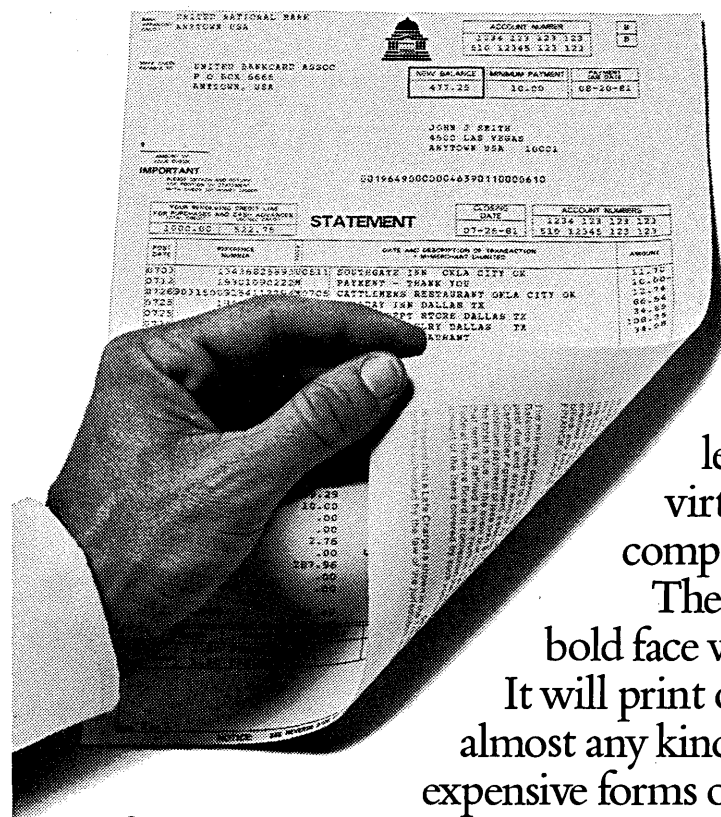
Maintainability is, of course, an important issue, but it is not specifically addressed in this context since it is really related to a separate systems attribute, namely, maintenance friendliness. Strictly speaking, the end user is not concerned about the ease or difficulty of the service technician's job.

There are other user-friendly features that could be added to this list, but if you are fortunate enough to be introduced to a system that meets most of these basic criteria, take a few minutes to get better acquainted with it. You may have just found a new friend.

—D. Verne Morland
Munich, West Germany

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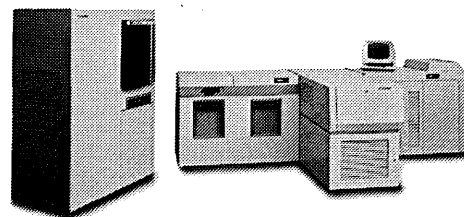
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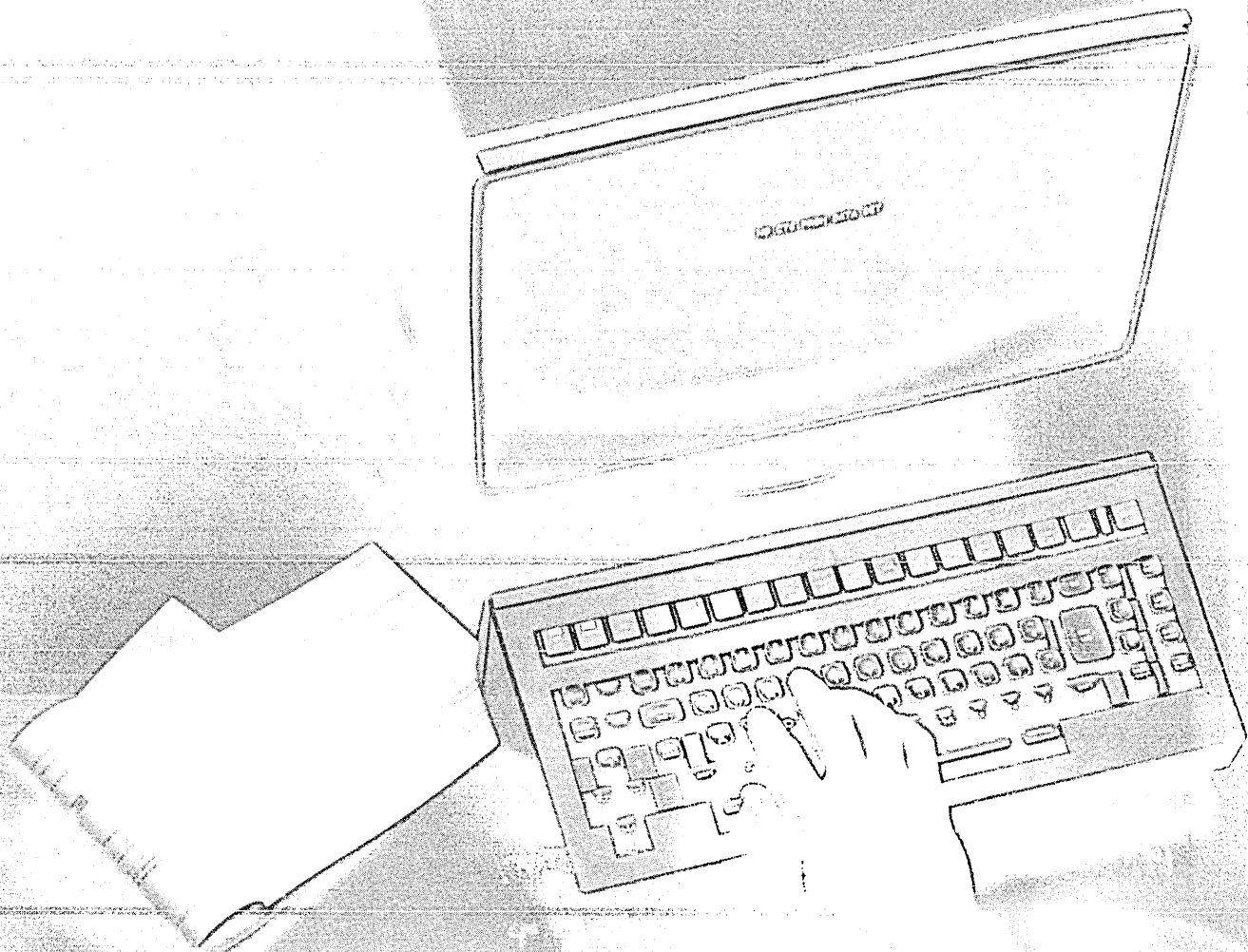
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