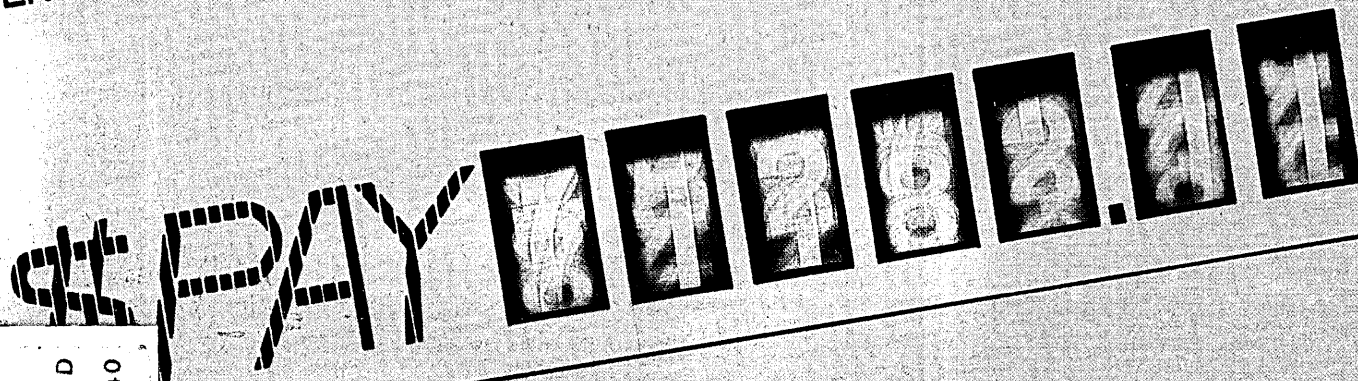


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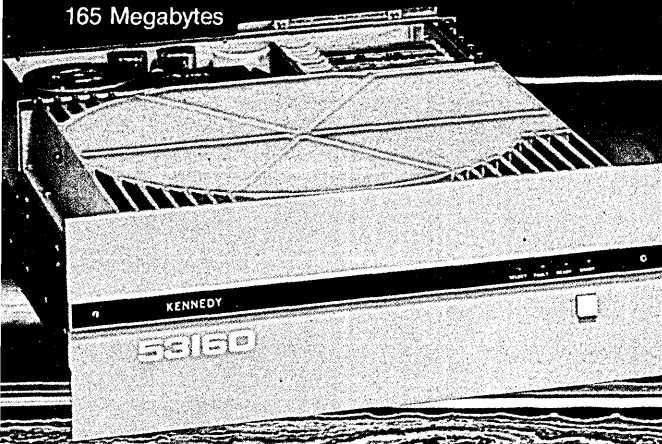
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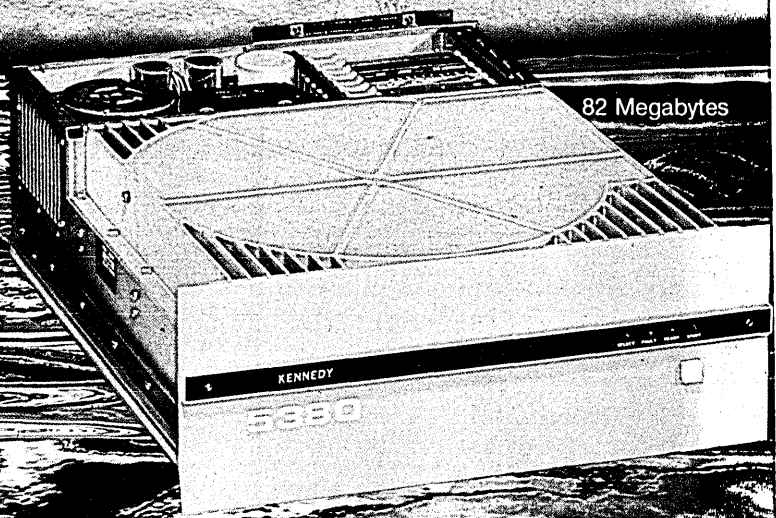
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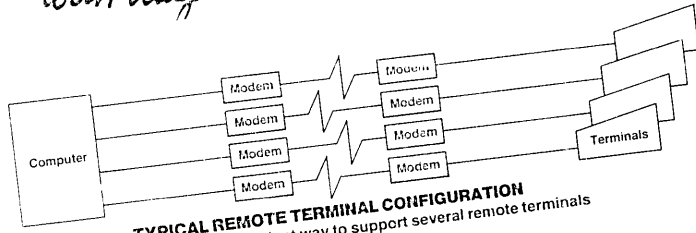


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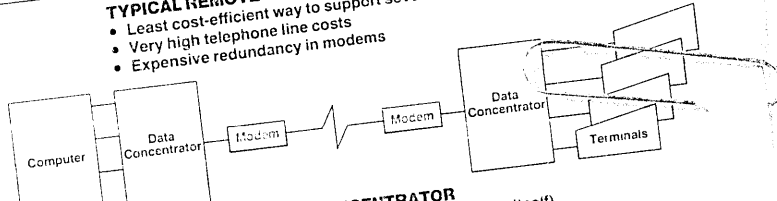
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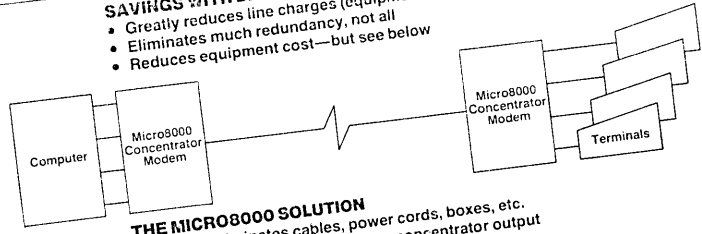
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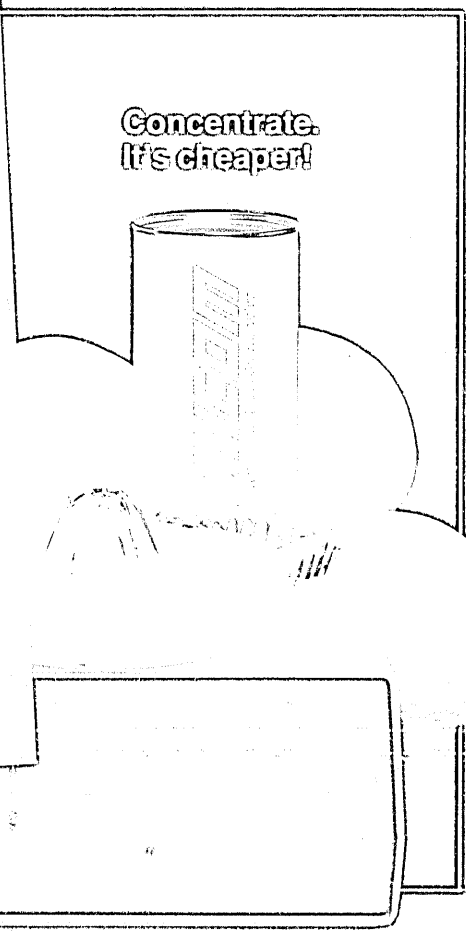


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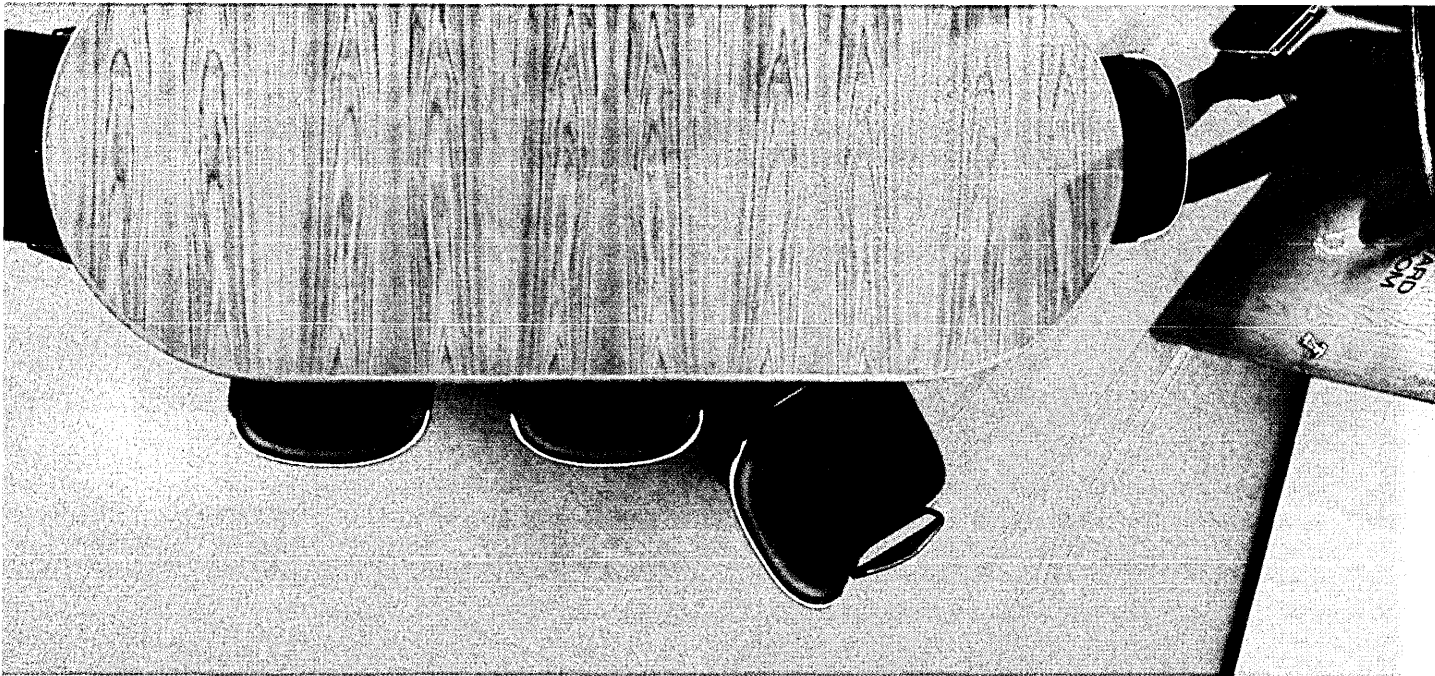
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VOLUME 28 NUMBER 11  
This issue, 162,061 copies

## FEATURES

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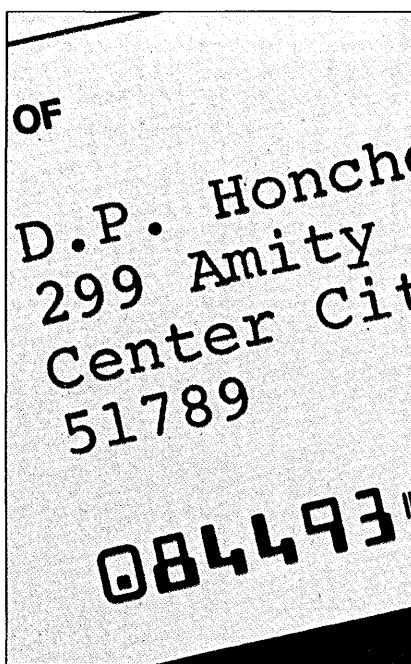
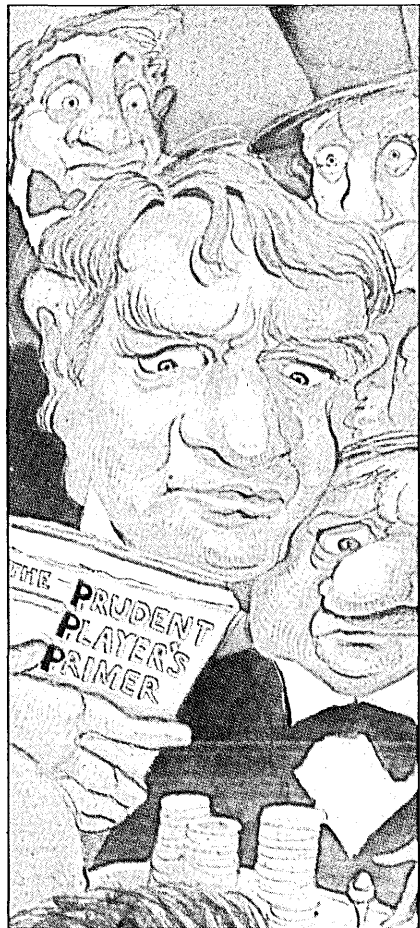
Three authors of microcomputer software—Bill Gates, Gary Kildall, and Dan Bricklin—tell how their products were developed in "Idealism Spawns Realism," compiled by Steve Ditlea.

### 90 YOU CAN'T PLAY IF YOU DON'T KNOW HOW

by John Thackray  
Dp managers must improve their knowledge of finance or they'll lose the power to make purchases.

### 101 PLAYING THE R&D TAX GAME

William Wewer  
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### 114 1982 DP SALARY SURVEY

Stephen B. Gray  
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### 145 100 WAYS TO AUTOMATE YOUR OFFICE

David Macfarlane  
Pick a number—any number. It's sure to offer you some technological know-how that will make the integration of your office system easier.

### 207 READERS' FORUM

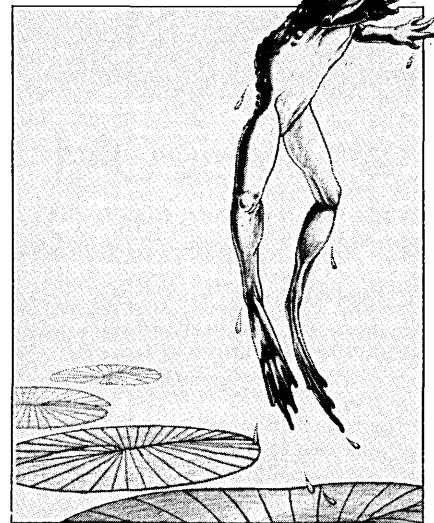
Peter B. Bittner urges us to set up "The Information Center." Then George Hannauer tells an ironic story of "Law and the Profits."

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875 Third Avenue, New York, NY 10022  
**Circulation Manager** Susan M. Gorman  
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**Technical Publishing**

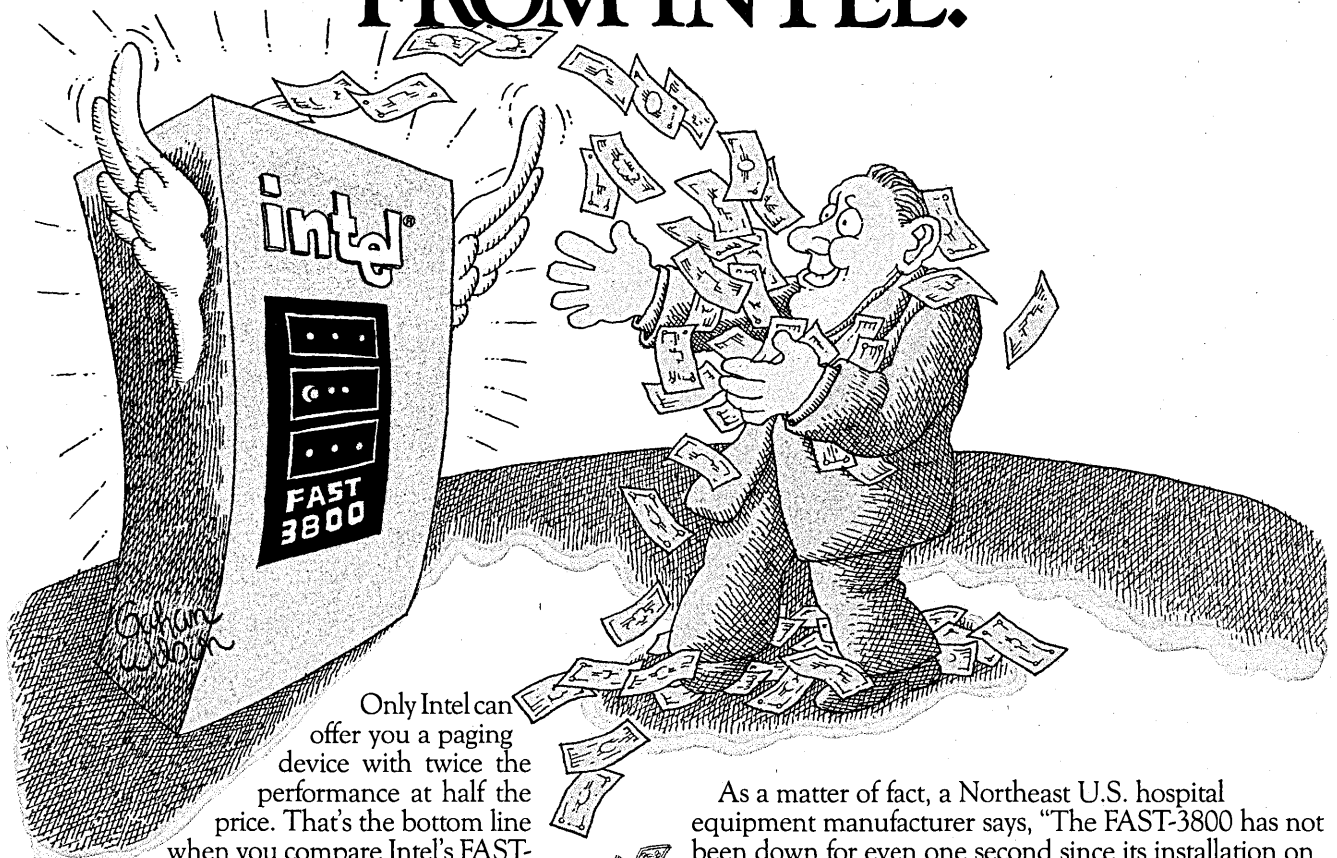
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**DATAMATION** (ISSN 0011-6963) Magazine is issued monthly on or about the first day of every month, with the exception of July, which is semi-annual. Published by Technical Publishing, a company of The Dun and Bradstreet Corp., 1301 South Grove Ave., Barrington, IL 60010. James B. Tatef, Chairman, John J. Abley, President, Executive Advertising, Editorial Office, and Circulation Department: 875 Third Avenue, New York, NY 10022. Distribution: East: Greenville, PA; Annual subscription rates: US and possessions: \$40; Canada: \$55; Europe, Japan, South Africa, New Zealand: £48 air freight; £95 air mail. Wholesale rates: £48 surface; £90 air mail. Request rate for qualified U.S. students, public and school libraries: \$30 Single copy: \$4 in U.S. Sole agent for subscription in Canada, Mexico, and Canada is J. B. Trafton, Ltd., 1140 Woodbine Avenue, Harrow, Middlesex, M2A 0J7, Canada. Telephone: (416) 882-4770. Telephone: (212) 512-2000. Second class postage paid at New York, NY 10022 and at additional mailing offices. Copyright 1992 by Technical Publishing, a company of Dun and Bradstreet Corp. All rights reserved. Canada registered trademark of Technical Publishing Company. Microfilm copies: 0-141444-0000. Second class postage paid at New York, NY 10022 and at additional mailing offices. Postmaster: Please address change to Datamation, 875 Third Avenue, New York, NY 10022.

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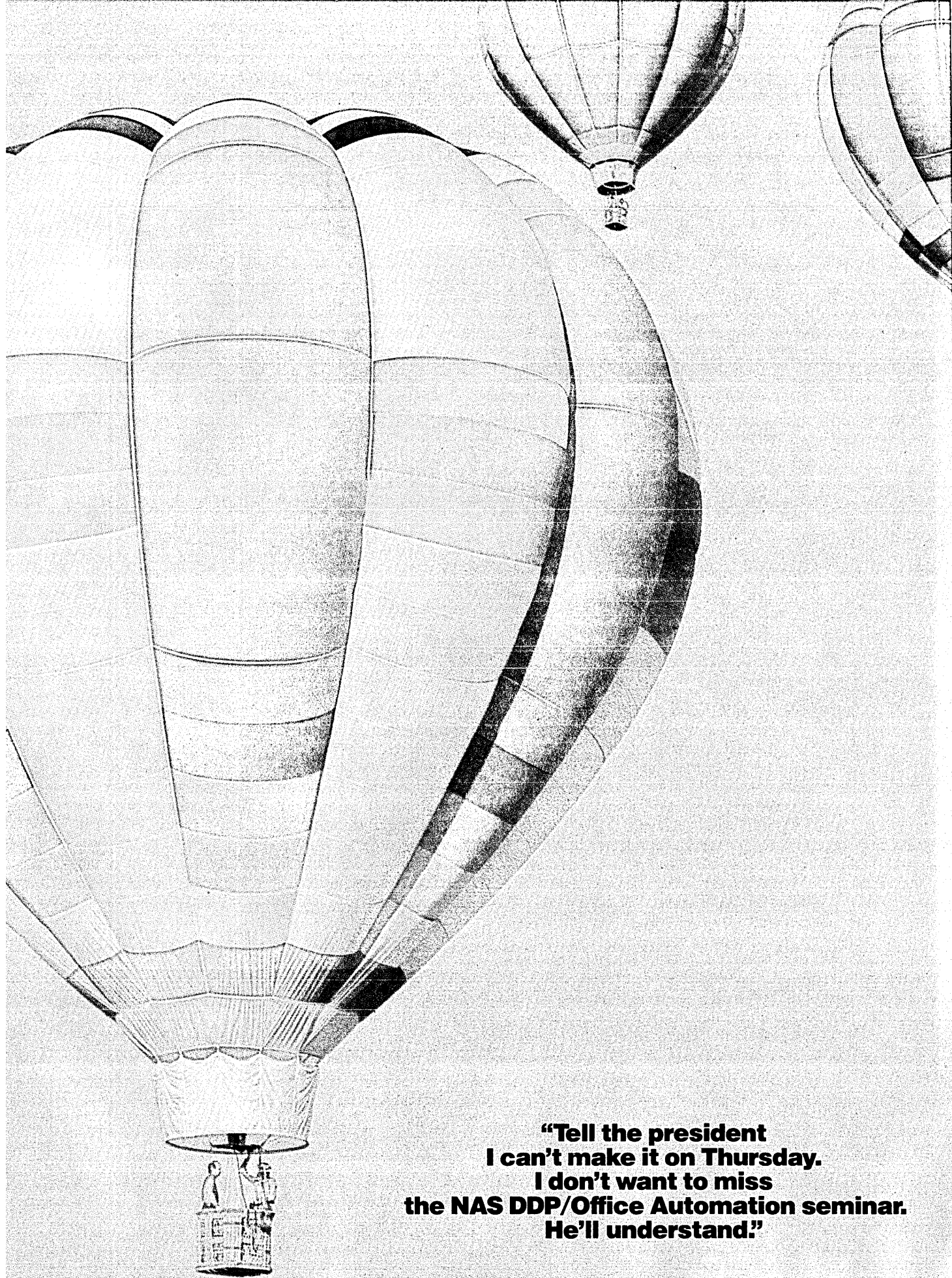
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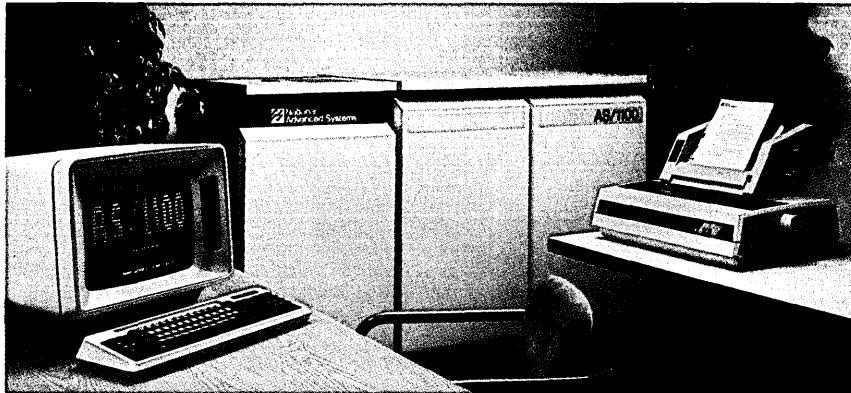
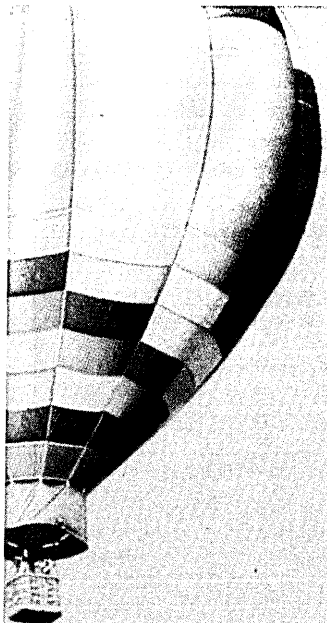
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# LOOKING BACK

## SECRETIVE SOVIETS

*October 1962:* In August 1962, DATAMATION visited the Soviet Union for eight days. Our October issue contained an expanded, two-page Editor's Readout with a report on the excursion. At best, staff members found the trip disappointing.

The trouble started before they even left the States. Correspondence was difficult. The Soviets were evasive, often ignoring letters, and when they did answer, requests for interviews and tours of facilities were generally denied. The explanations offered ranged from summer vacations, to "it is now not the practice of our institute to grant interviews," to national attention being focused on the two cosmonauts then in flight. Because of this flight, the Russians reported, virtually all computing technologists were in state committee meetings and their respective facilities were closed.

Plain and simply, the Russians were evading us. Although American literature had been flowing fairly freely to the Soviet Union, DATAMATION complained, little, if any, was allowed to trickle out from behind the iron curtain. Nor were delegates from Western countries generally invited to Eastern conferences, even though Westerners usually felt honored when an Eastern delegate accepted a conference invitation.

The object of the editorial was to make this "game of limited exchange" known to all, in hopes of changing it. Five suggestions to facilitate that change were listed: 1) send publications to the Soviet Union only when a comparable publication is received; 2) don't invite Easterners to Western conferences unless "legitimate contributions to knowledge" are being made; 3) in reference to exchange delegations, Westerners should visit the Soviets first so they couldn't claim "your visit here is based on what we saw in your country"—as had happened in 1959; 4) manufacturers and societies should not agree to "friendly exchanges" unless there was a substantial, bidirectional exchange; and 5) recognize Soviet silence for what it is—an unwillingness to communicate.

Such restrictions, suggested the edi-

torial, would by no means even the scales, but perhaps a greater willingness to share would emerge. At the very least, the Soviets might realize that limited exchange could be a two-sided game.

## BE PREPARED

*October 1972:* "If a fire swept through the building housing your computer facility, how long would it take you to recover?" IBM's Program Information Department (PID), Hawthorne, N. Y., may have set a record by recovering within one week. In the early morning hours of Sept. 11, 1972, fire struck PID, destroying the computer facilities, thousands of tapes, documents, and cards. But because PID was so well protected, it was up and running in Mahwah, N. J., by Sept. 28.

According to Laras Ehnebuske, director of the marketing support staff at the Data Processing Division, PID had sufficient backup, fire protection equipment, and contingency plans to keep the division from disaster. PID and IBM's Toronto distribution center carried copies of each other's master tapes, so the few that were destroyed in the New York blaze were quickly obtained from north of the border. Whatever IBM's vaults failed to protect was recovered in this manner—all IBM had to do was move its 135 people, programs, media supplies, documentation, assembly, packaging, and mailing equipment to the new location.

## COMPUTERIZED NEWSBOY

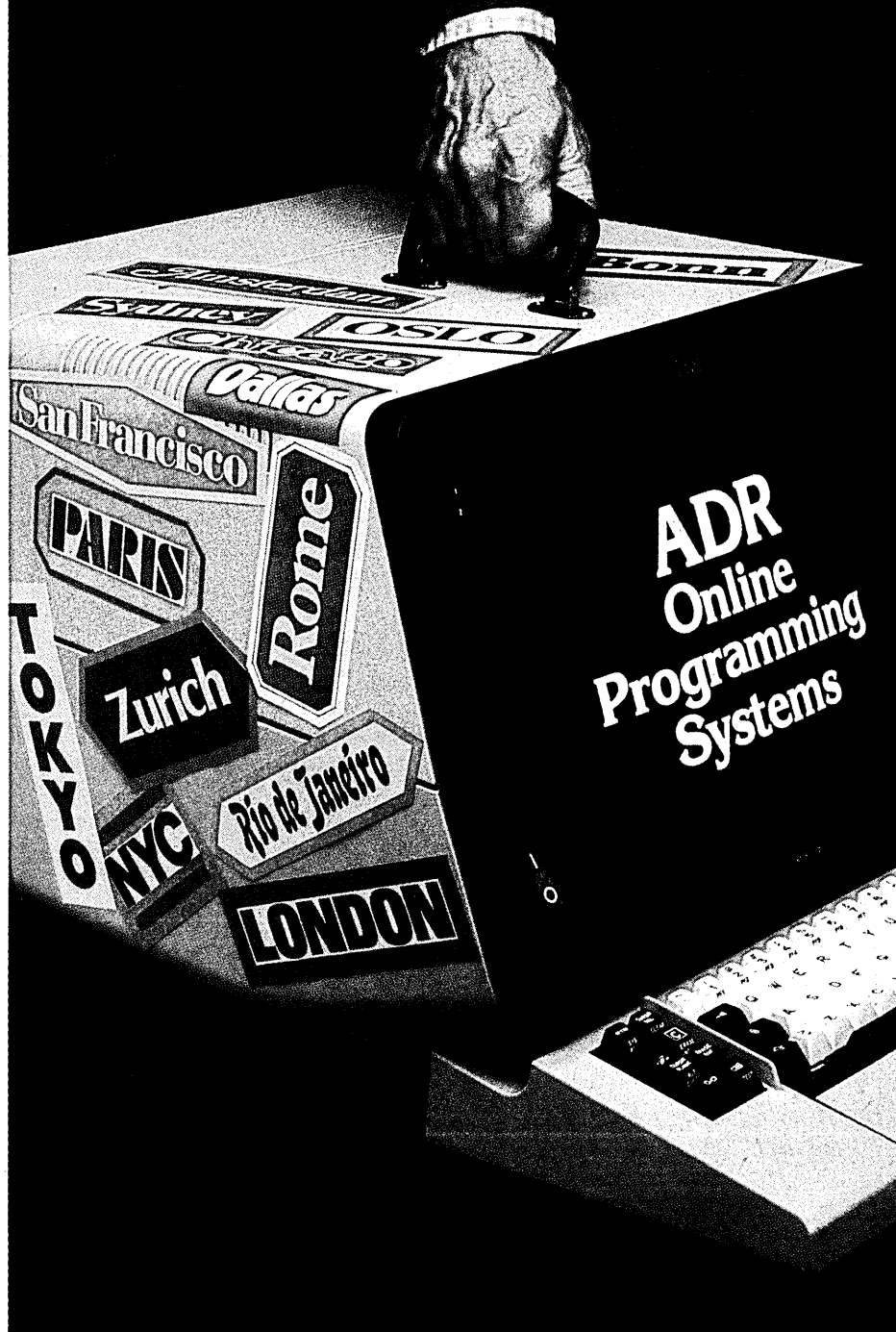
Avcon, of Fort Worth, Texas, wasn't satisfied that computers had already invaded the office, factory, shop, and home—it saw an application for minis on the street. No, not in traffic control, but in newspaper delivery. Using only a van, newspapers, one driver, two "tossers," a 4K Computer Automation mini, a Tri Data Cartrifile tape cartridge, and updated tapes from a 16K PDP-11, up to 20 paperboys and girls could be replaced on a 2,200 subscriber route.

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—Deborah Sojka

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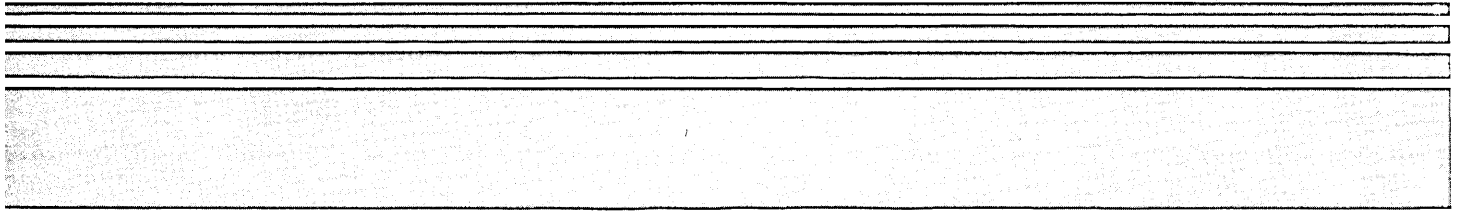
Address \_\_\_\_\_

City/State/Zip \_\_\_\_\_

Telephone \_\_\_\_\_

Computer \_\_\_\_\_

CIRCLE 20 ON READER CARD



# OFFICE POWER™

... because no one  
should be an island.

OFFICEPOWER™ is the multifunctional computing system that bridges those islands to bring office management and staff closer together than ever before. OFFICEPOWER increases productivity by enhancing communications and rescuing your organization from endless hours wasted on routine functions and paperwork.

With the mere touch of a button, you can harness the awesome power of OFFICEPOWER to perform a wide array of time and money saving duties. In addition to complete, full feature word processing capabilities, OFFICEPOWER gives you the power to:

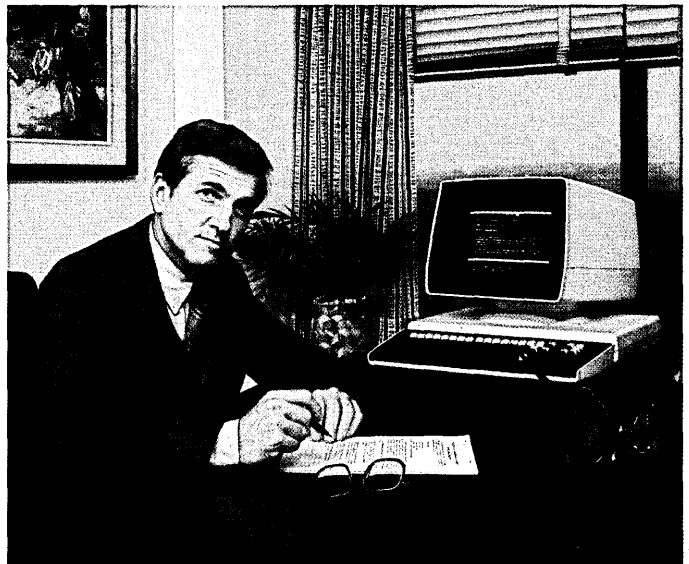
- Send, file and recall documents electronically
- Create budgets, conduct financial analysis and forecast using large electronic spread sheets
- Automatically check several users' calendars to schedule meetings convenient for all
- Maintain up-to-date lists of names by address, phone number and other relevant information
- Access and transmit information from remote locations (anywhere there's a phone)
- Perform more productively by reducing time spent on routine functions and paperwork

OFFICEPOWER runs under the UNIX\* system, today's premier operating system for mini- and micro-computers. Versatile UNIX adapts to any change in hardware requirements with no change in efficiency, assuring that your system will never be obsolete.

OFFICEPOWER is a product of CCI, designers of PerpetualProcessing™, an exclusive concept which ensures that your system will virtually never fail. CCI has installed over \$135 million worth of these "never fail" systems with another \$60 million worth on order, for major telephone companies in 250 locations. **In early 1983, OFFICEPOWER will be available as a PerpetualProcessing system.**

OFFICEPOWER is fully expandable to meet tomorrow's growing needs. Add to your system as required, with configurations ranging from a few to hundreds of terminals. Before your needs become major problems, send an S.O.S. to OFFICEPOWER and we'll provide the solutions.

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## The PerpetualProcessing™ Systems Company

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Company \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone ( ) \_\_\_\_\_

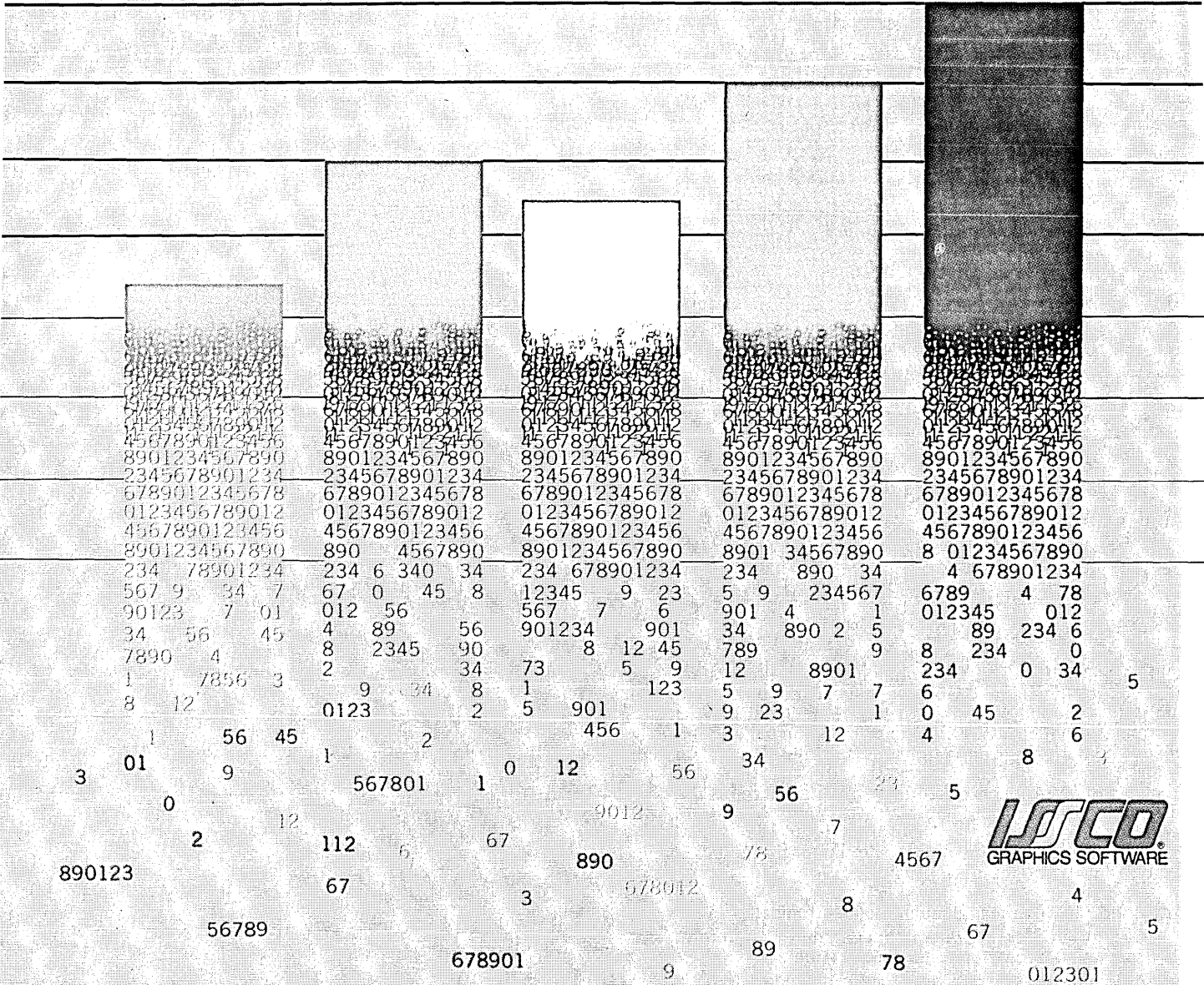
Mail to: Director - OP Marketing  
Computer Consoles, Inc.  
1212 Pittsford-Victor Rd.  
Pittsford, New York 14534

D

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CIRCLE 21 ON READER CARD



# INTRODUCING THE DATA CONNECTION™

## The final link to complete computer graphics

DISSPLA® device independence 1969; design flexibility 1974; TELL-A-GRAF® ease of use 1978; graphic-artist quality 1980; CUECHART™ 1982.

Now, ISSCO-quality graphics enters the mainstream of data processing with THE DATA CONNECTION—a TELL-A-GRAF graphics-software link that provides both easy access to data and data manipulation for graphic presentation.

THE DATA CONNECTION and TELL-A-GRAF combine the industry's most advanced presentation-graphics software with direct paths to virtually all business and scientific data sources—for display in graphics format for fast understanding, better decision making, and maximum impact.

## With THE DATA CONNECTION you can:

- Connect ISSCO graphics to all data, wherever it may be stored.
- Select appropriate data; exclude what is irrelevant.
- Extract data from both standard and non-standard files.
- Read tabular data from printer reports stored in any format.
- Accept data from application programs at data-generation time.
- Arrange data for maximum graphics impact.
- Organize, accumulate, summarize, tabulate.
- Perform mathematical analysis for decision support.
- Edit, store, retrieve and periodically update.

Shouldn't you have complete computer graphics? Call or write ISSCO—the industry leader in graphics software for more than a decade.

# LOOK AHEAD

## PC WITH A TWIST

The success of Intel's 1979 acquisition of software vendor MRI Systems will be put to the test this month when the semiconductor maker enters the personal computer market. Intel hopes to sell a 16-bit machine into its System 2000 DBMS customer base where large users are wrestling with the personal computer-mainframe data dilemma -- how do you share files between the big and the little boxes? At \$40,000, Intel's box is not so little and not so big. It services half a dozen or so terminals with personal computing -- the usual spreadsheets, Xenix operating system, graphics, and word processing, for instance -- as well as providing an intelligent gateway into a mainframe's System 2000 database. First shipments are slated for January.

## LOCAL NET FOR IBM P.C.

Nestar Systems Inc., the Palo Alto, Calif., company which has been offering local area networking for Apple computers since early '80, will announce networking systems for the IBM Personal Computer next month at Comdex. We hear the company is also taking a very close look at the market for the recently introduced DEC personal computers.

## AS THE WORLD TURNS

A planned October gathering of international computer vendors interested in helping nonindustrial nations computerize themselves was canceled due to a change in plans at the sponsoring Intergovernmental Bureau for Informatics (IBI) in Rome. IBI recently joined forces with UNESCO, a much larger organization, and delayed by a year its big SPIN 2 world informatics conference in Havana to September 1984. This month's vendor meeting was also to have taken place in Havana but will now probably be replaced by a series of regional meetings.

Meanwhile, it looks as if IBI still hasn't gained the support of IBM for its world plans. The computer maker says it wasn't planning to attend this month's meeting and hasn't made up its mind about 1984.

## SOUTH MEETS EAST

Also on the international scene, a recent short wave broadcast from Bulgaria's state radio reported that the country will soon share its computing expertise and possibly set up joint manufacturing with Nigeria. No details were provided, but it would seem that oil-rich Nigeria is leaning to the Eastern Bloc for computers after its run-in with IBM a few years ago.

# LOOK AHEAD

## GAMBLING IN THE AIR FORCE

A military market may have saved the day for a Canoga Park, Calif., company that was having trouble selling its computer-driven slot machine products. It seems gambling activity at legitimate casinos has been hard hit by the recession. Enter the Air Force, which purchased some 800 machines for about \$2.75 million from Interscience Systems, Inc. for officers' clubs around the world. The slots are programmed with a 17% bias, which means that the house (us taxpayers) wins at least 17% of the time. The next innovation in such gambling machinery may be voice-synthesis by which the one-armed bandits could seduce the passing stranger or soothe a loser.

## MEGA-MACHINE

Marvin Minsky, godfather of the artificial intelligence clan, is said to be working on a rather large computer system. It is to use about 1 million microprocessors configured in an array to simulate neural connections within the brain. Minsky and his MIT crew are looking for a semiconductor firm to help them out in designing and manufacturing 16,000 special VLSI chips that would each contain 64 simple processors. Each processor, in turn, would have a small amount of memory. If built, the machine may help Minsky test his pet theory that the brain has evolved into a kludge of federated thought processes, no one of which dominates the brain's operation.

## DISKS OF THE FUTURE

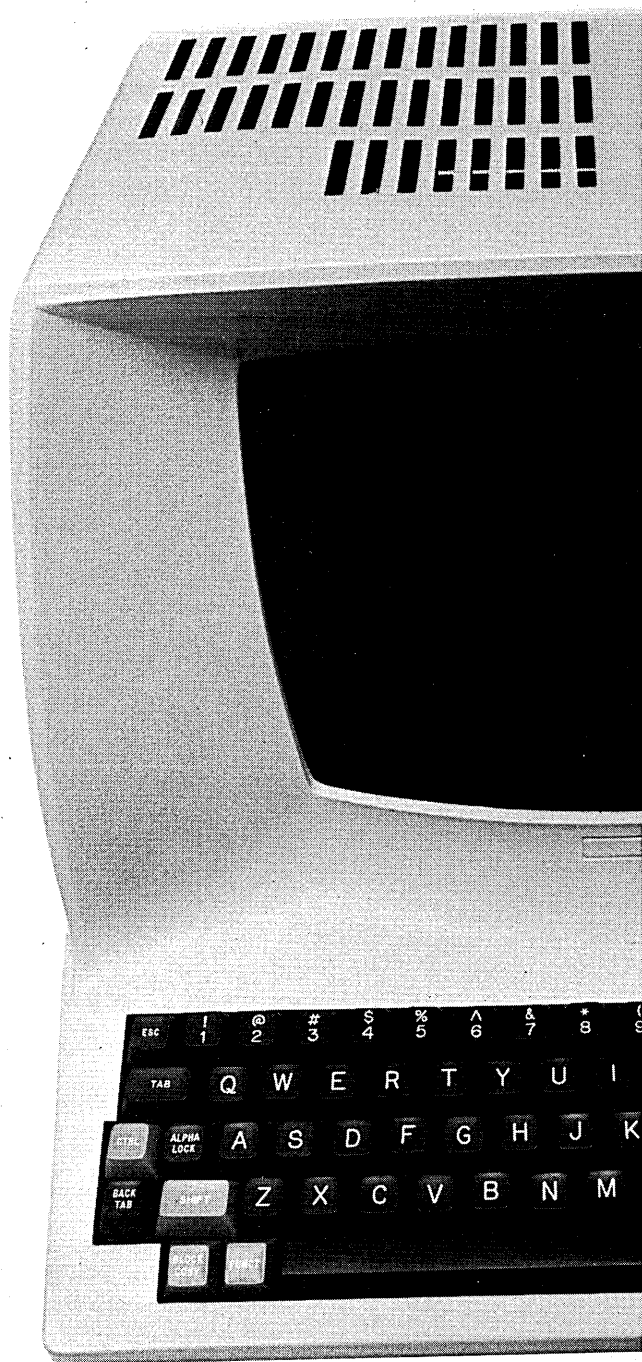
Century Data Systems late next month will introduce its newest Marksman disk drive, the AMS (Advanced Marksman Series) 315, an SMD-compatible Winchester emulation of Control Data Corp.'s 9766 removable pack drive. It is said to be one third the size of comparable 3330 technology drives with the same capacity. The company also anticipates introduction of a 630-megabyte version within six to nine months of the 315's introduction and a 1.2 gigabyte version within 18 months.

## RUMORS AND RAW RANDOM DATA

Look for Cray Research's marketing chief Peter Appleton-Jones to leave the company shortly. No word on his destination....Tandon Corp. is soon to enter the cartridge tape drive market with a product designed to offer backup to its line of 5¼-inch and 8-inch rigid disk drives....A new version of Tymshare's Scanset desktop terminal/telephone product is to be introduced by year-end. The timesharing company is competing head-on with Northern Telecom for sales to executives who want voice and data in the same instrument... A ruggedized Ada computer, probably based on Data General's MV series of 32-bit machines, is to be unveiled by Rolm Corp. this month....



# Our EPISODE™ microcomputer is the other 1/2 of a great idea.



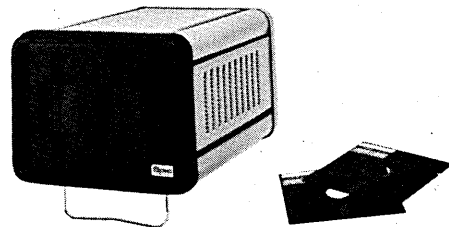
Your dumb terminal is 1/2 the investment in a full capability work station. The other 1/2 is our EPISODE — a compact, transportable, full featured microcomputer you plug right into your terminal for local computing capability including stand alone word processing.

EPISODE gives you a cost-effective means to unburden your mainframe. EPISODE plus your terminal — we interface with more than 45 including our 14C — and a letter quality printer are all the building blocks required for stand alone word processing capability. Add a cut sheet feeder for total automation.

EPISODE's word processing offers more than basic text editing. Features include automatic pagination, scrolls, justification, screen text preview, personalization, and automatic word or phrase revision.

What's more, EPISODE's storage capacity of more than 20 MB easily accommodates financial modeling, electronic spread sheet analysis, forecasting, scheduling, mailing lists, accounting records, expense reporting, statistics and more with the many software solutions Epic has in the works.

EPISODE offers you a choice of two drive options, depending on your specific work station and storage capacity requirements. Dual floppy disk drives provide up to 1.6 MB of disk storage. In the same compact footprint, EPISODE offers a 5.25" Winchester disk drive with more than 20 MB of formatted useable storage. A disk interface includes complete error checking and correcting capability. An 800 KB floppy disk drive serves as a backup.



All this capability is designed into a transportable case measuring 7-1/2" x 9-1/2" x 14-1/2" and weighing less than 20 pounds.

EPISODE utilizes the wide variety of applications packages based on the CP/M® operating system. Now with EPISODE's exclusive SUPERVYZ™, the unique software concept that serves as a translator, teacher and mediator, you can address any CP/M program in plain English. No need for extensive or expensive operator training.

There are thousands of CRT terminals in the marketplace that can be converted quickly, easily to full capability work stations with our EPISODE microcomputer.

That's not only a great idea, but a sound investment. Contact us for information.

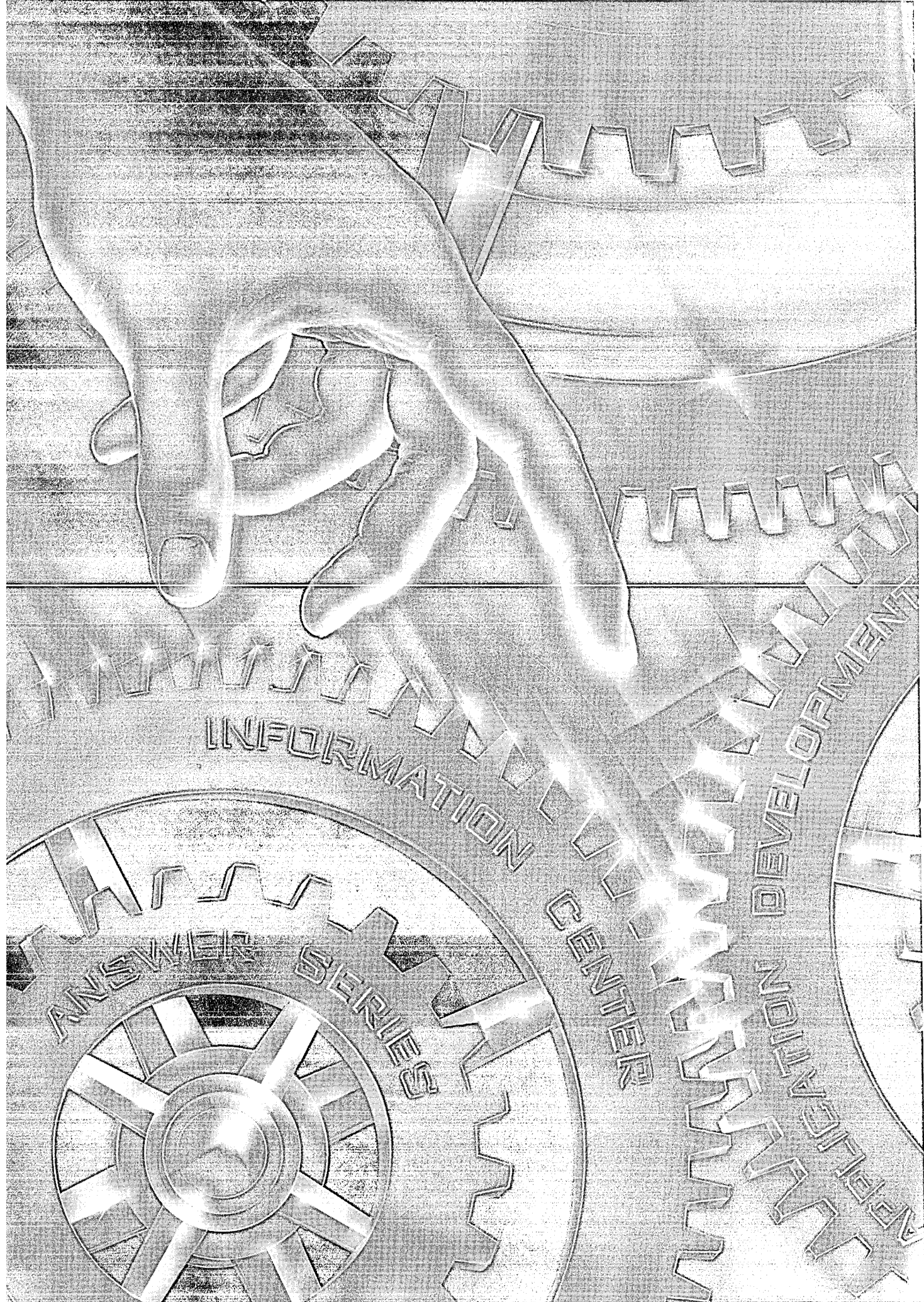
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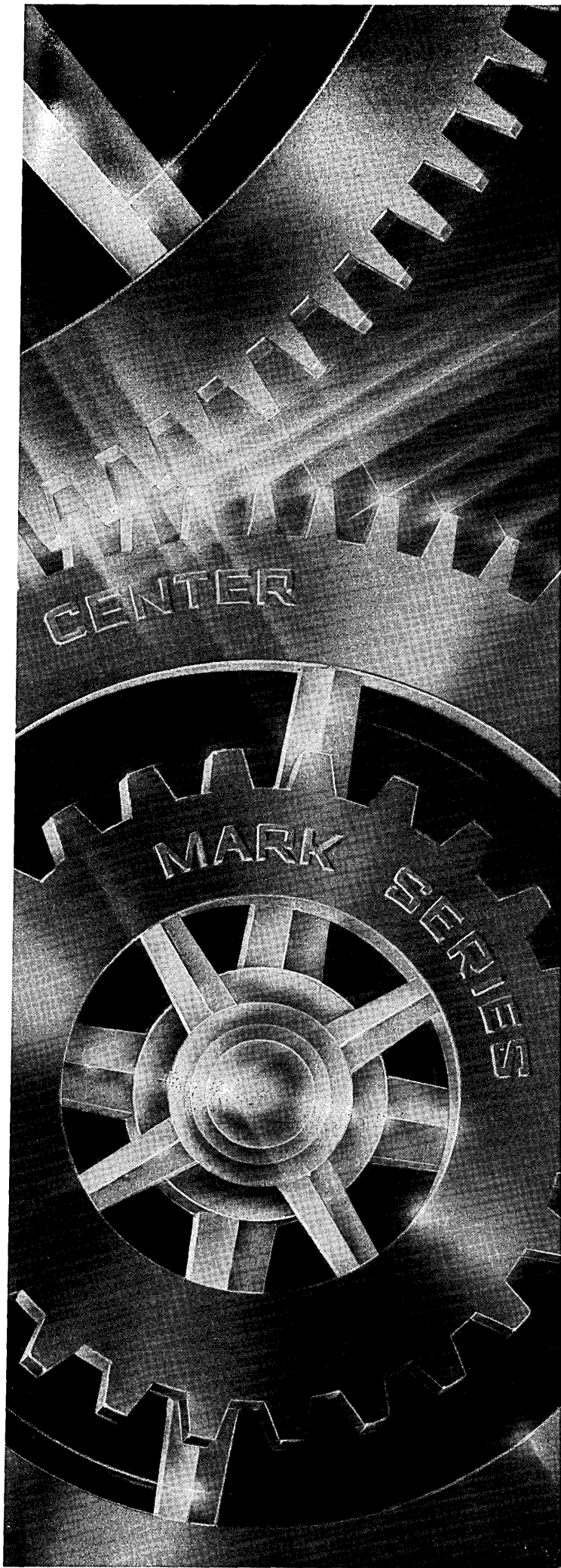
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# CALENDAR

## OCTOBER

### **INFO '82, October 11-14, New York City.**

For the first time, INFO will feature a "Software Center." Information is available from Clapp & Poliak, Inc., 708 Third Ave., New York, NY 10017, (212) 661-8410.

### **Federal Office Automation Conference, October 27-29, Washington, D.C.**

This year's event is dedicated to present and future federal government planning and implementation of office automation. Contact Federal Office Institute, P.O. Box E, Wayland, MA 01778, (617) 358-5119.

### **ACM '82, October 25-27, Dallas.**

The annual conference will cover a broad range of topics from artificial intelligence to software engineering. Contact ACM, 11 W. 42 St., New York, NY 10036. (212) 869-7440.

### **CAD/CAM Graphics Expo, October 26-29, Reno, Nevada.**

Sponsored by Computer Aided Manufacturing-International (CAM-I), the expo will be held in conjunction with CAM-I's 11th annual meeting. Contact CAM-I, Ryan Plaza Dr., Arlington, TX 76011, (817) 265-5328.

### **15th Brazilian Informatics Congress and Second International Informatics Fair, October 18-24, Rio de Janeiro.**

The congress theme is "An Informatics Society—Expansion of Human Frontiers." Contact Leo Brayner, Informatics Congress, SUCESU, Rua do Carmo, 57-6th, 20011 Rio de Janeiro, R.J., Brazil; telex: 021-32522.

## NOVEMBER

### **Comdex / Europe, November 8-11, Amsterdam, The Netherlands.**

On its first trip abroad, Comdex will emphasize business, financial, and marketing topics of interest to independent sales organizations (ISOs). Contact The Interface Group, 160 Speen St., P.O. Box 927, Framingham, MA 01701, (617) 879-4502.

### **COMPSAC '82, November 8-12, Chicago.**

Sponsored by the IEEE Computer Society, this year's show is the Society's Sixth International Computer Software and Applications Conference. Contact Carl Martersteck, Bell Telephone Laboratories, Room 1C-307, Naperville, IL 60566, (312) 462-5400.

### **MicrographiX '82, November 8-10, Washington, D.C.**

This new show evolved from the Government Micrographics Conference and Exposition. Like its predecessor, it will consist of a three-day conference program and a two-day product exposition. Contact Richard Caplan, National Trade Productions, Inc., 9418 Annapolis Rd., Lanham, MD 20706, (201) 459-8383.

### **Electronica '82, November 9-13, Munich.**

Billed as "the world's largest exhibition of electronic components and subassemblies," the 10th International Trade Fair will feature exhibits of semiconductors, various types of components, connecting elements, and subassemblies. Contact Kallman Associates, 5 Maple Ct., Ridgewood, NJ 07450, (201) 652-7070.

### **Autofact 4, November 30-December 2, Philadelphia.**

The Computer and Automated Systems Association of the Society of Manufacturing Engineers (CASA/SME) sponsors this three-day event, focused on CAD/CAM, computer integrated manufacturing (CIM), and the automated, integrated factory. Contact CASA/SME at One SME Dr., P.O. Box 930, Dearborn, MI 48128, (313) 271-1500.

## DECEMBER

### **CMG XIII, December 12-16, San Diego.**

The 13th International Conference on Computer Performance Evaluation is sponsored each year by the Computer Measurement Group. Contact CMG Headquarters, P.O. Box 26063, Phoenix, AZ 85068, (602) 995-0905.

### **2nd Gulf Computer Exhibition, December 13-16, Dubai, United Arab Emirates.**

The exhibition is the only show in this region devoted exclusively to computer technology. It is organized by the Trade Centre Management Co. in association with Middle East Computing, and is supported by the Ministry of Finance and Industry, United Arab Emirates. Contact Trade Centre Management Co., P.O. Box 9292, Dubai, United Arab Emirates, tel. 472200.

## JANUARY

### **PTC '83, January 16-19, Honolulu.**

PTC is organized by the Pacific Telecommunications Council. This year's event will focus on communication infrastructures, the "technical, human, and institutional resources that contribute to economic and social development of the Pacific Hemisphere." Contact PTC, 1110 University Ave., Suite 303, Honolulu, HI 96826.

## FEBRUARY

### **OAC '83, February 21-23, Philadelphia.**

Theme for the fourth annual Office Automation Conference is "Explorations in Office Automation." For information, contact AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3624.

### **SECURICOM '83, February 23-25, Cannes, France.**

Also known as the Worldwide Congress on Computer Security and Protection, the goal of the congress is to support the exchange of information on technological, economic, and social aspects of computer protection, data security, and privacy. Contact Peter Hazelzet, SEDEP, 8, Rue De La Michodiere, 75002 Paris, France, tel. 073-94-66 or 742-41-00.

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Don't be misled. Beneath the cooperative, friendly personality of ADABAS lies a data base management system ready and able to handle all your data management applications.

Send ADABAS to the rescue in your growing company. It is a comprehensive, relational-like system for IBM mainframes which features an online data dictionary, online inquiry language, batch report writer and host language interface. ADABAS can be installed in a day, and it's so easy to use it doesn't require a special staff.

And ADABAS is speedy. For quick changes, ADABAS can't be beat, because its inverted list architecture makes it unnecessary to predefine data relationships

or data access methods. Add a productivity system called NATURAL and you can streamline application development time up to 90%.

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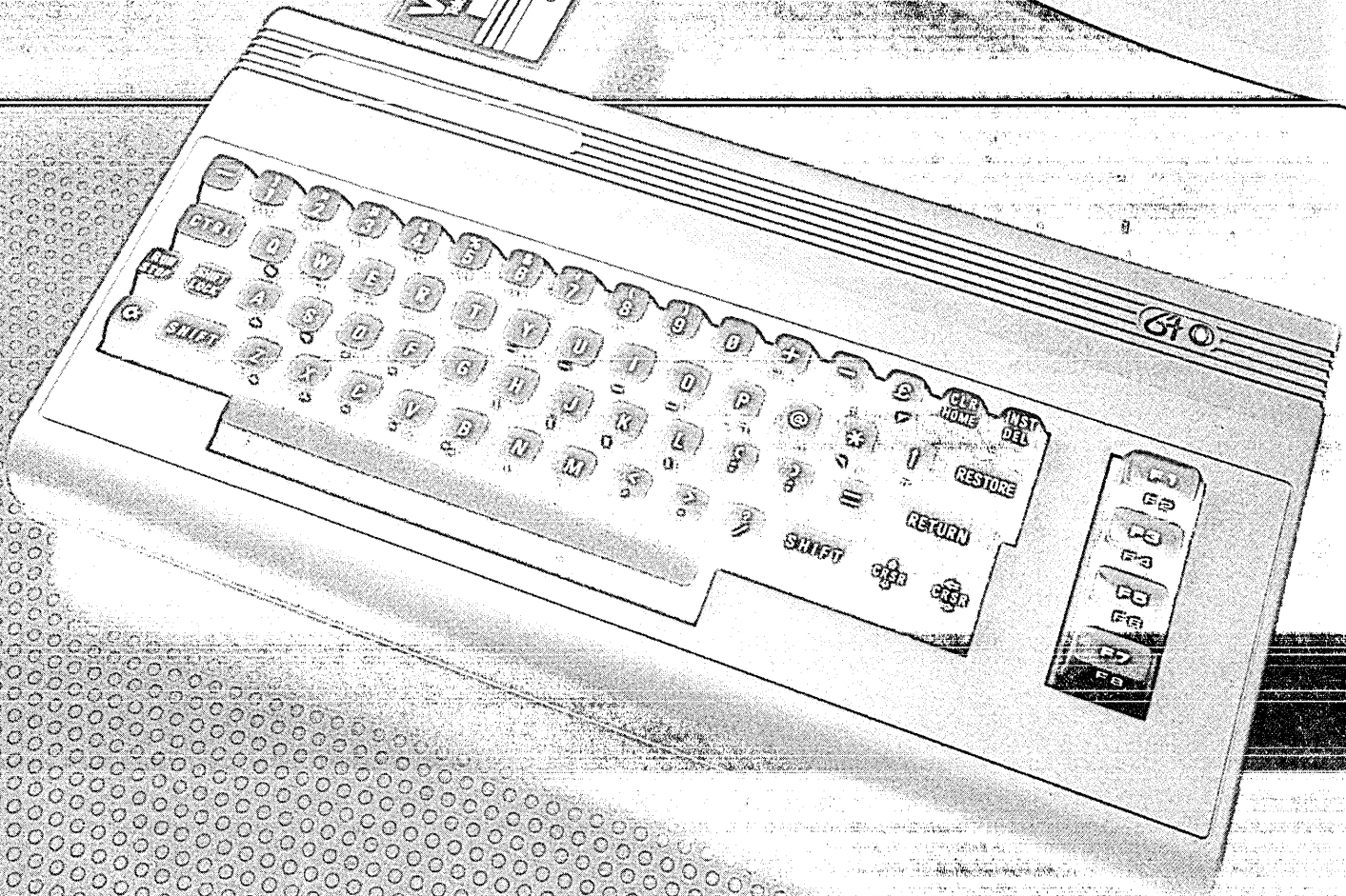
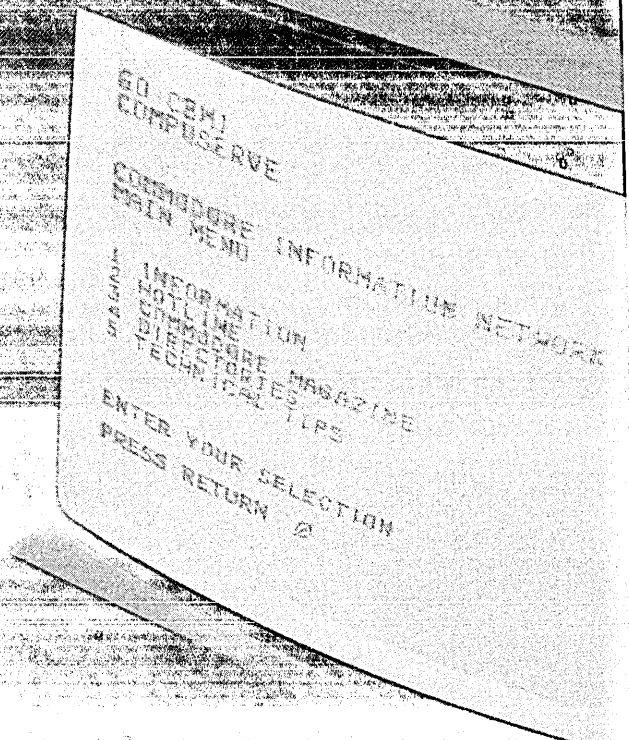
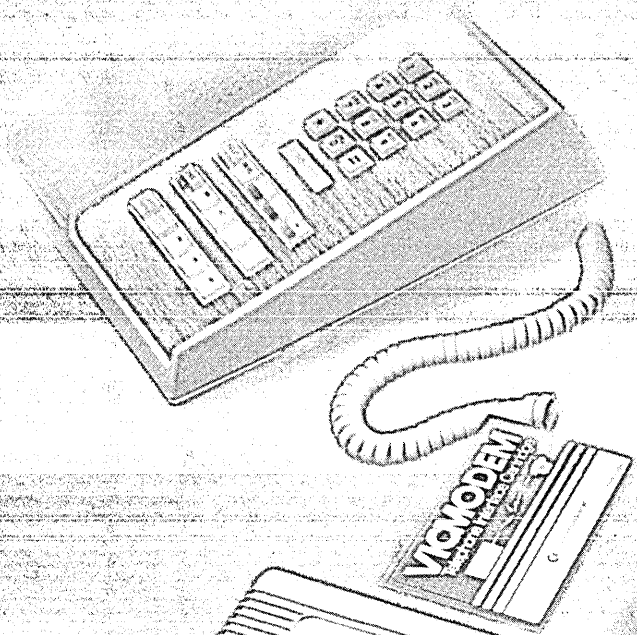
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CPU \_\_\_\_\_ Operating System \_\_\_\_\_

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OF NORTH AMERICA, INC

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# "THE COMMODORE 64 COULD BE THE MICROCOMPUTER INDUSTRY'S OUTSTANDING NEW PRODUCT INTRODUCTION SINCE THE BIRTH OF THIS INDUSTRY."

—SHEARSON/AMERICAN EXPRESS

They're speaking to a group as interested as anyone else in the future of computers: the people who buy stock in the companies that make computers.

If, on the other hand, you're a person whose livelihood depends on a personal computer—or whose leisure time revolves around one—what follows should impress you even more than it impresses investors.

## MIGHT MAKES RIGHT.

The value of a computer is determined by what it can do. What it can do is largely determined by its memory.

The Commodore 64's basic RAM is 64K. This amount of power is unusual enough in a micro at any price.

At \$595, it is astonishing.

Compared with the Apple II+\*, for instance, the Commodore 64™ offers 33% more power at considerably less than 50% of the cost.

Compared with anything else, it's even more impressive.

## PILE ON THE PERIPHERALS.

Because the basic cost of the 64 is so low, you can afford to buy more peripherals for it. Like disk drives, printers, and a telephone modem that's priced at around \$100.

This means you can own the 64, disk drive, printer and modem for a little more than an Apple II+ computer alone.

## HARD FACTS ABOUT SOFTWARE.

The Commodore 64 will have a broad range of custom software packages including an electronic spreadsheet; business graphics (including printout); a user-definable diary/calendar; word processing; mailing lists, and more.

With BASIC as its primary language, it is also PET BASIC compatible.

The Commodore 64 will also be programmable in UCSD PASCAL, PILOT and LOGO.

And, with the added CP/M\* option, you

will have access to hundreds of exciting software packages.

## THE FUN SIDE OF POWER.

The Commodore 64 can become very playful at a moment's notice.

You can use Commodore's plug-in game cartridges or invent your own diversions. All will be enhanced by brilliant video quality (320 x 200 pixels, 16 available colors, 3D Sprite graphics), plus outstanding sound.

The 64's built-in music synthesizer has a programmable ADSR (attack, decay, sustain, release) envelope, 3 voices (each with a 9-octave range) and 4 waveforms. All of which you can hear through your audio system and see in full color as you compose or play back.

## NOW'S YOUR CHANCE.

If you've been waiting for the "computer revolution," consider it as having arrived.

Through its 25 years of existence, Commodore has been committed to delivering better products and lower prices.

Today, the company's vertical integration has resulted in the Commodore 64's price performance breakthrough heralded by Shearson/American Express.

Visit a Commodore Computer dealer and discover the 64 soon.

It will expand your mind without deflating your wallet.

\*CP/M\* is a registered trademark of Digital Research, Inc.

Commodore Business Machines/Personal Systems Division  
P.O. Box 500 Conshohocken, Pennsylvania 19428

Please send me more information on the Commodore 64™

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Company

Address

City  State

Zip  Phone

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COMPUTER

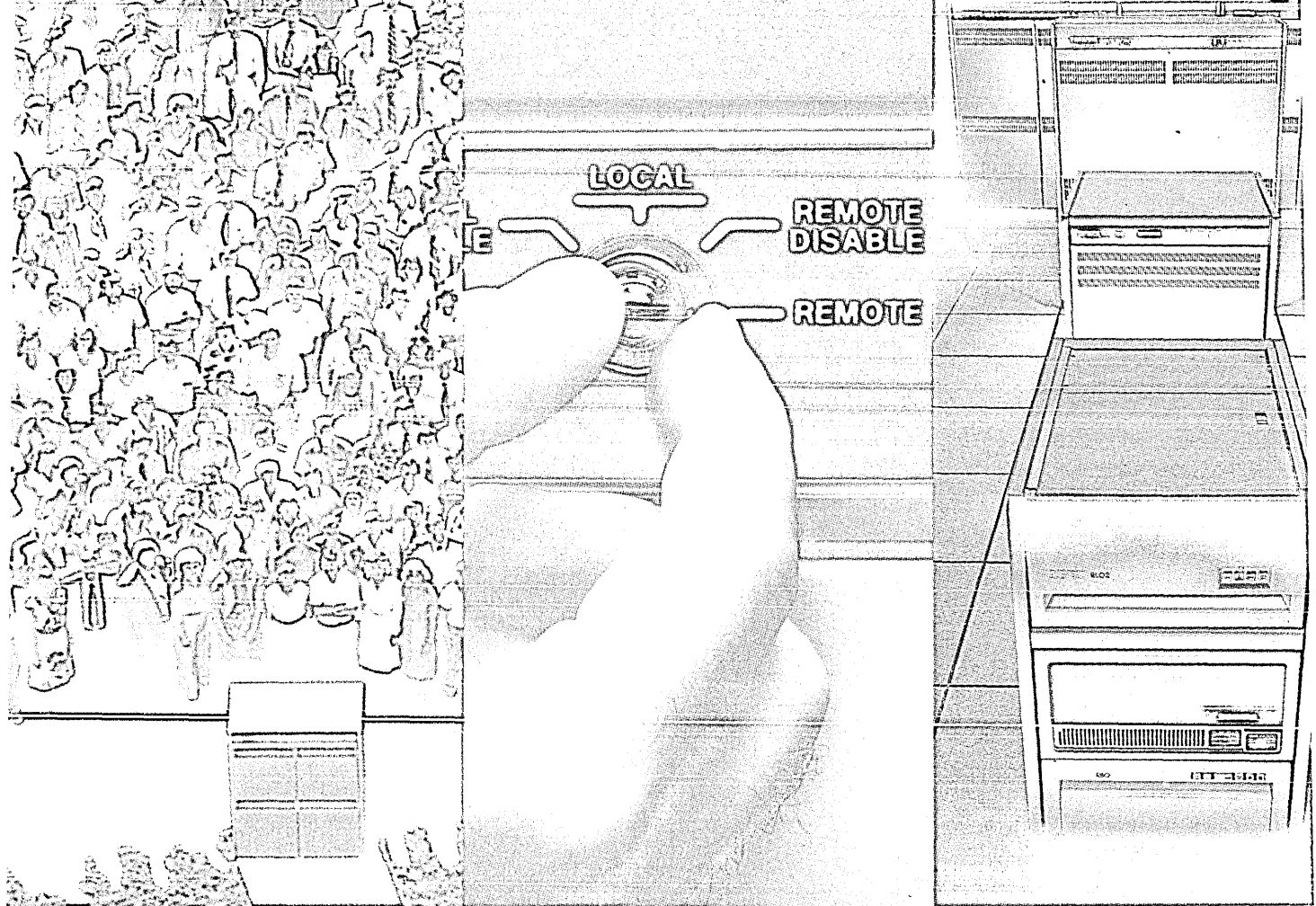
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If computer systems reliability is a critical factor in your business, then it's important that you buy a computer made by Digital. Because we'll work with you, to ensure that the reliability we design and build into our products is maintained at your site. In fact, once the necessary service requirements are met, we will guarantee that your VAX Family, DECsystem-10 or DECSYSTEM-20, will be available at an optimum level you can select yourself—up to 99%.

How is Digital able to offer a total system uptime guarantee? It has a lot to do with Digital's company-wide commitment to quality. A commitment evident in the years of engineering and manufacturing focus on reliability and maintainability technology. And

in one of the largest and most capable service forces in the industry—supported by the remarkable power of Digital's proven Remote Diagnosis technology.

One more thing: since high uptime is designed into all of Digital's products, it's not an add-on or an extra-cost option. There's no additional service charge for Digital's Uptime Guarantee. It is an integral part of your Service Contract.

For full details, call your local Digital office or write to: Digital Equipment Corporation, 129 Parker Street, Maynard, MA 01754. © Digital Equipment Corporation 1982

digital



# LETTERS

## PRO ANTITRUST

I had mixed reactions to your July editorial, "Life Without Antitrust." I agree that the Justice Department should explain why it dismissed the 13-year-old IBM antitrust case. But I must question the main point—that antitrust regulation is not appropriate to the computer field.

The central concept to antitrust is not related to bigness itself, but to the fact that active monopoly is the antithesis of a healthy economy. (Active monopoly, where one or more businesses deliberately act to establish and maintain a monopoly in the face of competition, can be distinguished from passive monopoly, where the lack of competition does not result from such practices.) The emergence of a new industry, such as computer manufacturing (although it hardly seems new anymore) or genetic engineering, may be characterized by passive monopoly if the number of businesses grows slowly.

Why should economic viability be promoted in the youthful domestic computer industry through exemption from antitrust laws? What has age got to do with it? (Even mature stability is no guarantee of continued profitability, as demonstrated by the Chrysler Corp.) Active monopoly cannot be tolerated at any age.

SUSAN J. DOREY  
Larkspur, California

## MCAUTO MISSED

We read with interest the considerable amount of useful information contained in your annual compilation of foremost U.S. companies in the data processing industry ("The DATAMATION Top 100," June).

For the record, we believe that you should have included McDonnell Douglas in the list of the top 10 companies in the computer processing services business (Table VII, p. 118) since McAuto's \$226.7 million commercial revenues (including CAD/CAM) would put us between EDS, listed as fifth, and Shared Medical, listed sixth.

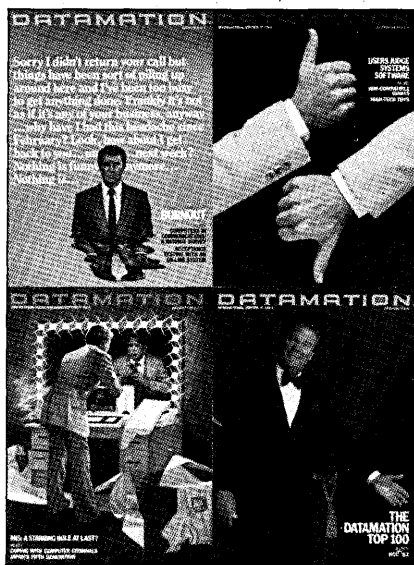
One other item for future reference: Applied Research of Cambridge (ARC), the

firm that sold us marketing rights to the BDS/GDS system, is located in Cambridge, England, not Cambridge, Mass.

M. WELLS HUFF  
McDonnell Douglas Automation Co.  
Saint Louis, Missouri

## CHAUVINISM UNCOVERED

I don't want to make any accusations, because I only have 11 back issues of DATAMATION. However, it does seem that you



tend to see the computing field as being for white males only. And they must wear white shirts too! I'd like to see your covers represent the wide variety of people and styles found in the computing industry.

SUSAN E. ESHLEMAN  
Paramount Pictures Corp.  
New York, New York

## A MATTER OF STYLE

We at CPT have read with interest and disappointment the article about CPT ("Living on Borrowed Time?" July). Your magazine has always been a valuable publication offering significant information to those of us in the industry. Unfortunately, it appears you've developed a reporting style usually

reserved for the *National Enquirer*. The reporter chose to present only one side of the story.

At CPT, we will continue to manage our affairs in a manner consistent with our goals. This means that the company manages its personnel, including engineers, and not vice versa.

JEROME JENKO  
Vice President and General Counsel  
CPT Corp.  
Minneapolis, Minnesota

## DON'T TREAD ON US

In "Not Just A Copycat" (June) you quote an unnamed source as saying, in reference to an individual who had left IBM to work for Amdahl: "IBM gave him permission to take his work with him." That is absolutely untrue. With respect to certain programming systems in particular and other IBM proprietary information in general, exactly the opposite was the case.

The article creates the erroneous impression that IBM is not concerned about protecting its proprietary developments. You and your readers should know that IBM takes whatever action is necessary and appropriate to protect its assets, including programs, from misappropriation or misuse.

W. C. DOUD  
Vice President  
Commercial & Industry Relations  
IBM  
Armonk, New York

## THE LAST GRAPEFRUIT LETTER

I noted with great interest McCracken's fruit-flavored article ("Maintaining a Grapefruit," April) and ensuing letters (July). Permit me to add my own experience. My associates and I are happy users of a multi-user microprocessor system built around a Southwest Technical Products Model S00, the heart of which is a Motorola 6809 microprocessor, and a Uniflex operating system from Technical System Consultants. It has been running reliably since it was installed about eight months ago. The only failures I can remember are two occa-

# F.Y.I.

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## LETTERS

sions of unexplainable disk errors, at least one of which was related to a power outage in our offices.

The software comes from two vendors and the hardware from five vendors. The system was assembled by a vendor who knows the microprocessor business and to whom I can always take my questions and problems, even about equipment he did not supply. I consider the fact that I have one central source of support to be a major contributor to my happiness and peace of mind.

The manuals are adequate, though definitely less than great. Some of the operating system conventions do not please me, and there are some design deficiencies here and there that we have to work around. But it works as advertised and it works reliably. I would not tolerate a machine that did not.

PHILIP R. BAGLEY  
President

The Automated Office  
Philadelphia, Pennsylvania

## FOOT FINAGLING

In the May NCC Product Preview you say "NCC will house some 650 exhibitors' booths covering 320 square feet of exhibit space ..." If 650 booths are compacted into 320 square feet, each booth would average one-half square foot in size. What a Lilliputian scene! Despite all precautions, bloopers do occasionally occur with everyone, I am sure. Should this be 320 square feet each or 320,000 square feet in total?

DONALD S. STACKHOUSE  
North Plainfield, New Jersey

*Sorry, but you're mistaken. Astrodome dimensions are properly given in Republic of Texas feet. For the New Jersey equivalent simply multiply by 10<sup>5</sup>; in other states, use 10<sup>3</sup>.—Ed.*

## DINOSAURS REVISITED

Last October you featured an article entitled "Renovating Dinosaurs," and you invited comments. Well, here are mine.

Twenty years ago, there were no operating systems. Smaller machines (e.g., the IBM 650) were operated in an open shop environment. Each user received a "tabula rasa"—and the advantages of a uniform starting state as well as the disadvantages of a do-it-yourself environment. On larger machines, compilers, assemblers, loaders, etc., raised the level of detail at which the user was forced to manage. The FORTRAN Monitor System (FMS, on the IBM 7090/7094) neatly packaged these components while leaving key system issues to the user.

And then there was 360. The prospective market was to be 100 times larger and broader than before, including commercial, transaction-oriented, and scientific users. A high-end machine would not be used the same way as a smaller system. Separate systems would deny the advantages of a compatible family. Thus, a single

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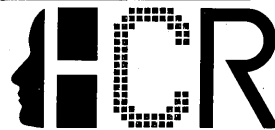
**UNIX** Operating Systems are becoming the versatile, powerful backbones of more and more computer systems. Helping people build the many advantages of the tried-and-true UNIX™ Operating System into their systems is our business. Our UNITY™ adaptation of Bell Laboratories UNIX System III is available for the DEC PDP-11™, the DEC VAX™ under VMS, and the 3RCC PERQ™. We also have Microsoft's XENIX™ adaptation available for systems based on the Intel 8086, the Zilog Z8000, and the Motorola 68000.

**AND** our growing array of software based on the UNIX operating system includes all the major languages, for example C, FORTRAN, COBOL, PASCAL and BASIC, as well as packages for word processing, typesetting, relational data base management and the Multiplan™ electronic worksheet.

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**CIRCLE 28 ON READER CARD**

## LETTERS

system serving all of the people all of the time.

How did we get into this situation? Why did we allow it to happen? The new, expanded market was populated by first-time users—users who wanted prospective systems to provide them with services, freeing them from the details associated with second generation machines. And where are these users today? They have grown and matured and no longer need these services that provided easy entry to computing. In fact, they now decry those services, and the operating systems that provide them, as

cumbersome, labor intensive, restrictive, overly complex, and in their present state, unwelcome.

How do we get out? First, it won't be easy. Second, it won't be popular. Continuation of the status quo can be blamed on them, while we are responsible for change.

Change is possible. It will become probable when we are faced with the necessity of using our limited personnel resources on our businesses and not on installing, maintaining, and updating operating systems. It will become certain when we users cause manufacturers to recognize

that we must have the tools to build systems that meet our needs, not merely the choices offered within the confines of today's systems with their attendant disadvantages.

As an example, when the NASA/Goddard Institute for Space Studies converted from an IBM 7094 to a 360/75, which was to be followed by a 360/95, the operating system was developed by a small, in-house team of systems programmers and IBM systems engineers. Declining to use the new OS/360, we built a system that allowed easy transition from FMS (we had not used IBSYS, as it offered no advantage) to the 360. Over the next few years, the system evolved into a general, scientist-user operating system. The specific technical issues still make interesting reading, but most important is the fact that development of an entire operating system required fewer people than are needed to maintain present systems.

Is anyone else ready to follow this path?

PAUL B. SCHNECK  
NASA/Goddard Space Flight Center  
Greenbelt, Maryland

### DEPARTMENT OF CORRECTIONS

I would like to point out an inaccuracy in your June report on the DATAMATION Top 100.

When you mention Informatics acquisitions you list Management and Consulting Services and Management Control Systems. Only one of these is correct. Informatics acquired Management Control Systems, which sells turnkey systems to accountants. There is no Management and Consulting Services. Perhaps you meant to mention another acquisition, Professional Software Services, which sells turnkey office management systems to the legal profession. Also, your applications software survey (May) contains an error. The Accounting IV package is not owned by Informatics. It was sold to Global Software of Raleigh, N.C., in 1981.

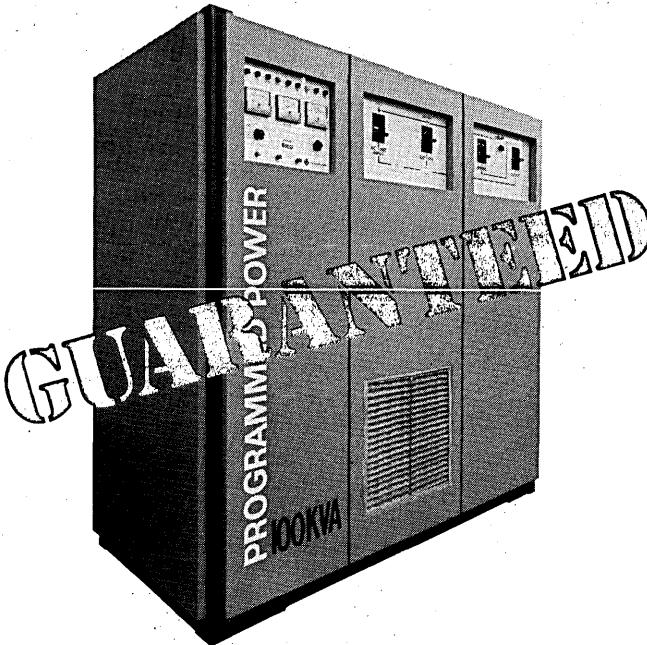
CAROL J. HAYS  
Manager  
Marketing Communications  
Informatics General Corp.  
Woodland Hills, California

In "B/4 Goes Retail" (July) there are two corrections: the president of MAI's Basic Four Business Products Corp., which is responsible for the retail distribution of the Basic Four S/10, is Pat Riley (not Riles), and he reports directly to me, not to William Rigby as indicated. The article was otherwise right on target.

STEPHEN J. KEANE  
President  
Basic Four Information Systems  
Tustin, California

*Our apologies to Richard Block for erroneously running another man's photo instead of his (People, June).—Ed.*

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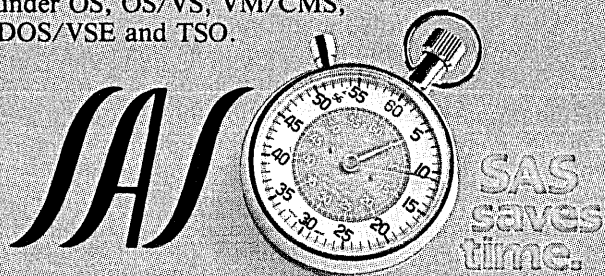
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# "I don't think any other computer could have grown with us the way our Datapoint has."

—Riley Jackson  
V.P., Information Systems  
First Interstate Bank of Washington,  
Seattle



First Interstate Bank's computer was the right size when they bought it, and *stayed* the right size as the company's data processing needs grew.

That's because they bought Datapoint's *expandable* computer system, the ARC™ local network.

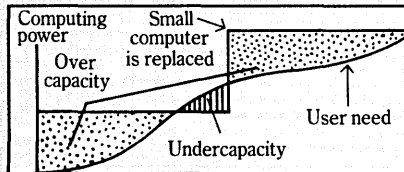
The ARC is expandable in a way no other computer is. You can actually increase its computing *power*. So, when First Interstate wanted their computer to do more work for more people, they just plugged in more Datapoint processors, storage disks, terminals, and printers. The ARC wasn't slowed by the added work because they were adding computing power with each expansion.

"So far we've expanded our administrative computer system from 30 users to more than 100," Jackson says. "The expansion steps are so simple that I really don't pay much attention any more. If somebody has a cost-justifiable job he wants to do with the ARC, we just plug in the new equipment he needs and he's on the system. The other users are unaffected.

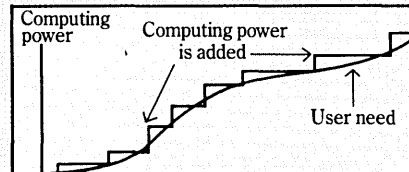
"Compare that to the huge effort that usually goes into upgrading a company's computer. Upgrading the ARC is simpler than buying a company car."

## Never again face the hassles of computer replacement

With the ARC, your company is spared the trauma of outgrowing its computer and starting over with a bigger one. And because the ARC system is expandable, you can keep all your people on one system. You're never forced to keep



To grow with ordinary computers, you throw out a little one and bring in a bigger one. You almost always have too much computer or too little.



With Datapoint's expandable computer, you can add computing power in small, inexpensive increments, closely matching capacity of the system to user needs.

duplicate files in several computers.

Some other companies call their computers "expandable." But check to see what that really means. For some, "expandable" means there's a bigger computer in the product line so you'll have something to move up to when you outgrow the first one. For others, it means you can add more memory. For still others, it means you can connect several computers together in a network. But can those "expandable" systems grow in processing power? ARC can.

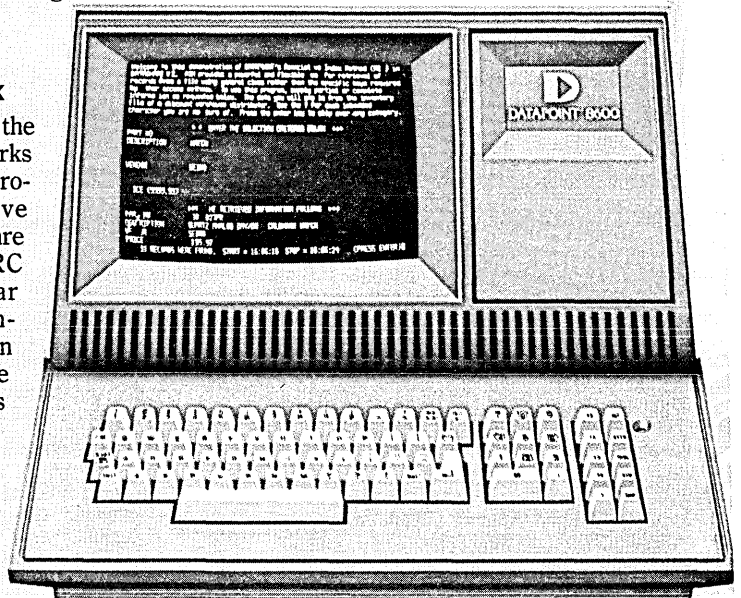
## The most widely used local network

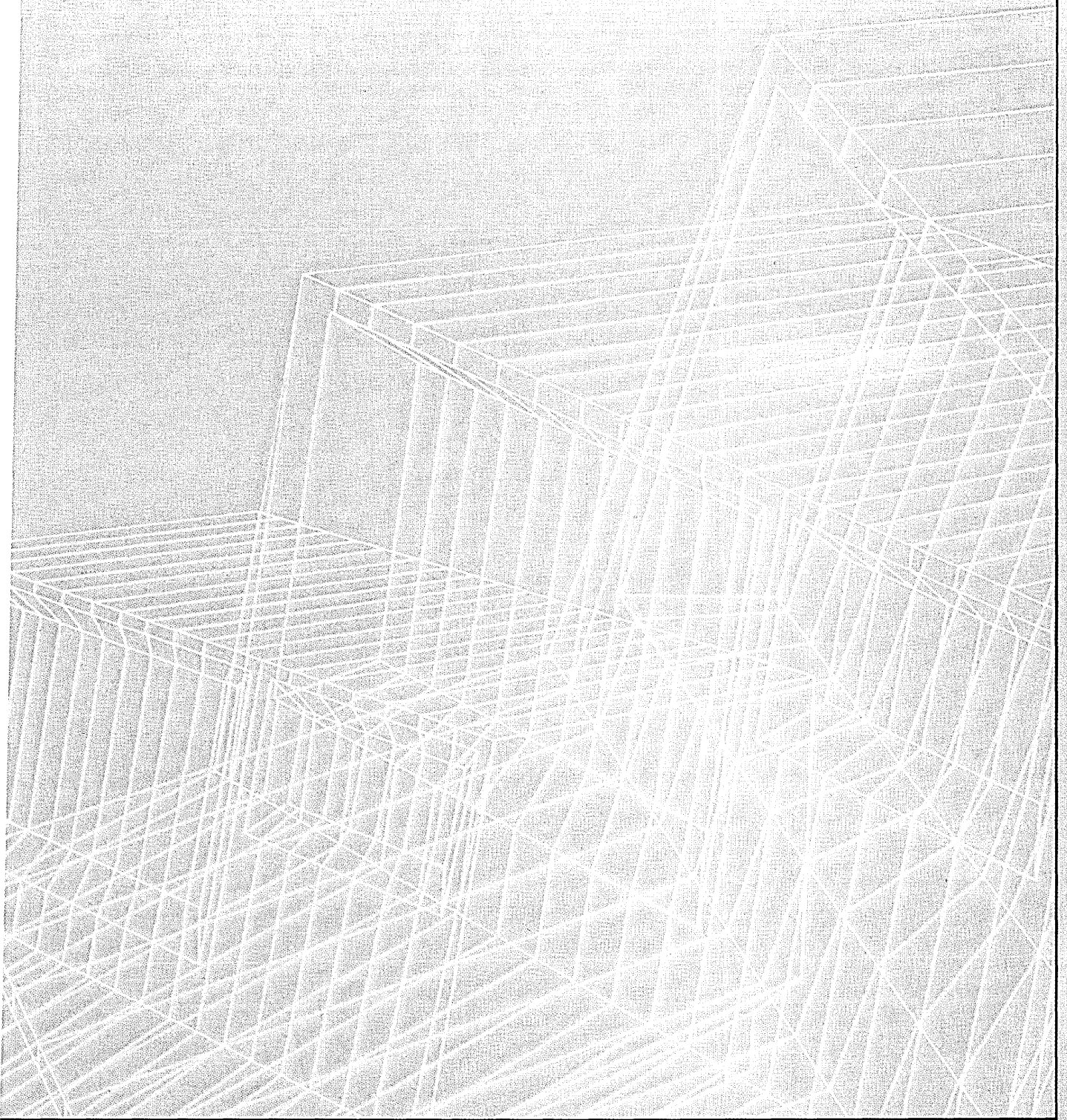
Datapoint pioneered the concept of local networks when the ARC was introduced more than five years ago. Now there are more than 4,000 ARC systems in use, far more than any competitive system, and an experienced service organization supports them worldwide.

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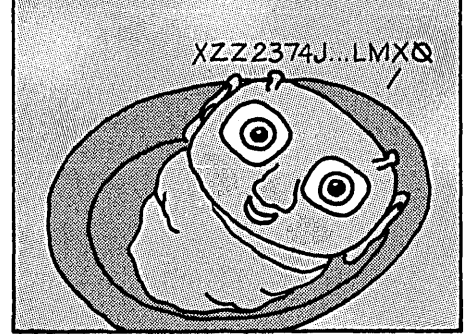
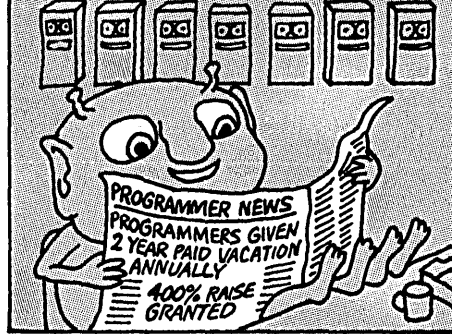
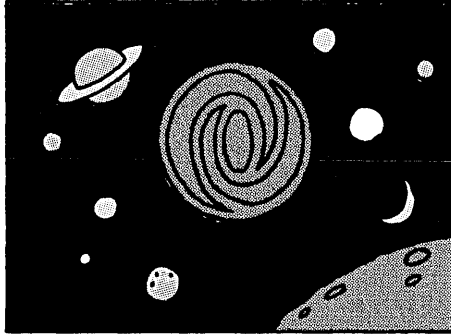
# DATAPOINT

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SOMEWHERE DEEP IN SPACE IS THE PLANET OXFORD...

SO ADVANCED THAT THEIR COMPUTERS ACTUALLY WORK.

AND WHERE THE FIRST THING A NEW BABY SPEAKS IS COBOL.

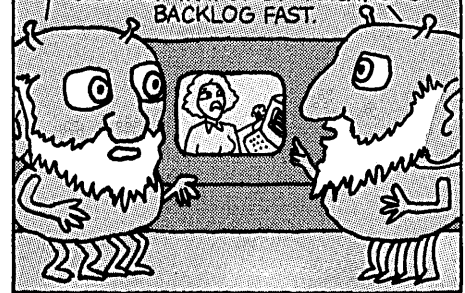
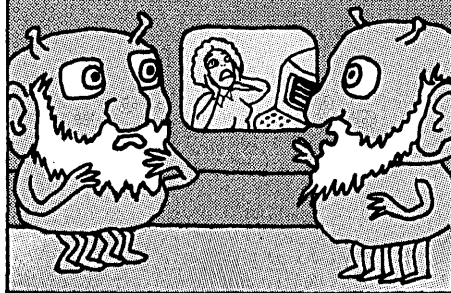


AS WE JOIN OUR STORY, THE ELDERS OF OXFORD ARE OBSERVING A DILEMMA ON THE PLANET EARTH.

I DON'T KNOW HOW I'LL EVER GET THIS CICS APPLICATION WRITTEN; WE ALREADY HAVE A 312 YEAR PROGRAMMING BACKLOG... AND I HAVE A DATE TONIGHT.

CAN'T WE HELP THAT EARTHLING? SHE LOOKS LIKE A SWEET KID.

LET'S SEND UFO DOWN TO HER. HE'LL CLEAN UP THAT CICS APPLICATIONS BACKLOG FAST.

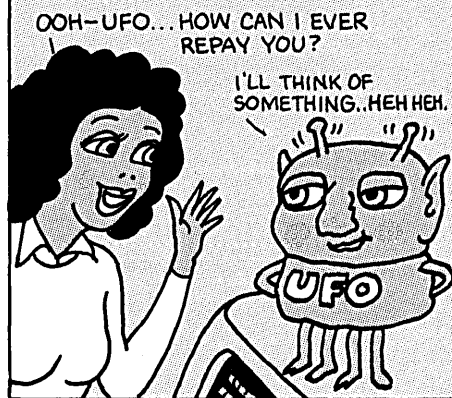
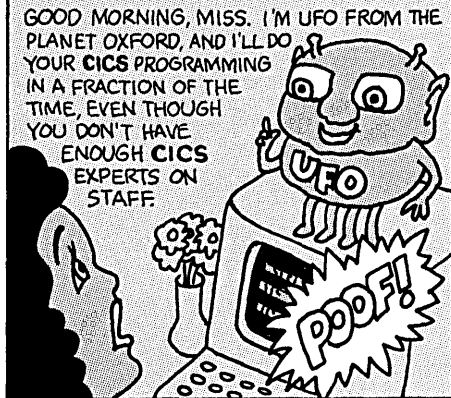


GOOD MORNING, MISS. I'M UFO FROM THE PLANET OXFORD, AND I'LL DO YOUR CICS PROGRAMMING IN A FRACTION OF THE TIME, EVEN THOUGH YOU DON'T HAVE ENOUGH CICS EXPERTS ON STAFF

OOH-UFO... HOW CAN I EVER REPAY YOU?

I'LL THINK OF SOMETHING...HEH HEH.

IF YOU NEED HELP WITH YOUR CICS APPLICATIONS BACKLOG, TOO... JUST DIRECT DIAL THE PLANET OXFORD AND ASK FOR UFO...

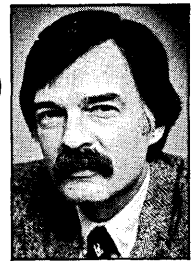


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# EDITOR'S READOUT



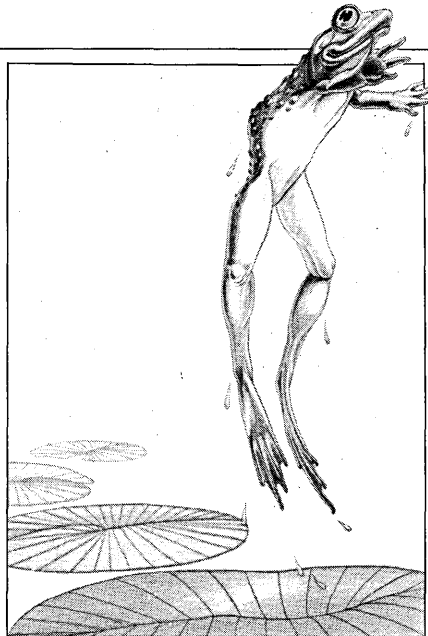
## THE LEAP FORWARD

The fifth generation of computers "will not be an extension of gradual improvements over current computers. . . The next stage will be a leap forward."

This is the opinion of Kazuhiro Fuchi, a leading Japanese computer engineer with the government's Electro-technical Laboratory, who was quoted in the July 8 issue of *New Scientist* magazine. It will be a leap into machines that will make use of artificial intelligence research. It will be a leap away from von Neumann architecture and toward parallel processing, and architecture patterned after the workings of the human brain. It will be a move toward knowledge engineering, natural language processing, and VLSI. The Japanese hope to achieve all this and much, much more by the 1990s.

Japanese plans for the great leap were formally aired at a conference in Tokyo last October. Scholars and researchers from around the world listened and responded to Japanese opinion about the research necessary to build the future systems. As DATAMATION correspondent Edward K. Yasaki commented in a story last January, "Those foreigners, numbering 86 out of the 300 or so in attendance, labeled the project ambitious and interesting, and they marveled at how open the Japanese have been about their plans. But behind some of the comments one could also detect some suspicion that the Japanese might not now remain open about the results of their research."

The Japanese Ministry of Inter-



national Trade and Industry has established the Institute for the New Generation Computer Technology in Tokyo and has dumped enormous amounts of money into the project. Roughly eight years from now all this activity may prepare the Japanese for the biggest leap of all—right over the backs of the competition, particularly the U.S. Although their plans are extraordinary, we have learned that the Japanese are not to be taken lightly. So the question is, how do we respond?

In an ideal world, free of crass commercialism, we would all happily exchange information to build machines to better the lot of mankind. We don't live in such a world. The name of the game is competition, and if the experience with our steel and automotive industries is not enough, Japan's actions in the tv and electronics industries ought to convince us that they play hard and they play to win.

If we base our response on the "great leap," we are liable to be in trouble. It seems more realistic to as-

sume that we will see the evolution of specialized systems, especially those that rely on advances in pattern recognition (including continuous speech and other forms of analog signal processing), and knowledge-based "expert systems" (the doctor or teacher on a chip).

We will probably see the development of specialized modules for specific disciplines such as medical engineering, structural analysis, and automatic program generation. These modules will attach to networks and be a part of the overall computing utility. The von Neumann machines will still be very much with us to handle payroll, inventory, and other mundane but necessary chores.

The development of the fifth generation is no different than the development of the last four—it is a competitive battle for the information marketplace, rapidly becoming the biggest in the world. In this country we have the researchers, the background, and the companies that can assure our pre-eminence in the development of machines based on the last 20 years of AI research.

Do we cooperate with the Japanese? Of course. But only in areas where it is mutually beneficial and in no way destroys our competitive edge. Should our government be involved in the battle for fifth generation supremacy? Emphatically yes! The government should do all it can in the form of research grants, tax incentives, and other forms of aid to private industry to meet the Japanese challenge. At stake is our leadership in the technology that we pioneered and that holds the most promise for our economic future.

If there is any leaping to be done, we must be sure that our leap is farther and faster. \*



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completely compatible with your existing RS-232-C (V.24) I/O ports.

The information you need to evaluate the potential of fiber optics for your application has been put into a new brochure, "The Hewlett-Packard Fiber Optic Multiplexer," that is available free for the asking.

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# IDEALISM SPAWNS REALISM

**Three microcomputer software authors describe the development of revolutionary products.**

compiled by Steve Ditlea

Because of differences in scale and usage, large computers and desktop microcomputer systems are often regarded as entirely distinct breeds of machine. Mainframes and minis are mainframes and minis, micros are micros, and ne'er the twain shall meet (so goes the common wisdom). And yet, the success of microcomputers is inextricably linked to those larger machines.

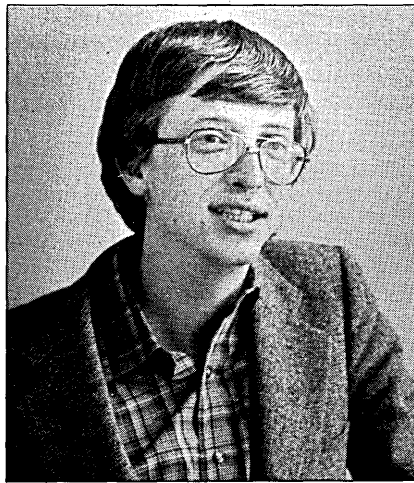
Obviously, microcomputer hardware could not exist without the advances made on mainframes and minis. Microcomputer software, too, has its origins in the large machines. Indeed, none of the major software products designed for micros could have been written without the use of large computers. Three such software products are generally credited with launching the personal computing revolution—the Microsoft BASIC high-level programming language, the CPM operating system, and the VisiCalc electronic spreadsheet.

The following narratives by the authors of these three widely used products describe the similarities in their individual design experiences—an idealistic vision of personal computing, perseverance in the face of adverse opinion, and a true pioneering spirit. They are tales of inspiration and perspiration—and good business sense.

## **BILL GATES ON MICROSOFT BASIC**

For any computer to become widely used, it must be able to run a high-level programming language facilitating the creation of applications software. On mainframes and minicomputers various languages have gone in and out of favor due to academic, governmental, and business factors, as well as engineering considerations. With a professional user base, such changes could be assimilated over time.

The larger user base made possible by the advent of microcomputers required a high-level language that would be universally applicable, without fear of obsolescence. When my friend Paul Allen saw the announcement in 1971 of the first 8-bit microprocessor, the Intel 8008, he brought it to me with the challenge that we should develop a BASIC for it. Because BASIC (the Beginners' All-purpose Symbolic Instruc-



BILL GATES, executive vice president of Microsoft Corp., Bellevue, Wash., relates his experiences in writing the Microsoft BASIC programming language.

tion Code, originally developed at Dartmouth by John Kemeny and Thomas Kurtz) is interactive and easy to learn compared to other computer languages, we decided it was the most appropriate language for low-cost machines that would be sold to hundreds of thousands of users. The 8008 instruction set, however, didn't appear powerful enough for the BASIC. We were still in high school at the time, so we shelved this idea but continued to work on other software projects together.

Our first exposure to using computers had come when I was in the seventh grade and Paul was in the ninth and the Mothers' Club donated money for the students to use timesharing computers. Paul and I later earned free computer time for ourselves by locating bugs in a Digital Equipment Corp. PDP-10 minicomputer. After several more years' experience with timesharing systems and minicomputers, Paul and I got around to writing our Microsoft BASIC interpreter for the second generation Intel 8080 microprocessor.

What finally prompted us to write our microcomputer BASIC was the January

**"In moving up from 8-bit to 16-bit microprocessors, we were able to step back and write the BASIC from scratch."**

1975 cover article of *Popular Electronics* magazine. That article told of a \$350 computer kit called the Altair, based on the 8080 chip and sold by a company called MITS in Albuquerque, N.M. We saw it as the first inexpensive personal computer.

By that time I was in college at Harvard, having vowed to follow my family's advice to give up this computer stuff and become a lawyer. Paul had taken a job with Honeywell in Massachusetts, and we were still brainstorming. After long discussions,

# IN FOCUS

## IN FOCUS

I was convinced the time had come to develop a BASIC for the 8080 chip.

During February and March 1975, mostly in Daniels 312, a small dorm room at Harvard, we wrote the first high-level language to run on a microcomputer, something at least one minicomputer manufacturer had claimed could never be done.

Remember that in 1975 memory was still very expensive. We decided we must develop a BASIC that would run in less than 4K bytes of memory. He contacted MITS, and they told us that several people were offering to develop a BASIC interpreter. We knew we had to work quickly. But first, to do our development work on a minicomputer, we decided to write our own 8080 simulator software for the PDP-10. Once we received the 8080 instruction manual from Intel, we worked more than 18 hours a day for the next five weeks developing our first version of the simulator. We modified the DEC PDP-10 macroassembler and symbolic debugger to understand 8080 instructions so we could more efficiently develop the BASIC itself.

Our interpreter design made it easy to add statements and functions without changing any of the existing codes. Since we couldn't anticipate what type of peripherals would be attached to the machine, we provided a CALL verb to access machine language subroutines. We had a hard time deciding which statements to use to provide access to the microprocessor's memory, but late one night we decided on the now famous PEEK and POKE verbs.

Our primary emphasis was on a fail-safe BASIC that would always indicate a user error instead of crashing or producing the wrong result. Because we knew our software was going to be put in ROM where it couldn't be updated, we needed to be extremely careful about subtle bugs. Our other major worry was that our simulator might be incorrect.

We agreed to take a paper tape of our BASIC to MITS to demonstrate it, knowing that if the simulator had made a mistake or we had misread the instruction manual the demonstration would end our chances of licensing our BASIC to MITS. The night before Paul left to go to Albuquerque, I stayed up reviewing everything to make sure it would run on the real machine. Paul wrote the bootstrap loader on the plane. Everyone, including ourselves, was amazed when this BASIC worked the first time. Many MITS employees who couldn't comprehend what to do with an Altair saw the value of the computer for the first time. Paul and I were ecstatic that all our work had paid off.

Two months later Paul left Honeywell, and I went on leave from Harvard (which to this day is my status there). We moved to Albuquerque to start Microsoft Corp. We completely rewrote our BASIC that summer, not knowing then that the

original design would prove most adequate for years to come. During 1975 and 1976 we developed a family of BASICs to accommodate a wide range of user needs, but always with compatibility among members of the family. Floppy disks were added to microcomputers at this time, so we devised an operating system that was completely invisible to the user.

If our first year supporting Microsoft BASIC was mostly technical, the following years were evangelical. One of our primary goals from 1976 to 1979 was to get Microsoft BASIC on as many machines as possible so that good courses, books, and applications would be developed. We envisioned users moving from machine to machine using Microsoft BASIC without having to learn a slightly different computer language each time. (It is, after all, easier to learn a completely different language than to learn one that is supposedly the same except for a few subtle differences.)

We tried to predict which microcomputer instruction sets would be popular and develop our product early so hardware manufacturers could license it immediately rather than develop it themselves. During

### **"Surprisingly one thing hasn't changed: mainframes and personal computers remain at odds."**

1976, we added support for the Zilog Z-80, the Mostek 6502, and the Motorola 6800. (Today we also support the 16-bit Intel 8086, the Zilog Z8000, the Motorola 6809, and soon the Motorola 68000.)

In moving up from 8-bit to 16-bit microprocessors we were able to step back and write the BASIC from scratch, taking advantage of the greater addressing and speed capabilities of 16-bit systems. When it comes time to write Microsoft BASIC for a 32-bit microcomputer—and we're starting to see true 32-bit microprocessors—we'll be able to make the transition more easily than from 8 to 16 bits. By doing the development ourselves, we've achieved what standards committees often fail to achieve—100% consistent implementations.

We have taken every opportunity to enhance our BASIC ahead of demand for new features. In the case of graphics, we have standardized on such verbs as DRAW, PAINT, and CIRCLE, bringing the full power of interactive graphics to unsophisticated users. These features were first implemented on the IBM Personal Computer, providing a large initial user base.

IBM came to Microsoft first to review the design of the IBM Personal Computer because they recognized the key role that innovative software plays in tapping the incredible power of personal computers. Although working with IBM was the opportunity of a lifetime, Microsoft is by no means slowing its efforts to provide im-

proved software. Lately, we have complemented our BASIC interpreter with a BASIC compiler that uses the same language, so compiler and interpreter usage can be combined.

It is ironic that we are now receiving inquiries from minicomputer firms for extended versions of Microsoft BASIC, when we originally set out to write a useful subset of minicomputer BASICs for personal computers. Such Microsoft innovations as PEEK, POKE, and PAINT have already migrated to larger machines. We are rewriting our BASIC in a more transportable code, so there is nothing to keep us from offering it on larger machines. But this isn't one of our primary interests, since we have to spend so much time just keeping up with the huge volume of personal computer models reaching the market and the millions of units they potentially represent. After all, Microsoft BASIC now runs on more than a million machines, making it the most widely used piece of system software ever written.

As 16-bit microcomputers become prevalent, we will be seeing more professionals with experience on large computers writing software for personal computers. And they won't necessarily have to know BASIC to do it. We're gratified to note that the 16-bit COBOL we recently began offering is already being used far more than our 8-bit COBOL. More problems originally developed on large machines will be adapted to take advantage of 16-bit microcomputers' individual computing power. To aid such direct adaptations, our major products, in addition to BASIC and COBOL, include two other high-level languages for microcomputers—Pascal and FORTRAN.

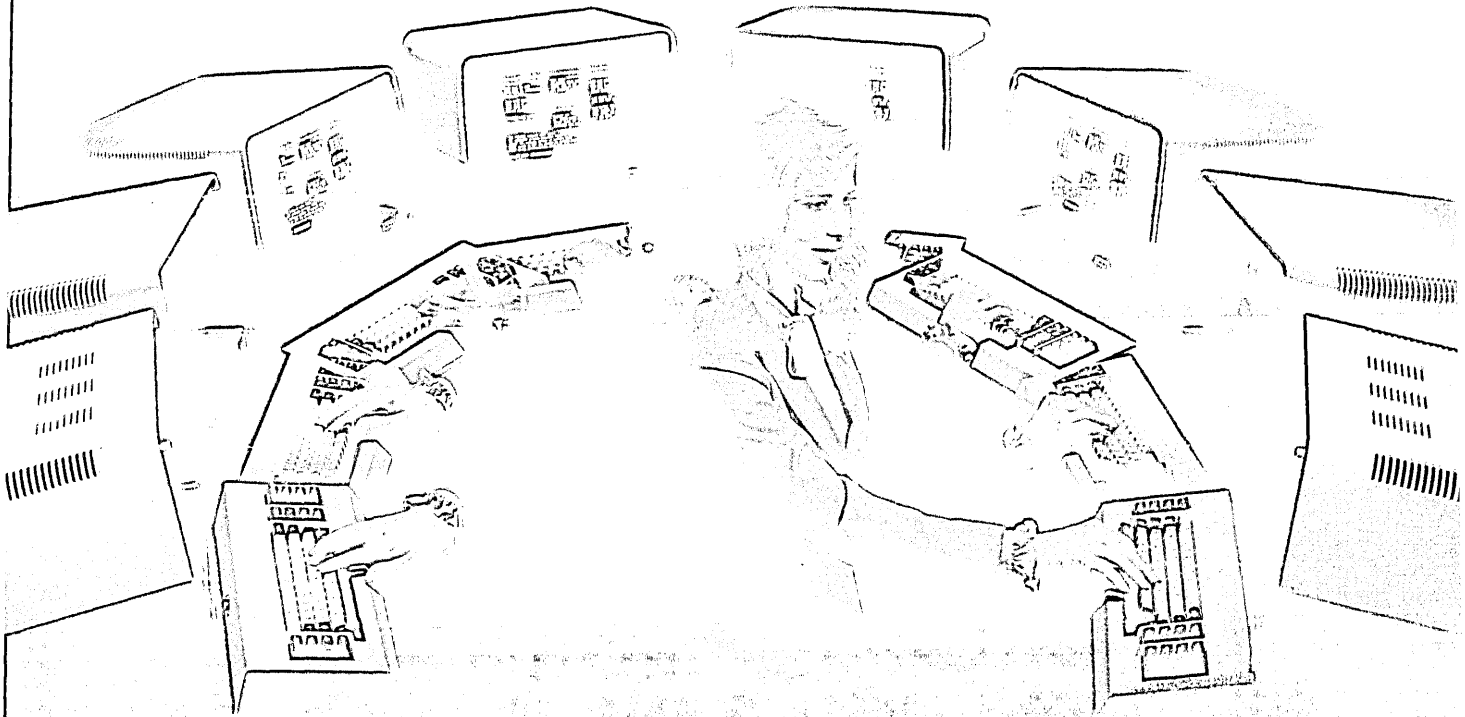
Our biggest new product area—which will take what we did with BASIC one step further—is what we call end-user tools. Even BASIC requires a user to understand variables, loops, and line numbers. If we want millions of machines to be used effectively, we have to eliminate this complexity by only presenting concepts that users already understand, such as paper, files, or procedures.

I consider word processing the first application where the end-user tool approach was taken. Accomplishing the same thing with data entry, report generation, graphing, query, and other common end-user functions is much more difficult. To develop Multiplan, Microsoft's electronic spreadsheet (the first in a family of end-user tool software to be known as Multi-tools), we put in more than a hundred times as much effort on development aids; project management and methodology have changed a lot since the weeks when Paul Allen and I wrote the first version of Microsoft BASIC.

Surprisingly, one thing hasn't changed: mainframes and personal computers remain at odds. An executive might have a timesharing terminal and a desktop

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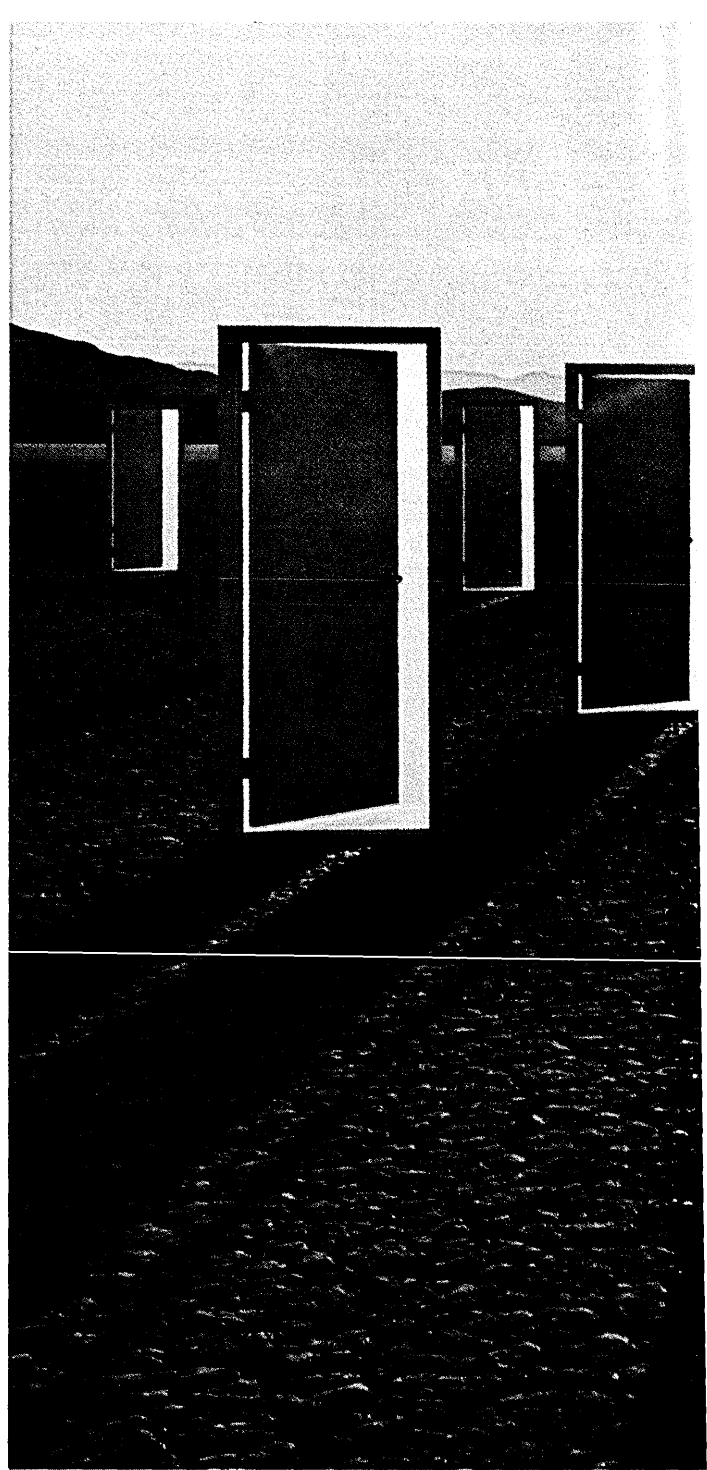
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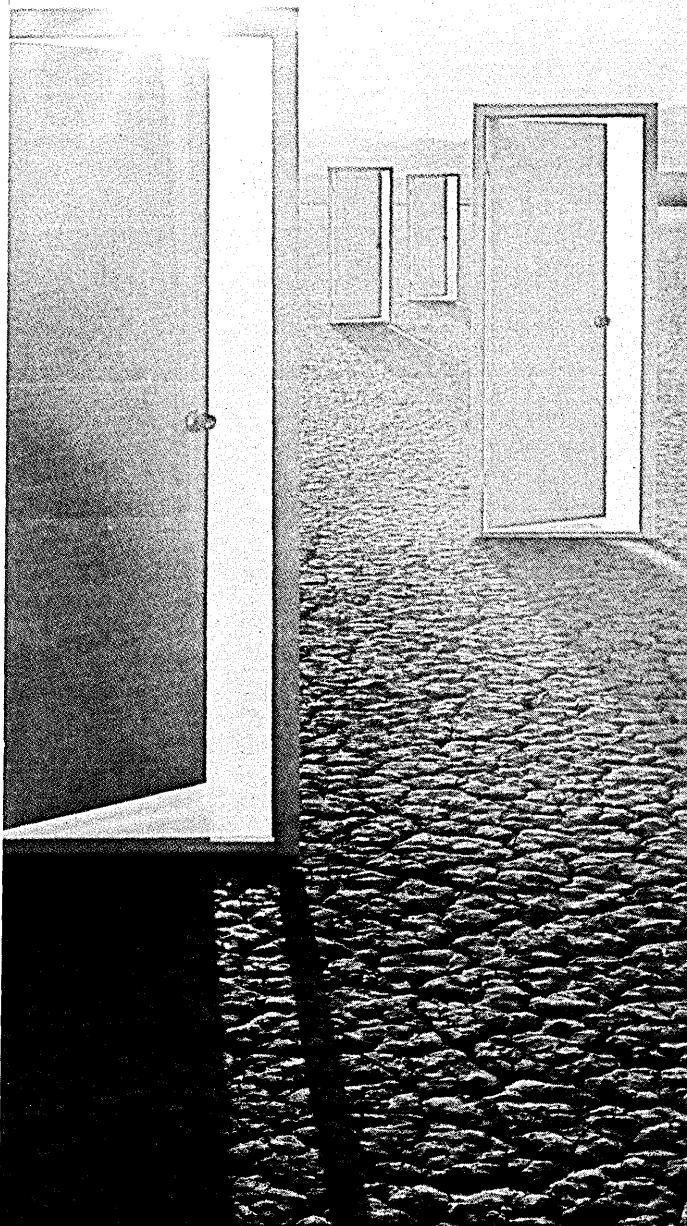
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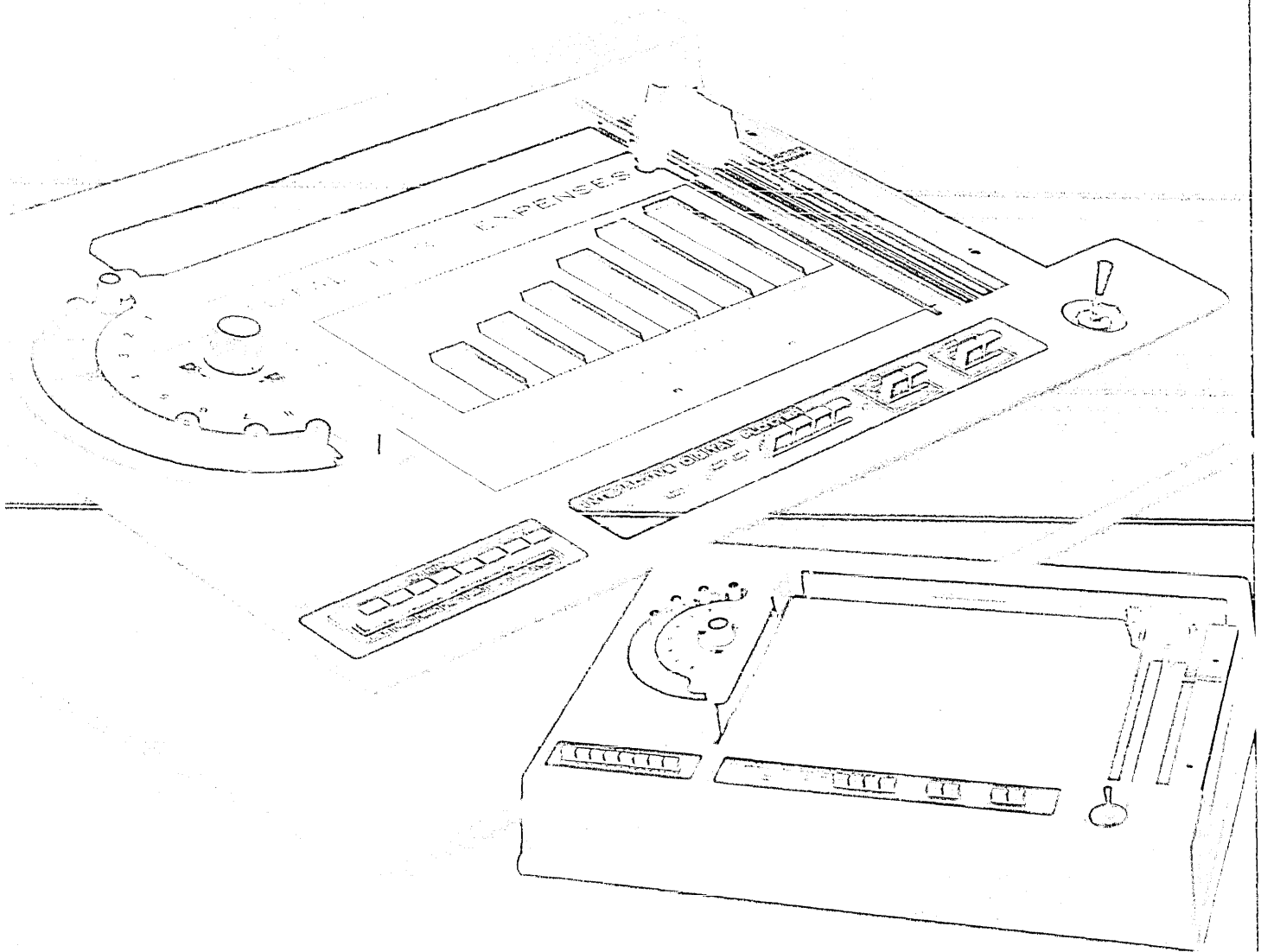
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### GARY KILDALL ON CP/M

It is hard to imagine that only a few years ago standardized computer operating systems seemed unthinkable. Traditionally, each computer or computer family from a specific manufacturer had its own proprietary software for managing and controlling the computer's internal operations.

This meant that each operating system could be designed and optimized for that hardware. But it also meant that programs written for that machine could not be transferred easily to another, and operators could not use different machines without retraining. This was not important when computers were expensive, because the conversion was a small cost in the overall operation.

Now, however, microcomputers are leading a frontal assault on hardware costs. Inexpensive machines can only be worthwhile if users can obtain and use inexpensive software. Few users write their own. Thus, declining hardware costs have created a need for standardized software, economically produced and priced to attract a maximum of buyers.

The emergence of a mass market for applications software is the major reason why the CP/M operating system has been accepted by most microcomputer manufacturers. Approximately 500,000 installed microcomputers made by more than 600 different companies, including some of the



GARY KILDALL, president of Digital Research Inc., Pacific Grove, Calif., tells how the CP/M operating system evolved.

largest makers of computers and business equipment, operate with versions of CP/M operating software. CP/M gives users access to thousands of applications software packages largely devoted to business and professional needs.

CP/M's establishment as a de facto standard for the microcomputer industry was due in no small part to good timing. Though CP/M (Control Program for Microcomputers) was first conceived for an 8-bit microprocessor-based system, its origins date back to my experience with large mainframe computers.

Back in 1967, when I was in graduate school at the University of Washington, I abandoned my intention to become a math teacher after a friend showed me a FORTRAN instruction card and told me that this "computer thing" was going to be very big. My first "personal computer" was a large Burroughs B5500 system I used in graduate school. I learned a number of interesting storage allocation techniques for organizing mass storage from my work with the B5500. I also became interested in compilers, programs to convert high-level language instruction codes into instructions the computer can assimilate.

At about the time I received my PhD in May 1972, and while I was an instructor in computer science at the Naval Postgraduate School in Monterey, I saw an intriguing ad posted on a bulletin board at work. It offered a computer for \$25. The "computer" was actually a 4-bit microprocessor, the Intel 4004, the first computer on a chip. I got the specifications of the chip and then, mostly for fun, wrote a simulator and assembler for the 4004 on the IBM 360 mainframe at the naval school.

My intent was to use the \$25 computer chip to develop a navigation calculator. Intel was interested enough to give me a 4004 development system, which was really the first personal computer. While it was limited in capability, it had all the key elements of a mainframe—central processing unit (cpu), memory, and input/output (I/O) capability. It required a teletypewriter with paper tape reader/punch for I/O.

Towards the end of 1973 I worked at Intel for four months, spending my time developing a simulator for the company's new 8-bit microprocessor, the 8008. I convinced Intel that it needed a systems implementation language tailored to the 8008. I ended up with what I called PL/M. The PL came from Programming Language, and the /M was a suffix I adopted for microcomputer software. I then started working on a variation of PL/M for the 8080 microprocessor, the chip that really started the microcomputer revolution.

Using a high-speed paper tape reader to store and enter long programs, I developed PL/M programs on a DEC PDP-10 with the PL/M compiler. This worked well, but I was dependent on the large PDP-10 ma-

chine. I wanted to develop programs in PL/M on my own system and break the umbilical cord tying me to the "large" system. A friend gave me a diagram for an interface that allowed a cassette recorder to replace the paper tape. Fortunately, it did not work. If it had, I might never have explored floppy disk storage, a key attribute of CP/M.

About this time, the inexpensive floppy disk mass storage system made its appearance. First used by IBM as a replacement for punched cards, it had been turned into a standalone peripheral device by Al Shugart, founder of Shugart Associates, a leading supplier of floppy disk drives. I went to that company and was given a used test drive. Much the same as the \$25 computer required \$1,000 worth of parts to operate, the \$500 disk drive required a fairly complex controller before it became useful. I spent a month building one, without success.

While I was trying to build the controller, I began to work on the software for diskette storage management. Every systems software designer uses past experience to produce new packages. In the case of CP/M, I patterned the user interface on the DEC PDP-10, the program interface on the Cambridge Monitor System I had used on an IBM 360, and the file system on the Burroughs B5500. The operating system worked under simulation, but I could not try it out with the floppy drive because the controller didn't work.

In 1974, working independently, I finally solved the controller problem, with the help of John Torode (now president of Digital Micro Systems), who had just earned his PhD at the University of Wash-

**"Mostly for fun, I wrote a simulator and assembler for the Intel 4004 on the IBM 360 mainframe at the naval school."**

ington. We talked Shugart out of another drive, put it and the development system in a box with the controller, and finally got it all to work with the CP/M operating system. We thought it was phenomenal.

But an operating system by itself is not sufficient for program development. I added utilities to CP/M: a text editor (ED), a dynamic debugger (DDT), and a simple assembler (ASM). The CP/M package was not my main project, so it wasn't until 1975 that I had a complete set of utilities for CP/M, including PIP for copying files. I tried to interest Intel in acquiring CP/M and completing the utility package. Intel said no.

Why? Intel's then-new microcomputer software manager, Terry Opdendyk (now president of VisiCorp, publishers of VisiCalc), had come from Hewlett-Packard and he felt that Intel, like HP at that time, should develop its own software. It was fortunate for me that Terry was overruled,

## IN FOCUS

since CP/M could easily have become proprietary software.

Since Intel was not interested in buying the package, John Torode and I decided to sell oem rights. Our first sale was to Omron of America, manufacturers of a sophisticated intelligent terminal system with floppy disk drives. John then built his own computers under the brand name Digital Systems.

Toward the end of 1975, a friend from the postgraduate school, Glenn Ewing, went to work for Imsai, a maker of microcomputer systems. Glenn and I came up with the concept of the basic input/output system (BIOS), a CP/M module that could be customized for specific hardware. This greatly reduced the work required to modify CP/M for an individual computer. It also made it practical for computer manufacturers to write the BIOS, and sell CP/M under license with their systems.

That same year my friend Jim Warren, who was then editor of *Dr. Dobbs's Journal*, a rather eclectic computer hobbyist publication, suggested we sell CP/M to hobbyists for \$70. My wife Dorothy and I took the suggestion, formed Digital Research, and soon had many technically oriented hobbyists using CP/M. (Many of them were later to hold key positions in the microcomputer industry and were influential in having their firms adapt CP/M as an operating system rather than developing yet another proprietary product.) Soon, about 100 companies were offering CP/M computers.

From 23 employees in 1980, we have grown to almost 200 today and have

**"I tried to interest Intel in acquiring CP/M and completing the utility package. Intel said no."**

added to the original CP/M operating system with multi-user (MP/M) and network (CP/NET) operating systems, as well as versions for 16-bit microprocessors (CP/M-86, Concurrent CP/M-86 and MP/M-86). We are now developing ANSI standard graphics capabilities for our operating systems, and we are working with hardware manufacturers to support a wider variety of microprocessors, including Motorola 68000.

I'm now convinced that the future of microcomputers lies in offering minicomputer and even mainframe features at greatly reduced cost. The Concurrent CP/M-86 system, for example, is a multitasking facility implemented on a small machine. The difference is that it is oriented toward a single user, while larger computer systems allow a number of users to do multiple tasks. By pushing a key, the user can put the current applications program in background and can start another program running simultaneously. In this way, word processing and data management, or financial planning and communications capabilities, can be

used at the same time to increase efficiency. This was not previously feasible in small memory microcomputer systems.

I also believe microcomputer systems are progressing in an entirely different direction from mainframes; microcomputers tend to use pictures to represent operations going on inside the computer system. The use of high-resolution graphics is possible because it's inexpensive for small machines and has been part of the evolution of small computer technology.

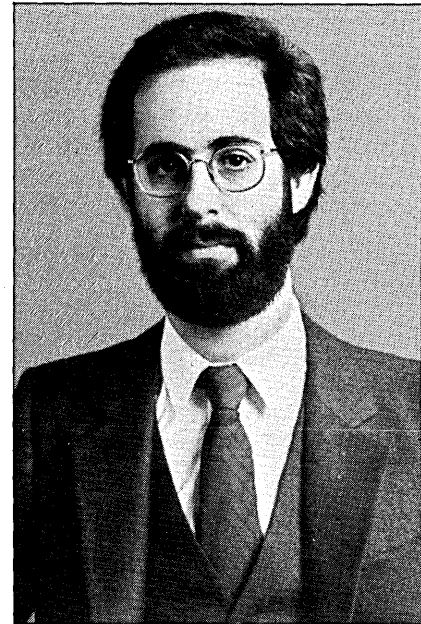
With this graphics capability, micro users can work with icons as opposed to keying information into the computer system. Icons are used in our society in many different ways. Symbols on automobile dashboards are a good example—where a picture of a gas pump is used instead of the word "fuel." In computers, we will see operating systems allowing us to work with pictures, not abstractions expressed in cryptic written commands and responses. With an icon, or graphics-oriented system, the abstractions are hidden and users can communicate in ways they find natural.

This kind of capability will require the design talents of computer professionals with experience in the areas of artificial intelligence, CAD/CAM, ergonomics, and programming languages. Because microcomputers are taking on mainframe and mini-computer characteristics, these professionals will be able to adapt quickly to advances in the microcomputer industry. They will have the same development tools with which they are now used to working. In fact, one change for the better will be the availability of individual development facilities. Having made the transition from mainframe to microcomputer systems, I can attest to pleasures of working on your own personal computer system, without having to wait for access to timesharing facilities.

### DAN BRICKLIN ON VISICALC

When microcomputer systems were first offered in the mid-1970s, they were a solution in search of a problem. Computer professionals knew what a mainframe or a mini-computer could do, but nobody really knew what a micro could be used for. Early microcomputers were designed by engineers and hobbyists for other engineers and hobbyists. A more universal application would have to be found for the microcomputer to fulfill its promise as a personal computer.

The tedious calculations I had to do in business school inspired VisiCalc, a software package that allows noncomputer-oriented professionals to do financial planning, analysis, and related calculating tasks on its electronic spreadsheet format. The idea for VisiCalc first occurred to me in 1978 while I was a student at the Harvard Business School. I had previously received a BS in electrical engineering/computer science from the Massachusetts Institute of



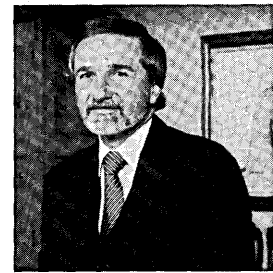
DAN BRICKLIN, chairman of the board of Software Arts Inc., Cambridge, Mass., gives a history of VisiCalc.

Technology, and had worked for DEC as a project leader on its word processing system. At Harvard, one of the most frequent tasks assigned students was repeated preparation of financial planning sheets for mock organizations. It was repetitive work that required numerous calculations before meaningful results could be obtained. And invariably I would get to the end of a spreadsheet problem only to find that one calculation in the middle was wrong and I'd have to refigure the entire problem.

From my experience with DEC and elementary word processing concepts, it occurred to me that an electronic spreadsheet was practical on the small computers that were just entering the marketplace. What I had in mind was a "magic blackboard" where, when one number in the equation changed, the computer could automatically refigure the solution and change all the numbers in the rows and columns accordingly. I talked to some of my professors at Harvard, all of whom—except one—thought what I had in mind was a good idea. That one "doubting Thomas" said there already were financial forecasting programs on the market; a financial forecaster himself, he advised me against putting a lot of time into the program.

But I knew the program could be written and could have value. Bob Frankston, a good friend from MIT, a superb programmer, and one who shared my desire to start a software development company, agreed to proceed with me on the project. At about that same time, another MIT graduate (ironically, introduced to me by the same Harvard professor who had tried to discourage my efforts) came onto the scene.

“The proliferation of financial planning languages will create chaos throughout corporate management ranks. In the future, we will see one standard modeling language that extends from the personal desk-top computer to the central corporate information center.”



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This new acquaintance, Dan Fylstra, who was then at the Harvard Business School, had just formed Personal Software Inc. (now VisiCorp) and was selling chess games that ran on the Apple II and the Radio Shack TRS-80 Model I.

In the fall of 1978 I did the first test version of VisiCalc, written in BASIC, on Fylstra's Apple in his Cambridge apartment. Suddenly it was clear to everybody else what I was so excited about. It was decided that Fylstra's company would mar-

**"Invariably I would get to the end of a spreadsheet problem only to find that one calculation was wrong and I'd have to refigure the entire problem."**

ket our program once we had it in final form. Bob Frankston and I incorporated as Software Arts Inc. on Jan. 2, 1979, and were soon working on program development, first with timesharing and later on our own Prime 550 minicomputer. We decided to write the commercial version of VisiCalc in machine language, fitting everything we wanted into the limited amount of memory space available in the personal computers of those days. The final program was only about 25K bytes long, yet set standards for performance and features still highly regarded in the industry.

We settled into a routine that would carry us through the end of my term at Harvard. I would go to school during the day and Bob would sleep. We would meet in the evenings to discuss progress and problems. Then Bob would go to work on the computer for the rest of the night, when the timesharing rates were cheaper, and I would sleep. In the summer of 1979 we hired our first employee, Steve Lawrence (who was instrumental in completing the product), and moved into our new offices in Cambridge. We were determined to build a major software development concern.

In October 1979, Personal Software, which was marketing VisiCalc, began shipping the product to dealers. Word began spreading throughout the microcomputer industry that the program was convenient, versatile, and inexpensive. Business people were going into computer stores to buy Apple II computers just so they could run VisiCalc. It quickly became evident that VisiCalc was going to be a big seller, and we continued our efforts to make it available on other major brands of personal computers.

What we had done with VisiCalc was technically possible long before we had attempted it. It was a case of no one thinking of the fundamental concept or application, nor executing it in a careful way.

While still revising, enhancing, and expanding VisiCalc, we used the revenues from program sales to assemble a management team and professional staff that would also allow us to develop new software products. To date we have grown to 50 employees, all of whom are experts in a technical or business area. And VisiCalc is now available on more than 10 different machines.

Early on, industry analyst Benjamin Rosen, in his highly respected newsletter, praised VisiCalc and said it "could someday be the software tail that wags—and sells—the personal computer dog." With this program often cited as the sole reason for business purchases of microcomputers, Rosen's prediction has proved far more accurate than anyone—including myself—could have hoped. More than 300,000 copies of VisiCalc have been sold in three years, making it the most popular business applications software yet developed.

We have devoted a great deal of time and effort during the past two and a half years towards supporting VisiCalc; among continuing enhancements to the original program is the DIF file format, an answer to the problem of how to let VisiCalc interact with other programs, on main-

frames and minicomputers as well as personal computers. Introduced in 1980, the DIF format is, to our knowledge, the first such standard in the industry. The latest improvement to the original electronic spreadsheet is Advanced VisiCalc, announced at this year's National Computer Conference, allowing simpler implementation of prewritten VisiCalc formats for the novice computer user.

The opportunities for creating innovative software for personal computers are still unlimited. Despite the incredible growth of the personal computer industry over the past five years, its future still depends on those in software development discovering new elementary operations for the home, office, and factory. These include such conceptual functions as word processing, simple filing, and spreadsheet analysis, as opposed to specific applications such as mailings, inventory control, tax planning, and "Space Invaders."

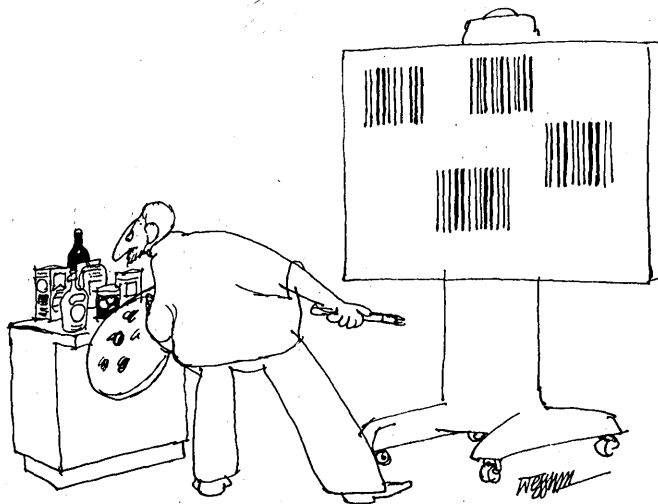
So far, only a limited number of elementary operations have been implemented on personal computers. We must now concentrate on developing software that will increase the practicality of owning a personal computer for all levels of society. Business applications have been explored in depth and there are now numerous programs that allow personal computers to be useful to large and small organizations. In other areas though, like home use, very few elementary operations have been defined.

**"What we had done with VisiCalc was technically possible long before we had attempted it."**

This will have to change if the microcomputer industry's growth rate is to continue accelerating.

At Software Arts, we feel the other principal direction in software development will be improvements in the human interface for these new elementary operations. The bicycle, for example, is an elementary operation in transportation that was discovered long ago. But it took years to experiment and develop the best human interface—the most effective design of wheels, gears, and structure for widespread use.

With personal computers, creating the human interface demands more of the software developer because micro users expect a higher level of performance in terms of speed and ease of use than do users of minicomputers or mainframes. The range of actual and potential personal computer users is vast: from those with no computer experience to ones with sophisticated knowledge. Yet all have a high level of expectation. This is what took up the bulk of the development time for VisiCalc. Making the computer do what we wanted was easy. Making it do the same tasks with simple commands was much harder. \*



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# MEMOREX

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## STRATEGIES

# THANKS FOR THE MEMOREX

**The confidence level is up among Burroughs users.**

Life with Burroughs has been everthing but dull since Michael Blumenthal took control two years ago. Granted, the follow-on to the B7800 has yet to show its faceplate, but corporate swears the B7900 is headed for field tests in February and scheduled shipping is to begin in May. Meanwhile, almost every aspect of the Burroughs organization has been poked, probed, or rearranged by chief redesign architect Blumenthal.

"One of the biggest things we've seen happening," said Tom Easterday, president of CUBE, an independent Burroughs users group, "is that to date everything Blumenthal said he was going to implement, he has. At this point, Blumenthal's got a 100% credibility rating."

That's quite a kudo considering what Blumenthal has promised: to change management style, cut losses, and pursue acquisitions, get the company back on sound fiscal ground, improve manufacturing and delivery procedures, improve field service, expand Burroughs' software reach, reorganize marketing strategy, and include users in Burroughs's product planning loop. In two years Blumenthal has made headway on almost every front.

Maybe too much headway, too quick, fret some skeptics, who agree with the "surgery" but worry that the "patient" won't be able to survive the recovery period. Blumenthal, too, admits he's had his share of anxious nights as he navigated through the past several months. "One night I'd go home and say I'm going too slow. I'd be frustrated. Next night I'd go home and be nervous as hell that I was going too fast. There is no good answer to this other than experience, and I have had a certain amount of experience, now and with other companies. It's sort of a gut feeling. If I hadn't done some of the things I've done, then they [analysts] would have said, 'He's not dealing with the basic problems.' Fact of the matter is, we completely reshuffled the team, reorganized substantially, and did some very dramatic surgery. But we did it with a minimum amount of disruption. By that I mean the morale of the organization is high."

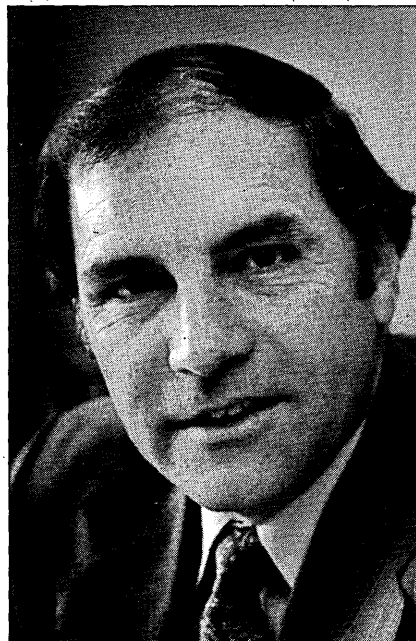
Despite the corporate-wide shake-up and executive suite shakeout, morale is high. A visit to Burroughs's world headquarters confirms Blumenthal's claim.

From secretaries to executives, there is a sense of a company on the move, a sense of excitement and enthusiasm. "There is really a new spirit going around at Burroughs," agreed Judd Peter, past CUBE president and current board member. "I've been there many times but never been there when I've seen old hands, people who have been at Burroughs for a long time, so thoroughly enthusiastic."

Morale, though, is not all that has taken an upturn. At the end of second quarter, earnings were up 15% and orders were up 15% over the previous period. "That's about in line with what Wall Street expected, only a little bit better," conceded Jay Stevens, a vice president with Oppenheimer & Co.

Stevens's cautiously positive attitude toward Burroughs was echoed by several other leading computer industry analysts, who also felt that the basic product line was not doing all that well—about on par with the rest of the BUNCH—and that most of the gains came from Memorex.

But that's exactly why Blumenthal said he wanted Memorex—to contribute to the bottom line and to expand Burroughs's product and services reach well beyond individual mainframe sales. "In the mainframe business, the whole technology has changed," remarked Blumenthal. "The company that is successful is the company that can integrate all these things: how you store data, how you work with them, how you communicate data, how you do distributed processing and use intelligent terminals. The mainframe is no longer the be-all and end-all, growing at only 8% to 10% per year. I say 'only' because other parts of the information systems market are growing at



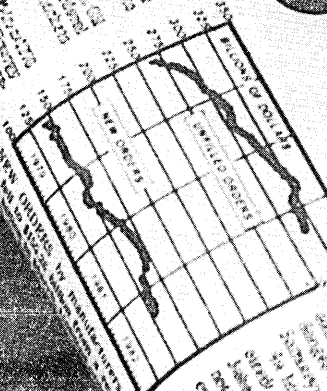
WILLIAM P. CONLIN: "The smaller the system, the easier it is to switch vendors."

# NEWS IN PERSPECTIVE

# OIL PRICES SOAR

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CIRCLE 41 ON READER CARD

## NEWS IN PERSPECTIVE

30%. Mainframes have become a peripheral like everything else, a peripheral to the system."

In response to this growing need for integration, Burroughs is grappling with the question of how to manage soft services. "More and more we are putting brains instead of boxes out there," remarked Jerome Jacobson, vice chairman of the board and chief strategic planner. "Sometimes we are charging adequately for that service and sometimes we are not." Jacobson's concept is to develop a new business group, the softer services group, which will have its own profit and loss focus. "Users are going to want mainframes, terminals, distributive data processing, electronic mail devices, store and forward devices, and interconnects to make everything work together. All that takes a helluva lot of sometimes standard engineering, but oftentimes a great deal of custom engineering. You have to cover costs. We are going to try to do that in a way that is very, very clear to the customer while giving us a clear P&L focus," explained Jacobson.

Another Burroughs executive, William Conlin, a senior vice president and president of Industry Systems who has spent 22 years within the Burroughs organization, sports the same philosophy as Blumenthal when it comes to computer industry discussions. "Burroughs is like a new company," he acknowledged, but added that it's also a new industry out there because of the impact of consumer-type products and microprocessor technology. Where once there were five or six major competitors in the mainframe business, now there are 10 times, maybe 100 times the competitors in the "new" computer industry, Conlin observed.

Confident the company will continue to grow, Burroughs top managers are not banking on traditional mainframe sales to first-time users of dp equipment as the main source of cash to support this growth. "When you can put the power of a B5000 in a tabletop computer like the B20 and ex-

### **"At this point, Blumenthal's got a 100% credibility rating."**

trapolate that out five years, the question becomes: what is a mainframe anyway?" commented Conlin. The company does expect to benefit some from the expanding demands of its user base. As the market fills up with small, low-priced systems, however, the word "competition" takes on a new edge.

"The smaller the system, the easier it is to switch vendors," admitted Conlin. "Fortunately, our strength for a long time has been in the B1900 and B900. The B2900 and B5900 are coming down in price enough to begin to be attractive to System/38 and 34 users. Where do they go in the IBM house? They have a conversion prob-



PAUL G. STERN: "As more and more system function migrates to the silicon level and certainly to the module level, packaging is where the big leverage in cost/performance will be."

lem to face. That is where new business will come from."

Second quarter results indicate that Blumenthal figured right about Memorex. It appears to be having a positive affect on Burroughs's financial position. Down the road, as the two companies combine their research and development efforts, Burroughs also expects some technical boosts to come of that union. "They were further along in thin film than we were," said Blumenthal, when discussing the many reasons behind the Memorex purchase.

Before many crossover benefits can flow through, noted one Burroughs user, the companies will have to work out some unexpected technical glitches that have cropped up in the Burroughs/Memorex marriage. Apparently, all is not going so smoothly in the effort to link Burroughs I/O to the Memorex storage device, said Larry McQuown, CUBE board member and member of the technical computing services group for Raychem in Menlo Park, Calif. "In some ways Burroughs is a lot simpler than IBM, and in this case there is just enough difference that it caught them by surprise."

Technology isn't the only integration snag Burroughs has run up against with its acquisitions, including Memorex, System Research, and System Development. The companies have yet to resolve how to serve their two marketing responsibilities, one to Burroughs and one to the outside commercial market.

As Burroughs slugs away at integrating Memorex's IBM plug-compatible hardware line and continues to hire former

IBMers to fill top management posts, it's not surprising that some users worried that the new Burroughs would turn off on an old road, the IBM plug-compatible road. Blumenthal replaced about 20 of the top 25 Burroughs management positions with new people, most of whom had varying degrees of IBM experience. "When we saw that herd of IBMers coming in, we had some questions," recalled CUBE president Easterday, who works as technical advisor for the dp operations at Indiana Lumberman's Mutual Insurance Co., Indianapolis. Burroughs had not been a follower but an industry innovator, and users did not want to see that tradition die only to be replaced by another "me too" company. "[Innovation] is the only thing that kept Burroughs alive," observed Easterday.

When members of the CUBE board asked the new Burroughs management about rumored intentions to go the pcm route, the response, recalled several CUBE board members, was an emphatic no. Users were assured the new management team has every intention of staying with the Burroughs architecture. They too consider it to be far superior to IBM, the users were told. Where Big Blue's influence will be seen, however, is in manufacturing. Plans are to apply IBM cost saving methods to Burroughs's historically inefficient manufacturing operation, said users.

First to tackle manufacturing was Paul Stern, who came to Burroughs with a strong and varied work pedigree. Hired in January 1981 as executive vice president of

### **Despite the corporate-wide shake-up and executive suite shakeout, morale is high.**

engineering and manufacturing, Stern moved up to president and chief executive officer this past May. Prior to joining Burroughs, Stern worked for Rockwell International, where he held the positions of president, commercial electronics operations, and corporate vice president, strategic management. He was also a member of the corporate management committee. Before Rockwell, Stern held a number of senior management positions with Braun AG from 1976 to 1979 and with IBM from 1968 to 1976, where he served in such assignments as manager of integrated circuit processes and products in the Components Division; director of organization in the Data Processing Products Group; and director of new products and technology and director of future manufacturing systems, both in the Systems Products Division.

A chronic complaint of Burroughs users has been the company's inability to ship product on time and in proper working order. This has led to unhappy users, delayed and unorganized installations, and an accounts receivable record that stretched out as far as 96 days. Customers who would

*The options and implications of . . .*

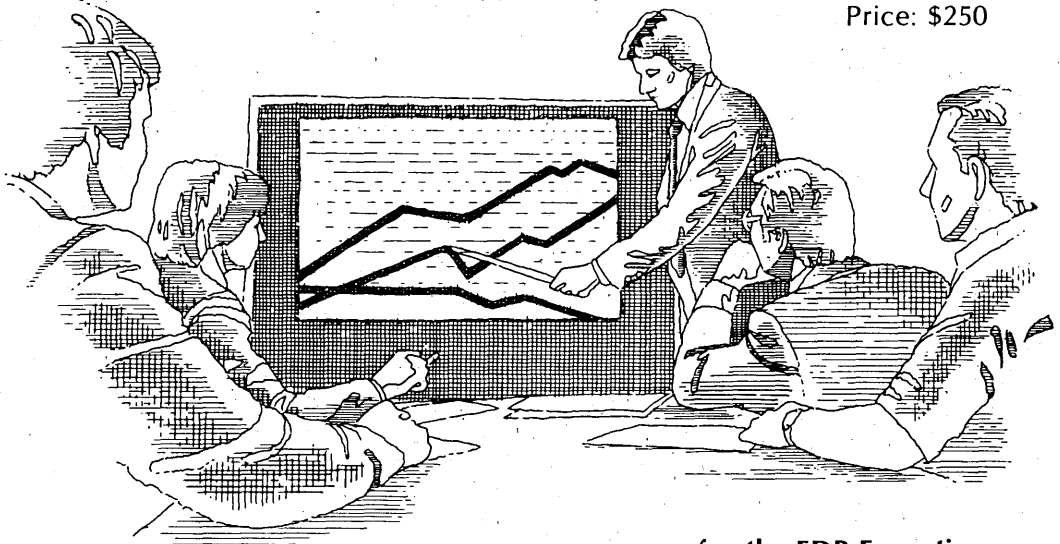
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## NEWS IN PERSPECTIVE

take delivery on a system only to find it didn't work or that a cable or peripheral was missing, would not pay until the system was fully configured and working. Addressing this problem at the plant level, Stern established a vice president of quality—a corporate, not staff level position—who reports directly to the president. Quality has people located at every plant who are empowered to stop production on a product at any point.

Closely linked to that effort is a five-step phase review program under the guidance of the vice president for systems. The phase review process ensures that ev-

### **"Mainframes have become a peripheral like everything else, a peripheral to the system."**

everyone is talking to everyone else—engineering, marketing, public relations, legal, quality, sales, and so on—and that all participating parties sign off on a new product as it moves through its birth channel. The Planning Logistics Group is another control set up under another vice president who is responsible for matching inventory and production to marketing needs. After the product gets out the door, it goes to a staging center where a customer order is assembled and tested. Staging centers are credited with wrestling accounts receivable down from 96 days into the 50-day range, said Blumenthal. At the other end of Blumenthal's cost-cutting strategy is an effort to consolidate Burroughs's 63 plant locations, the result of the previous regime's one-plant-one-product strategy.

Blumenthal disagreed with that management philosophy, preferring instead to "spread the overhead over a larger volume. That is a very major factor that can have immediate impact on margins. We have already closed five or six facilities," reports Blumenthal.

The long-term benefit expected from this flood of new programs and controls, said Stern, is to reduce Burroughs's manufacturing costs and enhance the company's reputation. When Burroughs announces a product, said Stern, the goal is to deliver a new product that will do what Burroughs says it will do and deliver it on time. While the new method forces Burroughs to schedule and live up to shipment dates, it also places more stringent planning requirements on users. "Before," said Easterday, "users were never given an actual delivery date for their shipment."

The B20 was the first product to come through the phase review process, said Stern. When the B20 hit the streets, everything was ready, recalled a user. The product was available when the company said it would be available, and literature, installation aids, and publicity all were rolling out according to schedule. The B4900 and B7900 will be the next tests of the phase

review and manufacturing controls groups' abilities.

Another major shift in manufacturing philosophy has occurred at Burroughs's chip-making facility in Rancho Bernardo, Calif. It's roughly a 500,000 sq. ft. facility employing about 985 people and, according to Stern, "is as fine a facility as you would find most anyplace, if not better." Stern's first order of business was to redirect resources toward custom chips and packaging technology and away from making "vanilla memory chips."

"I said to myself, it is unlikely that on vanilla products we can make them cheaper than what we can buy them for from high-volume makers. I wanted us to concentrate on the value-added areas." As part of this new direction, Stern negotiated what appears to be a unique deal with Intel. Burroughs agreed to give Intel a certain percentage of Burroughs's basic MOS memory requirements and some custom work. In return, Intel gave Burroughs its process technology. "We wanted to design using the Intel process so that when we are ready to integrate our chips with those made outside, it's an easy release," explained Stern.

Having deemphasized volume manufacturing, Stern refocused resources on CAD/CAM design technology, custom designers, and packaging technology. "As more and more system function migrates to the silicon level and certainly to the module [package] level, packaging is where the big leverage in cost/performance will be."

Burroughs also intends to leverage its limited resources by going outside for assistance, a move that signals yet another major change in philosophy. "We have moved away from the notion that Burroughs must do everything itself," said Blumenthal. "The B20 is a good example. While we will not surrender control of our own destiny, we have no hang-ups about going to someone on an oem basis if we feel it is to our benefit to invest our resources in that manner." While the basic kernel for the B20 is the Convergent Technology microcomputer, Burroughs insists on taking a certain amount of credit for the B20. "We adopted their product to our own specifications, our terminal systems, and our own needs," said Blumenthal.

The software side of the house has also felt the effects of the new Burroughs philosophies. The result is two new programs, ISO and APEX, both of which encourage outside vendors to develop Burroughs-compatible software. The ISO program, for independent sales organization, assists those who buy Burroughs hardware in developing their own software and selling systems directly to end users. APEX, for application program exchange, encourages outside vendors to write software for Burroughs machines and either sell it themselves to end users or to convince Burroughs to buy the rights and market the soft-

ware itself. "We recognize the fact, as I think everyone in the business has," observed Conlin, "that there is a growing demand for applications software. It's to the point that people will buy a mainframe just to run a certain application. We also recognize that as much as we want to invest in development of applications, it is impossible to meet user demands."

"The APEX and ISO programs are long overdue," summarized Curtis McAdams, vice president of Burroughs World Corp., Austin, Texas, a cooperative of Burroughs users, and publisher of an independent monthly trade paper for the group. McAdams has noticed that Burroughs is treating these "outsiders" more like employees, inviting them to preview Burroughs's products and plans. In contrast, under the old regime, said McAdams, the NIH (Not Invented Here) syndrome was "pretty strong."

Meanwhile, the areas of hardware and software support and services still have a ways to go, according to some users. Users generally agree that Burroughs's Respond program, an effort to better manage field engineers in order to get the right person with the right expertise to the problem site as soon as possible, is a step in the right direction. "Too often in the past when the field engineer arrived, he wouldn't know enough about the business or wasn't trained on the components that failed," explained Jay Richardson, CUBE director at large who works as director of MIS and dp at Polk Community College, Florida. They needed better training and less turnover, added

### **Memorex appears to be having a positive effect on Burroughs's financial position.**

Richardson, who believes those improvements are being made. Burroughs claims it is investing much more in the training of those in field support and service. As part of its effort to get a handle on turnover and improve its direct contact with users, the company has revamped its employee compensation program.

CUBE president Easterday, however, said he has yet to see any real improvements on the software (service and support) side. "I think these are some of the things Janzen is going to address in his field reorganization," said Easterday.

In May, Carl Janzen, former president and ceo of Nixdorf Computer Corp., replaced Burroughs veteran Fred Meier as vice president and group executive of the domestic marketing organization called Business Machines Group. His charter is to restructure marketing, with the specific goal of emphasizing line-of-business expertise and increasing the amount of direct contact Burroughs people have with their users. Part of his reorganization strategy includes increasing the number of regional



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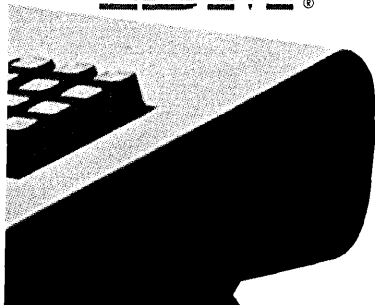
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## NEWS IN PERSPECTIVE

offices from four to eight, while cutting down the number of district offices.

According to sources close to Burroughs, "all the experienced sales managers are pushing papers instead of meeting with customers." Janzen has said he intends to put a stop to that waste of skilled personnel.

—Jan Johnson

## SOFTWARE

# MOVE OVER VISICALC

**A West Coast startup company is hoping to put corporate data entry onto desktop microcomputers.**

The race is on to tap the booming micro-computer market establishing itself within large corporations, where the spread of personal computers can only be described in terms of rabbits: let a couple of them in and soon they're everywhere.

One firm eyeing this potentially lucrative market is Datalex, a San Francisco startup that intends to offer software designed to help large companies move traditional data entry tasks onto the new wave of micros. The company's bold plans are to sell a new concept to America's biggest corporations just at a time when they don't



CAROLYN J. MORRIS: "People used to buy terminals for a specific need, but now the personal machines are coming through the walls in an unorganized fashion."

quite know what to do about the proliferation of desktop machines.

"These microcomputers are already on-site, and we can accommodate that," says Carolyn Morris, president of Datalex. "Acquisition patterns are shifting. People used to buy terminals for a specific need, but now the personal machines are coming through the walls in an unorganized fashion. We can help the dp manager organize them."

Datalex has just begun marketing a pair of software packages that enables several popular brands of personal computers to perform standard data entry functions and transmit batched data to a mainframe or large minicomputer. The company hopes to sell its wares directly to corporations and to OEMs who will build the packages into their corporation-bound systems.

"Software like this gives the data processing manager an excuse to have power over the acquisition of microcomputers," comments Morris. "It can be a political tool within the corporation."

She is referring, of course, to middle management's plethora of microcomputers that are now intended for dedicated tasks but which, Datalex hopes, can easily take care of some corporate dp tasks as well. Datalex's research, according to founder and vice president of R&D John Tibbetts, shows that many firms are intent upon moving data entry functions away from centralized groups and into user departments themselves. Instead of large pools of data entry operators glued to clusters of mini-based terminals, Datalex foresees micros scattered throughout a company, each helping a specific department enter data into the corporate database.

It is not just a question of data entry philosophy, says Tibbetts, who formed Datalex after several years with Tymshare and a brief stint at a small Bay Area systems house. The economics of microcomputers as data entry devices makes them superior to traditional methods, and Datalex's software paves the way for the transition, he says. The thinking is that many micros already installed can be put to further use as part-time data entry machines, each serving a specific corporate group or function.

"A year ago we thought we'd have a tremendous marketing job in front of us," says Morris. "But we found many companies had already decided on off-line data entry. They may not have decided on what hardware to use, but we were very surprised."

Datalex, she claims, has an edge on most hardware vendors in that it understands the data entry business better than they do and will be able to sell its software into organizations still at the stage of deciding which data entry route to go. "We're trying to capture those people already migrating data entry to user departments," says Tibbetts.

## NEWS IN PERSPECTIVE

At present Datalex is but a group of eight persons. It is seeking a round of venture capital financing that will give it about a million dollars to work with and then it

**"We found many companies had already decided on off-line data entry."**

plans to expand its product line to include other generic micro-to-mainframe packages. "We'll add another four people by year-end and some new channels," says Morris.

So far the firm has signed Philips, the Dutch electronics giant, as a European oem. Philips will sell the data entry software on its P2000, a Z80-based personal computer, in Europe and Southeast Asia, says Tibbetts. The packages were originally designed to have table-driven screen handling to facilitate changing languages for different international markets.

"We think the market is huge," says Morris. "This is a very underdeveloped area in terms of available products."

Datalex's first two products are Entrypoint, a data entry package, and Pass-

port, a program that provides a "tailorable communications link" between the micro and mainframe host. Entrypoint is described by Morris as providing screen formatting, editing, and data checking functions similar to those found in traditional data entry systems. Passport transfers Entrypoint files to the host and can receive screen formats and other files from the host. It consists of FORTRAN code running in the micro and the mainframe, according to Tibbetts, who adds that ASCII or binary transmission can be used.

Both programs are designed to run on the UCSD p-System, a programming environment designed by the University of California at San Diego to be portable between various processors. Currently the system is available for machines based on the Intel 8080, 8085, 8086, and 8088, Zilog's Z80 and Z8000, Motorola's 68000, MOS Technology's 6502, TI's 9900, and Digital Equipment's PDP-11.

The single copy prices for Entrypoint and Passport are \$1,000 and \$400, respectively. Discounts are available for high-volume and oem orders.

Soon to come from Datalex is a package designated Transport, which is designed to enable interactive, real-time data transfer between micros and larger computers, according to Tibbetts.

Tibbetts founded the company in 1981 after several years at Noesis, a small Bay Area timesharing and systems integration company. It was there that he developed the ideas for the Datalex products.

President Carolyn J. Morris came from Hewlett-Packard where she was product marketing manager for HP 3000 software.



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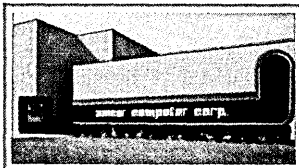
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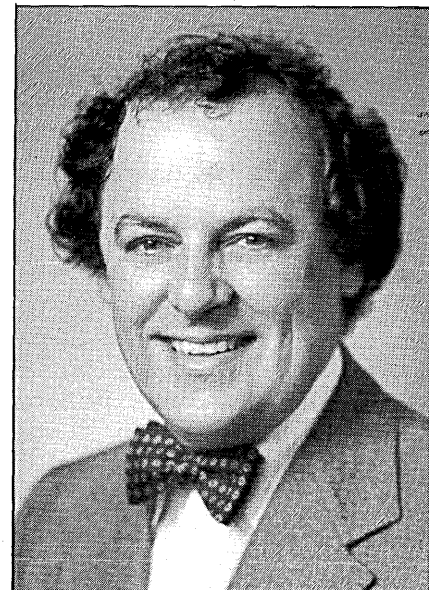
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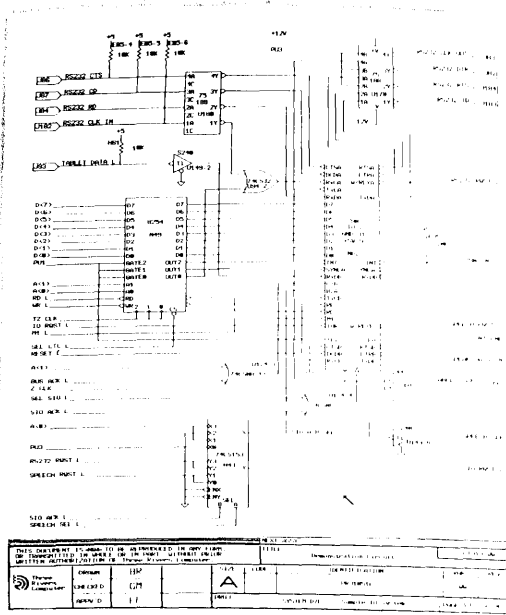


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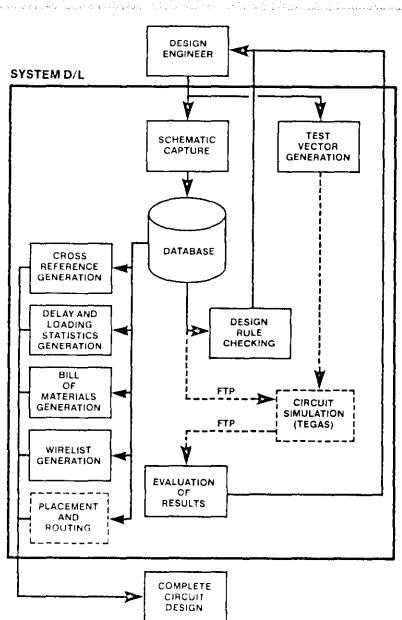
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JOHN J. TIBBETTS claims the economics of microcomputers as data entry devices makes them superior to traditional methods, and that Datalex's software paves the way for the transition.



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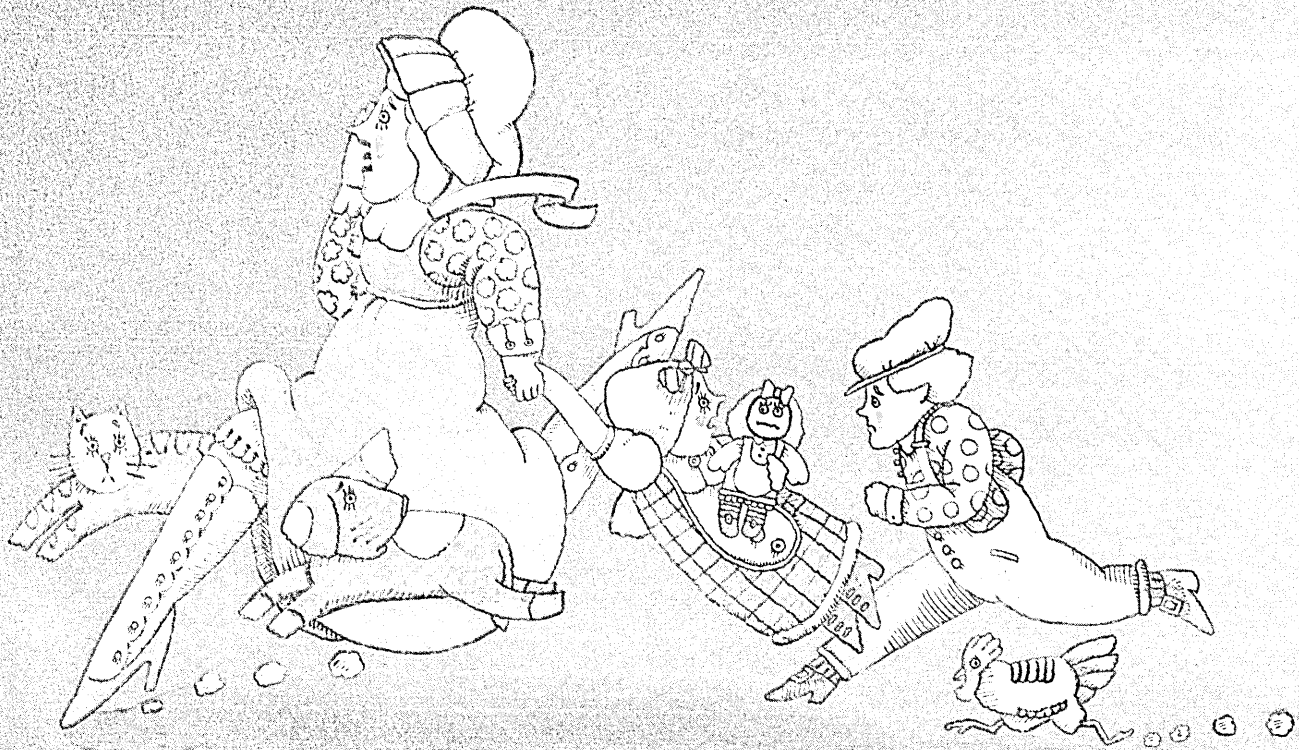
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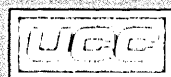
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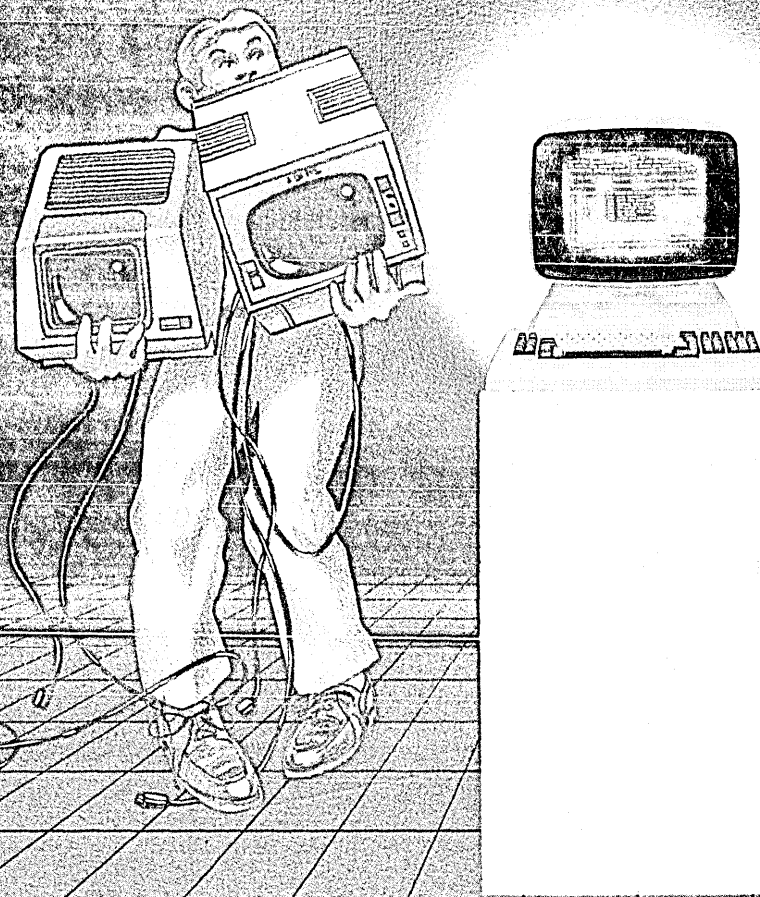


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## Lee Data's universal terminal system design provides access to both 3270 and VT100 applications.

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The Series 400 System incorporates a new hybrid approach to system operation that is simpler and more efficient than

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In addition, a single Lee Data controller provides you 3270 compatibility via either a remote BSC or SNA/SDLC or a local SNA or non-SNA interface, as well as 1 to 16 RS232C ports for your asynchronous application needs. Line speeds available are from 300 to 19,200 BPS.

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## NEWS IN PERSPECTIVE

"We're out to destroy a few myths about the microcomputer," she says. "One of those is that it's only a toy. There's a lot of sophisticated software out there that can help do real work."

Datalex is not, of course, the only vendor eyeing the corporate personal computer market. The potential for big sales has been seen by companies such as Management Science America, which through its Peachtree subsidiary recently introduced a series of micro programs that tie into databases managed by the parent firm's traditional mainframe financial software. And IBM, although not yet making its full plans clear, has provided a software key into the popular Displaywriter, offering for the first time high-level and assembly language tools to enable a full range of data processing functions to be put onto the powerful machine, which till now has been marketed solely as a word processor.

It seems clear that the microcomputer, which has been purchased by managers in droves just so they could run electronic spreadsheets and office football pools on their desks, will eventually be engaged into the corporate data processing net. The risks of allowing informational anarchy are too great for the establishment to let micros go unnoticed.

—John W. Verity

## VOICE RECOGNITION

# IT'S ALL IN HOW IT'S SAID

**Sales of voice response computer systems are expected by some to soar into the billions by the 1990s.**

At a General Electric kitchen range manufacturing plant in Columbia, Md., quality control inspectors wearing lightweight microphones and transmitters verbally call in observed defects on parts moving along on a conveyor belt.

At Abbott Laboratories in Chicago, micropathologists examining slides under a microscope report their findings to a computer by voice. This application requires a voice recognition vocabulary of 425 words. "We expect a whole lot of improved productivity," said Abbott's Rick Bergen.

At Lockheed Missiles & Space Co. in Sunnyvale, Calif., workers bond electronic chips onto substrates while logging, by voice, the material's identity, source, part number, assembly machine number, and other pertinent data.

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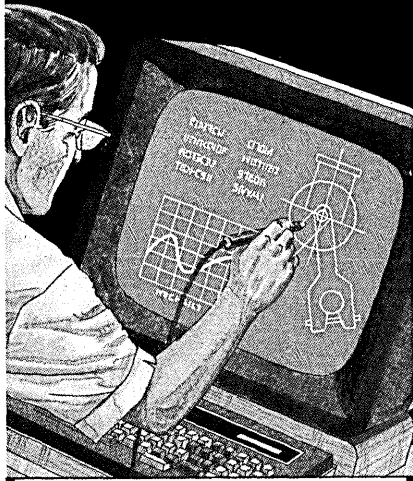


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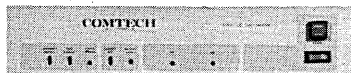
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## NEWS IN PERSPECTIVE

Automatic Data Processing Inc. is using a voice recognition system for estimating damage that results from auto accidents. An estimator, wearing a microphone, simply walks around a car verbalizing what he sees.

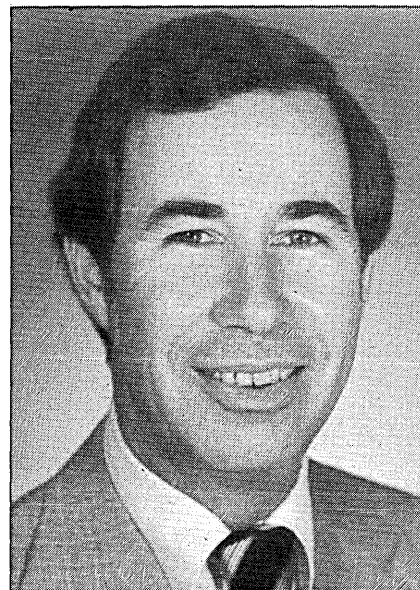
At Mt. Sinai Medical Center of Greater Miami, Fla., a voice recognition system has been incorporated into a Computer Aided Patient Care System. "This has eliminated some potentially dangerous errors," said Bertram Weinstein, director of forward planning for Interstate Electronics Corp., Anaheim, Calif., whose voice response unit the hospital is using.

Interstate's president, Richard A. Foster, predicts that "in less than two years, most computer terminals will offer a voice recognition option."

A study by the New York research firm Frost & Sullivan predicts voice processing "will come to the forefront during the first half of the 1980s in assembly line manufacture, financial transactions, order entry, quality control and inspection, education, and, during the decade's second half, in office systems and consumer products such as appliances."

The research firm cited as persistent problems in voice data entry the high prices, vocabulary limitations, and speed constraint on speech rate. But, says the F&S report, "it is only a matter of years before a sufficiently low-cost, large vocabulary system will appear that can accept continuous speech."

Interstate has been in voice recognition since it introduced a voice operated intelligent terminal in 1978. The company got into the field when it hired a speech recognition research group from McDonnell Douglas and combined it with a product developed by and acquired from a small



RICHARD A. FOSTER: "In less than two years, most computer terminals will offer a voice recognition option."

Reston, Va., firm, Scope Inc. Most of the original development team is still at Interstate, including designer Sam Viglione, who has been doing voice research, starting at Carnegie-Mellon, for some 20 years.

The "persistent" problems cited by F&S have taken their toll at some firms. Centigram Corp., Sunnyvale, Calif., has gotten out of voice recognition though it remains in voice response. Heuristics Inc., also of Sunnyvale, which had a low-cost, 128-word vocabulary voice recognition system, has closed down. Exxon Corp.'s Verbex Division, Bedford, Mass., has cut its staff.

Other companies still in there along with Interstate include Threshold Technology, Delran, N.J.; Scott Instruments, Den-

**"It is only a matter of years before a sufficiently low-cost, large vocabulary system will appear that can accept continuous speech."**

ton, Texas; Votan, Hayward, Calif.; Commodore International and Intel, both in Santa Clara, Calif.; Televideo Systems, Inc., Sunnyvale, Calif.; and Japan's Nippon Electric Co. and Matsushita Electric Industrial Co. Texas Instruments is expected to join them shortly.

How does a typical device recognize speech? The incoming waveform is made up of a number of frequencies. The speech is processed by filter hardware to separate the frequencies into 16 groups. The waveform is sampled repeatedly, typically 50 to 100 times per second. Patterns of frequencies are aligned, which involves determining the beginning and ending of each word and dividing the total speech input into time slices of equal duration.

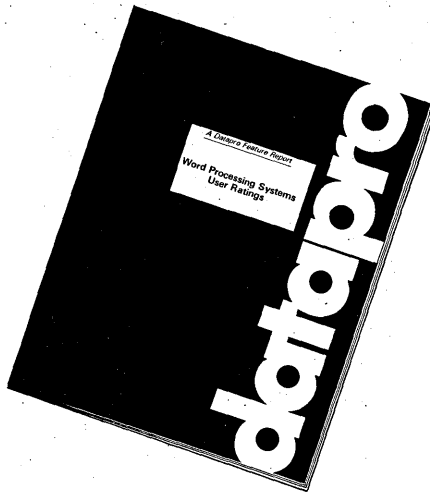
The resulting pattern is compared to a set of memory-stored patterns. These are typically stored during a learning phase that is associated with voice dependent systems—systems trained to the voice of the user. Voice independence is a sought-after goal and such systems do exist. Votan last month introduced a speaker independent product that can recognize the digits zero through nine and eight command words, including yes and no.

"This technology can facilitate the use of a communications system without the need for time-consuming user training," said Votan president Ron Stephens. "It will allow the untrained public to access databases or control equipment quickly and easily, for instance, over the telephone lines." But the vocabulary is still limited.

And there are trade-offs today if one wants speaker independence. Interstate, which claims 99% accuracy for its primary systems, is working on a \$5.50 chip targeted at the consumer marketplace. "It doesn't take as much information out of the signal," said Interstate's Weinstein, "and it's



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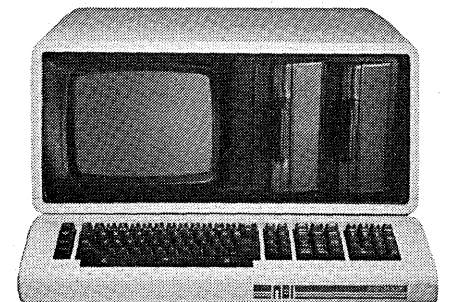
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64 DATAMATION

## NEWS IN PERSPECTIVE

not as accurate, but it is speaker independent." He said Interstate has been talking to a number of toy manufacturers as well as other consumer product firms.

"We'd like to get into the automotive market. We could control everything in a car by voice with the exception of steering, brakes, and the accelerator."

Interstate is promoting a voice recognition users group that so far is made up of Interstate system users. A first meeting was held last June in Chicago and a once-a-year schedule is contemplated. "The credit for the user group has to go to users," said Weinstein. The first meeting was made up of user panels—five companies per panel

### There are trade-offs today if one wants speaker independence.

was typical. The group also is trying to build interchange with related disciplines. This year they encouraged participation by microphone makers. "Nobody has ever made a microphone just for voice data entry," said Weinstein. Next year the users will encourage participation by voice synthesis companies.

Weinstein believes there are two forces at work that make growth of voice recognition inevitable. "One is technology. The costs are coming down. The other thing is that more and more unsophisticated users are finding themselves interacting with computers."

Daniel Fink, corporate strategic staff, Intel Corp., believes human factors are the big key to success in voice recognition. "The biggest determinants are the application software program in the interface process and the vocabulary selection. The program and the vocabulary must be designed to make the operator process as natural as possible. To do this requires an intimate understanding of the operator's actions and normal sequence of events.

"Proper selection of a generic terminology vocabulary for the operator is very important. In 1976, a voice recognition system was being tested by a vocational rehabilitation center for the severely disabled who were being trained as computer programmers. The initial three months of operation were a total failure. Analysis of the system revealed a small but critical human factors mistake. Programming was done on a large timesharing system. To access the system, the operator had to perform, without error, a log-on and password sequence, one character at a time. The recognition unit interface processor sent the recognition result simultaneously to the timeshared computer and to the operator for verification. Thus, any error was sent to the timeshared system before the operator could correct the error. The timesharing system automatically terminated the log-on procedure anytime an error was encoun-

tered. As a result, the beginning operator never successfully logged onto the time-share system. By adding a simple word to the vocabulary, 'log-on,' and modifying the interface program to output the entire sequence of log-on characters in response to this command, the system became an instant success."

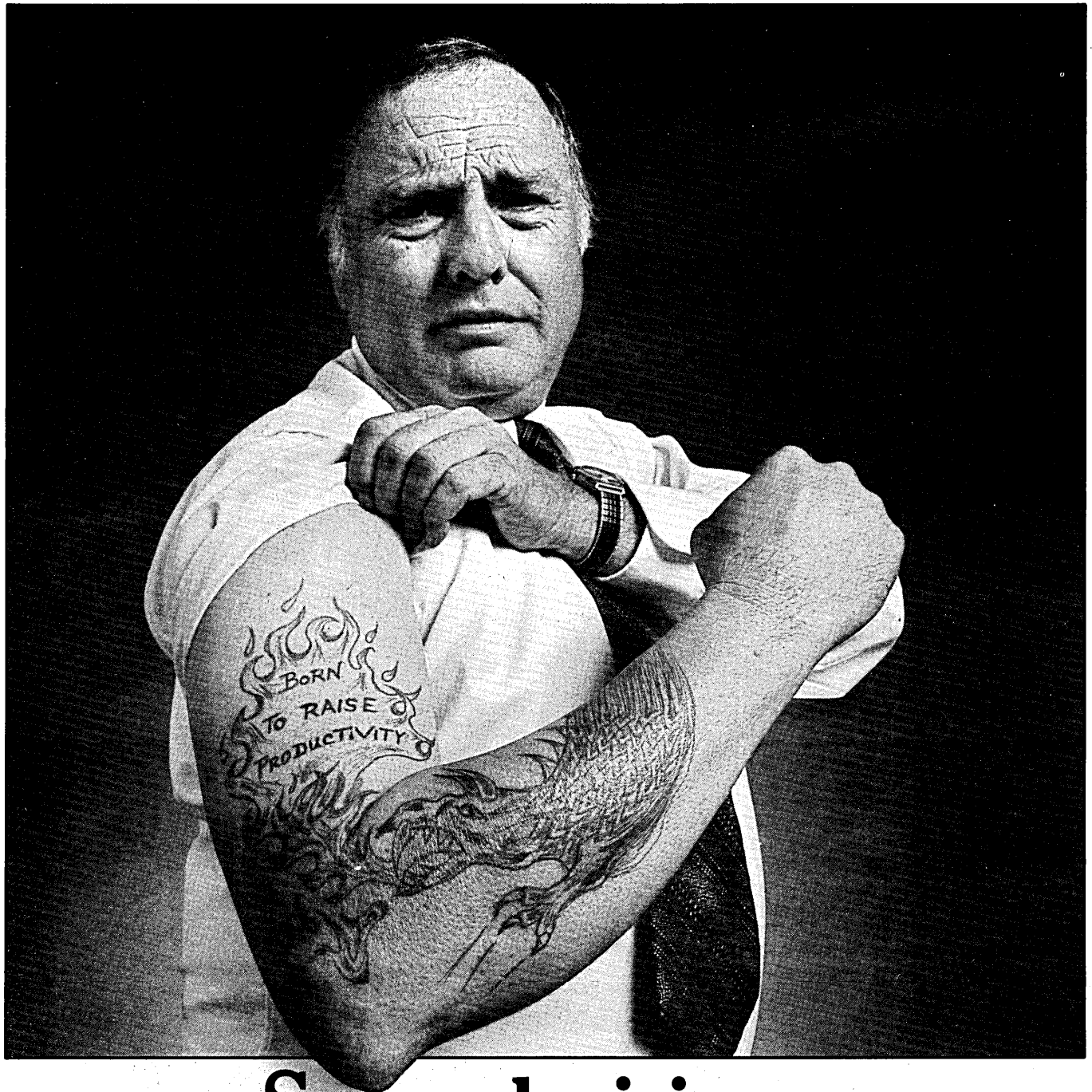
Fink also recalls the case of a major New York bank that began to use a voice recognition system over the telephone to enter financial transactions between the bank and many geographically dispersed credit unions. "The initial application program, in the interface processor, required the operator to train [provide samples of] 42 vocabulary words at one time. After completing the train and going into recognition, the beginning operator then had to conform to all of the complex edit rules for the entry of a valid transaction. This created a high level of new operator tension and resulted in less than satisfactory results. This continued even after several days of practice. By separating the training process from the transaction entry rules and segmenting the 42-word vocabulary into three logical subsets—numbers, transaction types, and edit commands—new operators were successfully enrolled in less than one hour. To enroll, a new operator called the special training program. On the first call, four samples of the digits zero through nine and 'oh' were provided. The system would then automatically go into a recognition mode and ask the operator to say each word. The system then would provide qualitative feedback ('very good,' or 'I may need more samples,' or, 'I had a hard time with that one'). This made the training process a series of short segments, and since no transaction rules had to be followed, the operator was free to concentrate on getting used to

### "Proper selection of a generic terminology vocabulary for the operator is very important."

the concept of talking to a machine. This resulted in an operator who was comfortable with talking to a machine before mastering the complex entry procedures."

Says Stephens of Votan, "While speech technology is still considered to be in its infancy, it is widely recognized for the possibilities it presents to such diverse areas as manufacturing, banking, retailing, and transportation, among others. Industry observers agree that within the next five to 10 years, verbal interaction with computers will be the rule, rather than the exception. The market for computer speech products is expected to reach \$750 million by 1985 alone, with sales soaring into the billions by the 1990s."

Nowhere is voice recognition more needed and wanted than in Japan. Nippon Electric is the leading supplier there, and this month it began marketing what it



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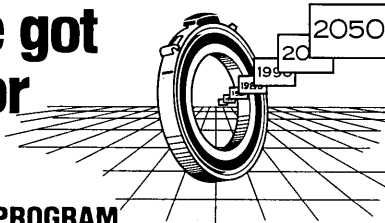
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## NEWS IN PERSPECTIVE

termed a voice recognition breakthrough in that country—a system that, instead of being based on recognition of words, is based on the recognition of single syllables. Such a system could be ideal for the complex Japanese language.

And for new owners of personal computers who don't want to learn programming, Scott Instruments has teamed up with Southwest Microcomputer Systems, U.S. distributors of a British program/application generator called The Last One, to make it possible for a new user to talk out a program.

—Edith Myers

## CONFERENCING

# CALLING ALL SITES

### Infomedia's computer conferencing system, Notepad, is more than electronic mail.

One of the things that brought down the nuclear power-generating plant on Three Mile Island in 1979 was a pressure relief valve that stuck open, allowing water to escape from the core. Unbeknownst to Metropolitan Edison, operators of the plant, a similar valve failure had occurred in 1977 at Toledo Edison's nuclear reactor in Ohio. In the earlier incident, operators terminated the process before damage occurred.

The disaster at Three Mile Island showed how small malfunctions and errors can lead to one large mess. It also showed the necessity for plant operators to maintain constant communications with each other, exchanging technical know-how for use in both daily operations and in crisis management.

For this purpose, the Nuclear Safety Analysis Center in Palo Alto, Calif., has installed a computer conferencing system called Notepad, a successor to the Planet system developed at the Institute for the Future. More than 70 nuclear utilities in the U.S. and seven abroad are participating in this party-line arrangement that on the surface looks like your everyday electronic mail.

As with electronic mail, Notepad users sit at crt terminals to initiate the transmission of a message, which can be to an individual, several people, or everyone on the system. The terminal is also used to receive messages, retrieve any in your queue, and determine whether an addressee has received the message you sent earlier. The system will also inform you of who is currently at his terminal and thus immedi-

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Attributes Req No Display Space	✓	✓		✓	
Line Drawing Character Set	✓				
Screen Tilt	✓	✓			✓
Read Cursor Address	✓		✓	✓	✓
Detachable Keyboard	✓	✓			✓
Separate Function Keys	10	3	1	0	11
Insert/Delete Line Key(s)	✓		✓	✓	✓
Insert/Delete Character Key(s)	✓		✓		✓
Clear EOL/EOP Key(s)	✓		✓		✓
Print Key	✓				✓
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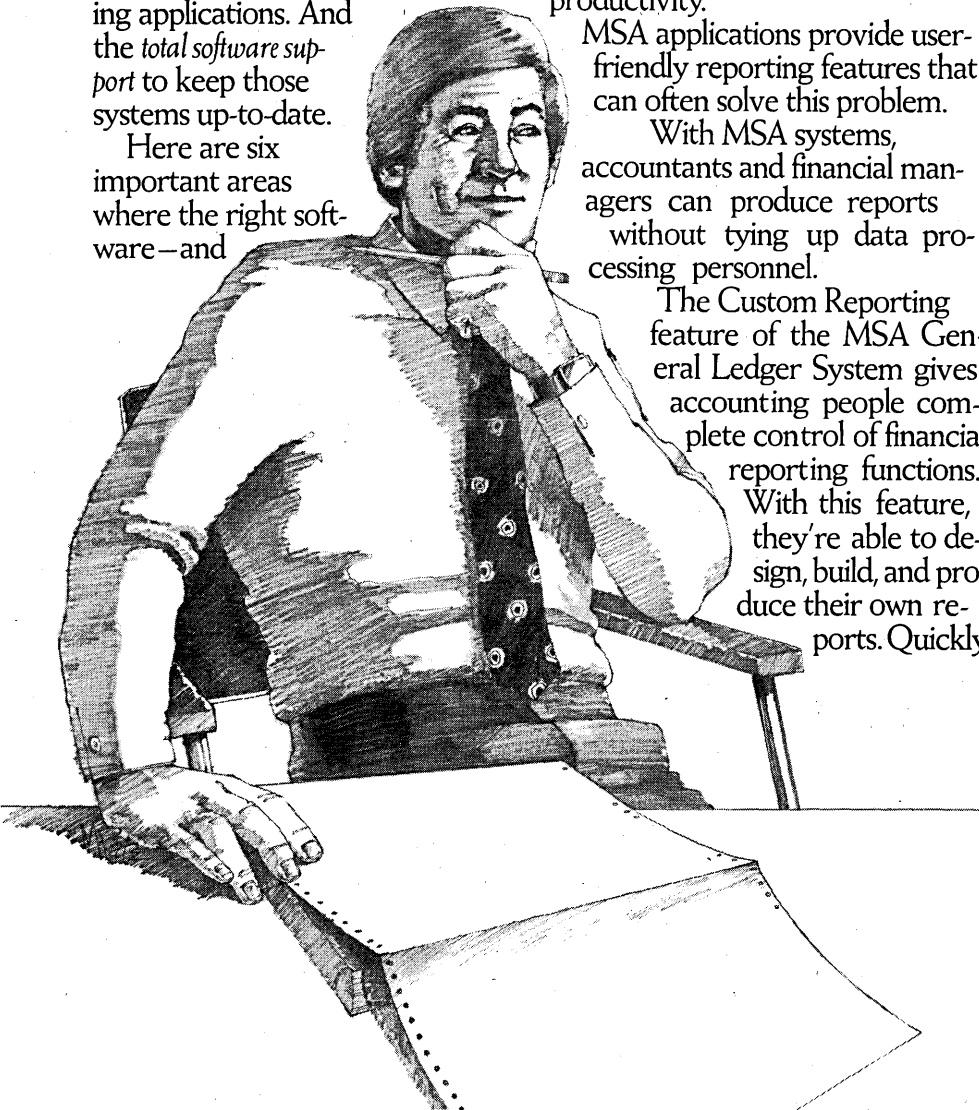
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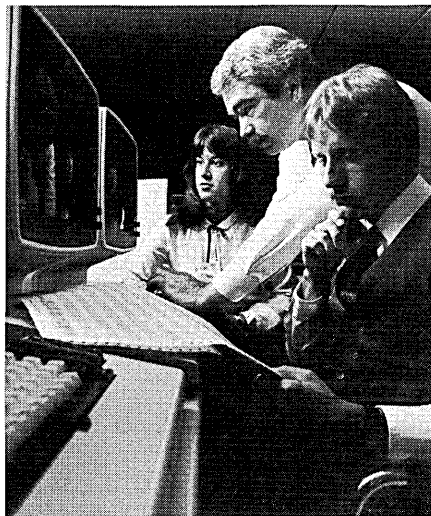
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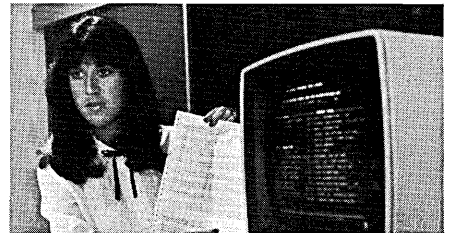
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# MSA

## The Software Company

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## NEWS IN PERSPECTIVE

ately available. Copies of all messages are stored and easily retrievable, summoned according to topic, and databanks can be established with restricted access. The various facilities include the ability for participants to vote on a question and see the final tally.

The Notepad system, a product of Infomedia Corp., San Bruno, Calif., has been under development since 1974 but has been on the market for only two years. Subscribers to the service, comprised of more than 30 companies around the world, reach Infomedia's computer over the Tymnet net-

### Subscribers to the service reach Infomedia's computer over the Tymnet network.

work. The software, available for in-house installation as well, originally ran only on a DEC System 20 but now also runs on any IBM and compatible mainframes under the VM/SP operating system.

Infomedia chairman Jacques Vallee, formerly with the Institute for the Future, was instrumental in the development of the conferencing system. He explains that it was designed for use by a diverse audience that includes technical experts, planners, analysts, forecasters, and decision-makers—those who know their jobs but have no interest in computers or in reading a users' manual. "So we had to come up with something that was adapted to the needs of the executive," he says. Adds John Hoiness, the firm's marketing vp, it also is more than electronic mail—which he describes as an improvement on the post office—and it provides some filing and retrieval capabilities. "But electronic mail doesn't really facilitate group communication. And that's what Notepad does."

Notepad's forerunner, Planet, was used by NASA's Ames Research Center to help manage the Communications Technology Satellite (CTS) program. It linked experimenters and participants in Canada and the U.S., such as those involved in Satellite Business Systems's so-called Project Prelude, an experimental use of the CTS that led to SBS's current commercial offering.

The value of the conferencing system as a communications medium linking the participants is recalled by Ames's Bradford Gibbs, a communications specialist. He describes operational problems they encountered with the spacecraft, possibly inconveniencing those who had experiments scheduled that day or the next, and says, "The only way we could get information disseminated was to warn the participants of the problem and inform them that progress in resolving the problem would be transmitted to them on an hourly basis." They were told to check in with the Planet system every hour if they wished to be apprised of what was going on. "There's no other way you could really do that," he

adds, except to establish a conference phone call, but that would require that everyone be glued to the phone; with Notepad, of course, participants can merely check in and learn the latest status. The convenience is obvious to anyone who has to phone from New York to California and try to catch people at their desks.

Spanning even more time zones is Bechtel Corp., which is involved in a gold and copper mining project in Papua, New Guinea, a joint venture with Morrison-Knudsen International. To help coordinate project logistics, Notepad is used to link project members wherever they might be at whatever time of day. The engineering, procurement, and construction are being managed from Melbourne, Australia, but there's also a field office in Port Moresby, a day's travel away, plus the job site that's two days away, not to speak of project and personnel decisions being made in San Francisco.

NASA's Brad Gibbs found no problem with the fact that participants have to be able to type; people at least learn to hunt and peck, he says. But problems do show up in people's inability to spell and their difficulties in expressing themselves on paper. With Notepad, for example, all past communications are archived, forming an audit trail of sorts, and so users approach the keyboard with the idea that "whatever I say has got to be right," Gibbs explains. But he is also quick to admit that because such systems promote "the exchange of information between remotely located people at their convenience," there can be plenty of noncrucial notes being passed.

—Edward K. Yasaki

## ARTIFICIAL INTELLIGENCE

# LEARNING TO LISP

**Xerox Corp. is coming on strong in the Lisp computer market as artificial intelligence makes its commercial debut.**

With artificial intelligence finding its way out of the lab and into the commercial marketplace, a small but potentially lucrative hardware market is heating up. Vendors offering machines that run Lisp, the language of choice for AI research, are battling it out for control of what may be a future goldmine.

While only half a dozen or so manufacturers are involved so far, the pricing and marketing action the Lisp market has seen in recent months indicates that much is at stake. The market is only about two years old and yet has seen more than its share of

price cutting and product introductions as AI-related systems move off drawing boards and into applications at end-user sites.

At the center of the battle is Xerox, the copier firm, which has for years been using Lisp for advanced computer science research and development. It is one of the few firms, observers say, that has kept abreast of AI and Lisp-related research, the great majority of which has taken place at universities. The company last year brought to market an internally developed Lisp machine and has been eagerly seeking business ever since. Meanwhile, several startups have entered the market, and more Lisp implementations are expected shortly from traditional computer makers.

The marketing battle is taking place in the midst of a wrenching upheaval currently shaking the long-obscure AI community. What was once "a small, lovable field," as one researcher puts it, has been transformed practically overnight by the lure of venture capital. Artificial intelli-

### The marketing battle is taking place during an upheaval in the AI community, prompted by the scent of venture capital.

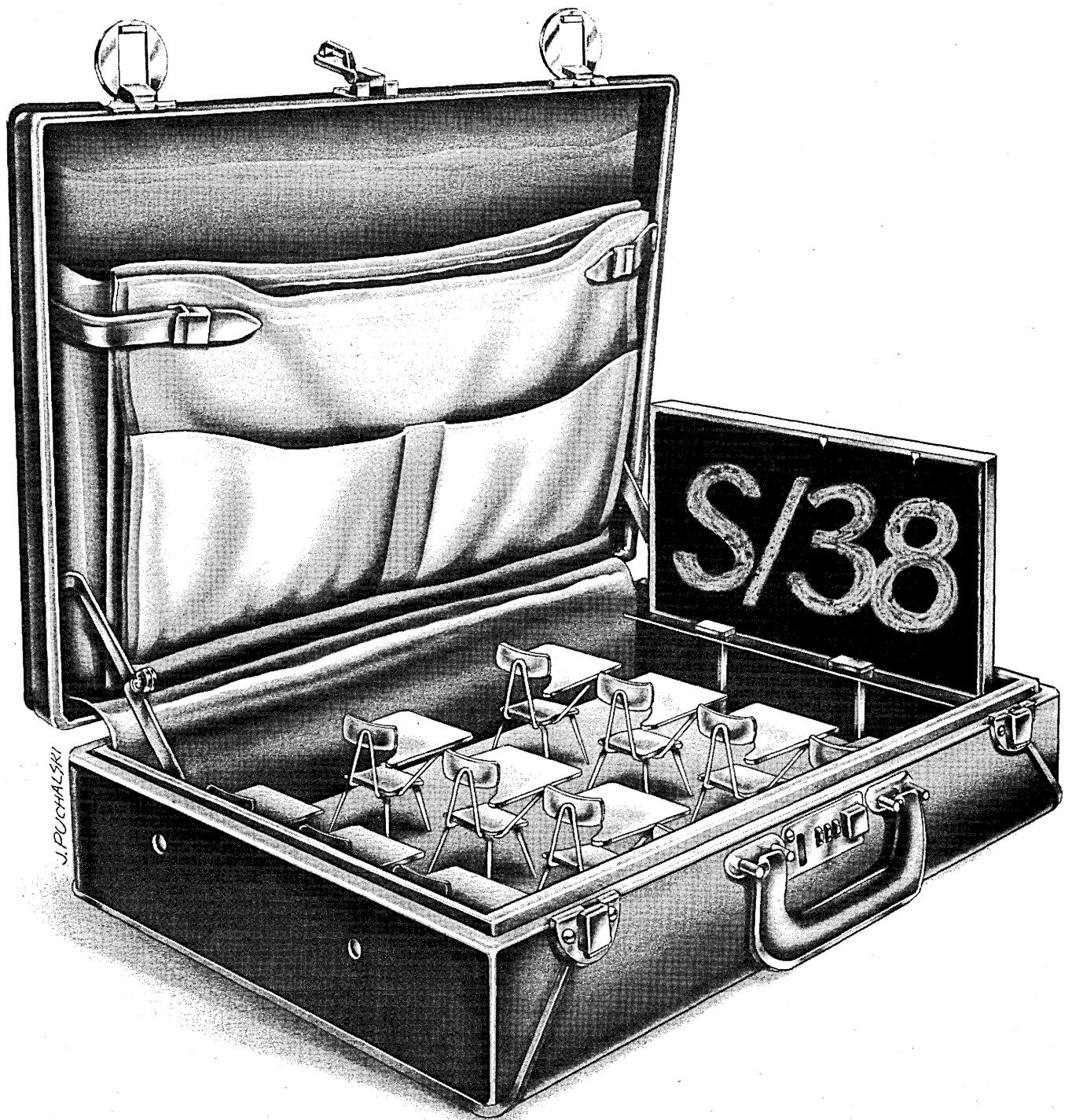
gence ideas and theories, long gestated in the womb of academia, are the basis for a host of new companies. The situation, say observers, is quite similar to that which occurred in the biotechnology field a few years ago. Many of the same concerns about pure vs. applied research have arisen.

Whether it was the software or the hardware, the ideas or the money, the chicken or the egg, no one is sure, but the emergence of AI as a commercial enterprise seems to have coincided with the introduction of cost-effective Lisp machines a year or so ago. A gathering of the AI clan in Pittsburgh last August, a national conference of the American Association of Artificial Intelligence (AAAI), provided a microcosmic view of the field and its players, commercial and academic.

Until 1981 there were no pure Lisp machines on the market. In the '70s, and perhaps even now, most AI work was done on Digital Equipment timesharing machines, the DECSYSTEM-10 and 20. Most research was performed under contract to the Defense Department's Advanced Research Projects Agency (ARPA), famous for its Arpanet national network. Little of the work, however, was perceived as having any immediate commercial application.

One exception to that rule was R&D work under way at Xerox Corp., a company that, although out of the mainframe market as of 1975, fully intended to score big in the imminent office automation market. The firm saw direct payoffs in keeping up with AI research at universities in order to handle classified government contracts, to develop





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## NEWS IN PERSPECTIVE

future office systems products, and to give its designers access to the best of all programming tools. Towards that end its Palo Alto Research Center (PARC) grew to be one of the most advanced AI labs in the world, a community of workers equipped with costly personal Lisp machines and workstations all tied into shared filing and printing resources over the firm's Ethernet. PARC offers, one worker there says, a "personal machine AI culture."

That culture was hidden for the most part from the peering eyes of competing manufacturers and the AI community as a whole, but in August 1980, Xerox opened the door a crack. Attendees at the AAAI con-

### **Symbolics is already planning a new machine for next year that will deliver better price/performance.**

ference being held at nearby Stanford that year were invited to an open house at PARC. The way Xerox tells it, what they saw so whet their appetites for personal as opposed to timeshared Lisp hardware that Xerox was beseeched by ARPA officials to make at least one of its machines, the Dolphin, commercially available. In mid-1981, the Dolphin surfaced as the \$59,000 Xerox 1100 "scientific information processor."

At about the same time, two spin-offs from Massachusetts Institute of Technology licensed an MIT-designed Lisp machine and began selling hardware head-to-head with Xerox. Symbolics, Inc. of Cambridge, Mass., came out with the LM-2 at \$99,000, and Lisp Machine, Inc., Culver City, Calif., introduced the Lisp Machine for \$80,000 (Sept. '81, p. 105).

Just in time for the Pittsburgh meeting this year, Xerox unveiled two more Lisp machines, the \$30,000 Dandelion/1108 and the \$179,000 Dorado/1132. It also dropped the price of its original Dolphin 23% to \$45,000. Clearly, Xerox intended to grab a piece of the expanding AI pie.

"It was surprising to see Xerox in such force at the conference," says Dr. Scott Fahlman of Carnegie-Mellon University in Pittsburgh. "For a long time they had kept their expertise in-house. Their marketing was done halfheartedly at first and they had been teasing people with Smalltalk. They seem determined to capture some of the market."

Dr. Fahlman has observed the AI hardware market for several years and at the Pittsburgh conference presented a tutorial jointly with Dr. Guy Steele on AI languages and programming.

What Xerox is trying to sell is not just systems but a collection of hardware and software that make up the "PARC culture," according to Robert "Bo" Bomeisler, marketing manager for the 1100 series processors at the company's Electro-

### **AI IN THE DP SHOP**

Although the last few months have seen several so-called "expert systems" become viable commercial products, their focus has typically been on such high-risk, high-payoff applications as oil exploration and well drilling, and treatment of diseased hearts. In Dallas, however, a small startup firm is hoping to provide an expert system to help the large data processing shop.

Computer\*Thought Corp., founded by a pair of ex-Texas Instruments researchers, plans to bring to market a system that will help train interactively the many programmers in industry who need to learn the Defense Department's new Ada language. Backed by General Electric and other venture capital firms, Computer\*Thought expects to deliver its first systems in mid-1983 after a few months of prototyping.

"Ada uses a different methodology of programming," says Mark Miller, vice president of the firm. "You can't use textbooks to learn it very well. You need hands-on experience."

Miller, along with president Truman D. Blocker III and others in the company, have developed a system that mimics the teaching methods of an Ada expert. "We've built in the expertise that a consultant would have," explains Miller. "The system looks at a student's program, evaluates his approach, and then suggests remedies to problems and difficulties. It will be much more insightful than a conventional CAI [computer aided instruction] system."

Aiming to teach both beginning programmers and those already steeped in FORTRAN, Pascal, and similar languages, the expert system will provide immediate graphical feedback to students as to their handling of such Ada concepts as functions, subprocedures, recursion, data types, multitasking, and packages, according to Miller. Using artificial intelligence techniques, the system will be able to infer a student's underlying misconceptions, he adds.

Miller states that the system will be able to adapt itself to the student's level of understanding, offering a series of "plan templates" whose slots are filled from selections off menus.

Thus, high-level programming

Optical Systems division in Pasadena, Calif. The company is stressing its range of three personal Lisp machines, the range of printers and file servers, and, of course, the much-publicized Ethernet local network. A

### **"Xerox seems determined to capture some of the market."**

major part of the firm's offering appears to be its Interlisp-D software, which is claimed to provide a unique programming environment with a robust set of software tools.

Additionally, the company is emphasizing that it offers the lowest priced

ideas are emphasized and the system itself generates most code. Advanced students are free to enter code directly, but those with less experience will be able to explore Ada constructs and gain knowledge from the system's handholding facilities.

Miller suggests that the system, written in LISP and designed to run on Digital Equipment VAX computers, will in 10 hours a week for three weeks get a student through the equivalent of a one-semester Ada programming course.

In order to provide advanced graphics and support the style of interaction proposed, Computer\*Thought is supplying users with a specially designed terminal that will attach to VAX processors. Miller says that aerospace companies, which already run many VAX machines, will be among the first to receive the system for beta testing. Other versions of the software may be designed for LISP machines offered by Symbolics, LISP Machine Inc., and Xerox, he adds. About half a dozen students could be accommodated concurrently on a VAX-11/750, he states.

Computer\*Thought thinks that much of the knowledge underlying programming skill is language-independent so that the Ada "programmer's apprentice" system could be adapted to teach other languages. Potential products include a Smalltalk Tutor for future Apple personal computers and a LOGO tutor for M68000-based systems.

The company's employee roster numbers only 10 right now, but with system deliveries beginning next year, growth is anticipated. Another round of financing is planned next year, according to Miller, who says the firm has received "a lot of investor interest."

"What's so exciting about this is that hardware prices will come down in the next few years and we'll be able to have all sorts of expert education systems for much less cost." Miller notes tentatively that the Ada package will probably sell next year for about \$35,000 a terminal, including graphics hardware and software, but no LISP processor.

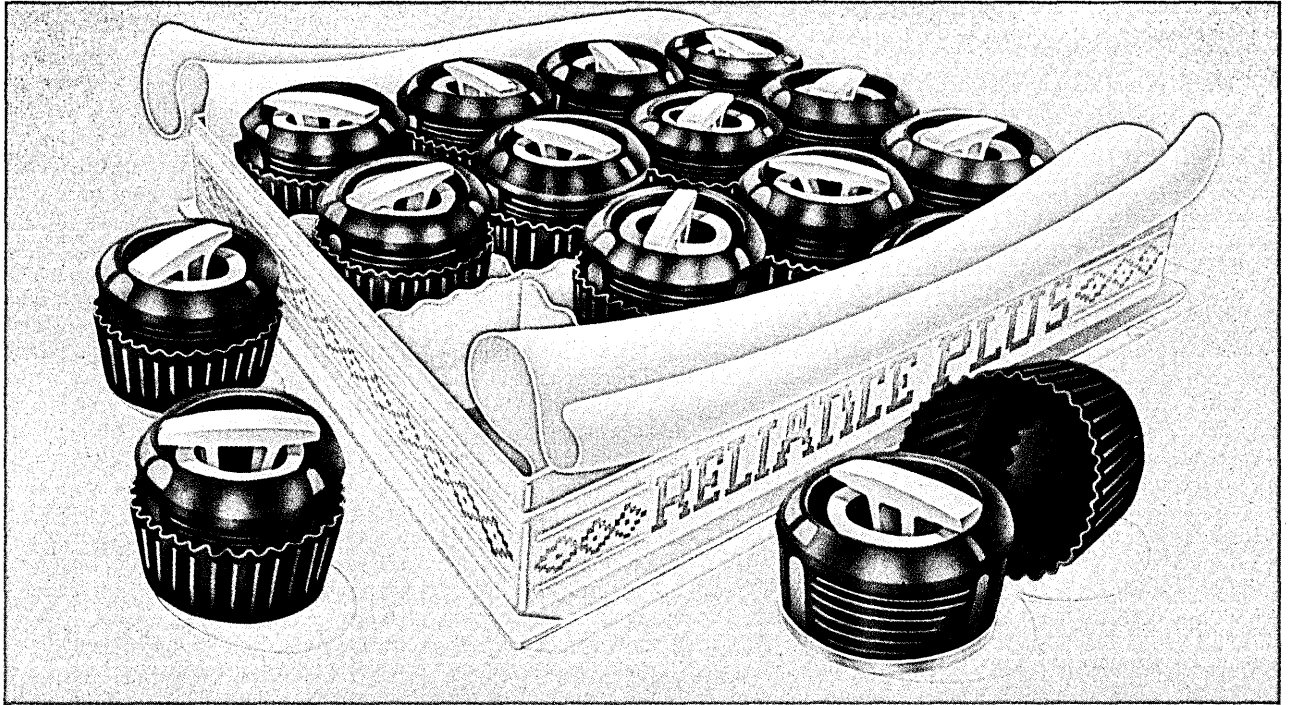
—J.W.V.

LISP machine, the Dandelion, which lends itself to being a so-called delivery vehicle, or processor that AI systems integrators could sell to end users with proprietary software on-board.

"We are definitely after the delivery market," says Bomeisler. "We've got the machines with which to develop the applications. Once you're ready with an application, we're ready with a low-cost delivery vehicle."

While Xerox is also trying to sell the Dandelion as a personal development system, competitors question whether the system has enough power and memory space

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## NEWS IN PERSPECTIVE

to handle large Lisp programs often encountered in AI research. They claim the machine may turn out to be a good teaching tool but that it is probably too small to handle full-blown AI programming.

Bomeisler disagrees, saying, "The \$30,000 price is a breakpoint where people can get off timesharing and get their own personal machine. Most labs can't afford a \$60,000 machine, but they can afford one for \$30,000."

The Xerox executive declines to specify how many Lisp machines Xerox has

### **Lisp Machine, Inc. has teamed up with Western Digital to deliver Lambda, a scientific workstation that also runs Unix.**

built, but says about 200 systems have been shipped, most of them within Xerox itself.

Even if Xerox turns out to be not exactly on the mark with its Dandelion machine, it is clear that the future delivery market is where the big money will be for AI hardware manufacturers. Once VLSI technology is applied and machines can be made cheaper, and once AI applications are "folded down" to reside on smaller processors, market growth is expected to boom. Already some oil companies are considering placing well-drilling expert systems on each offshore drilling platform they construct, according to Jerrold Kaplan, vice president of business development at Teknowledge, a Palo Alto company that designs such systems.

As Kaplan points out, generic AI packages will help move the AI market. Currently, each expert system developed is a custom job. Once so-called knowledge engineering is better understood, Kaplan explains, enough commonality between expert systems will be discovered that off-the-shelf, generally applicable systems will become available and boost the use of AI technology. "Generic systems are perhaps two years away," he says. "They'll certainly be here in five years."

Russell Noftsker, president of Symbolics, claims his company has delivered some 40 of its original LM-2 machines, each of which, he says, is about two and a half times as powerful as the Xerox Dolphin. "The vast majority of shipments are going to commercial customers," he states, pointing to Fairchild Industries, Hewlett-Packard, and Bolt Beranek and Newman as a few he can disclose.

"Our strategy is to start with high-performance hardware and software and drive prices down with new technology," the Symbolics executive comments. "Xerox is starting with a low-performance machine and working up."

Noftsker claims the firm's new 3600 system, introduced formally earlier this year, has eight to 10 times the power of

the Dolphin, but at \$78,500 sells for about 73% more. In fact, he notes, educational discounts will bring the 3600's price down to the \$60,000 range, compared to the Dolphin's \$45,000. First 3600 shipments are scheduled for this fall, the executive says, claiming that 135 booked orders for the machine had been received by mid-August. He states that leads on 5,000 more machines have been identified.

At \$60,000 a clip, that's big money, although Symbolics would seem to have a long way to go to book that many orders.

"We're moving the price down rapidly," he adds. "Next spring we'll introduce a reduced price version of the 3600 aimed at OEMs. It will offer similar performance to the 3600."

The firm, he says, is investigating gate-array technology for future Lisp hardware implementations. A machine selling for less than \$40,000 in quantity and offering at least twice the performance of the 3600 appears feasible, he claims. Also, the firm plans to make FORTRAN as well as Lisp available on its machine in order to wean customers away from VAX-class and main-frame systems.

Lisp Machine, Inc.'s Morris J. "Mache" Creeger, director of marketing, says the company in August had delivered 19 machines and that a total of 25 had been ordered. An upgraded system, the Lambda, will be introduced in mid-October in conjunction with Western Digital of Irvine, Calif. Western is to introduce the so-called Nu machine, a scientific workstation based on the Motorola 68000 and running the Unix operating system. LMI will supply a four-board Lisp processor that will plug into the Nu system, permitting customers to run both Unix and Lisp concurrently.

"The biggest market for Lisp is not necessarily AI, but systems programming," says Creeger. "It provides lots of support software, probably more so than any other language available today. For instance, storage allocation is implicit in the language, in all implementations."

It is just that sort of programming environment that Xerox hopes it will sell to, other than AI-oriented customers. The company thinks its Smalltalk-80 language, a so-called object-oriented language, will appeal to systems designers of all sorts who need to prototype systems quickly and repeatedly. Smalltalk and a conceptually similar language from Symbolics called Flavors are said to lend themselves to "evolutionary programming," where a program's design changes during the course of its construction. This differs from traditional languages such as FORTRAN, where the structure of a program is decided upon early in the design process and adhered to throughout.

That type of programming—where, as Carnegie-Mellon's Fahlman puts it, "you go inside an environment and play around with your program"—may turn out

to be a big market for Lisp and its linguistic relatives. Some people, such as Fahlman, think the language will be a big hit in educational circles: "Lisp will blow BASIC away on personal computers in a few years."

So far, according to Fahlman and others, Xerox's Smalltalk-80 and Interlisp-D packages provide the most complete of the new programming environments, but Symbolics and other competitors will catch up in a year or two. "If you want to do AI research right now, Xerox is your only choice. They've got a full set of tools and the machines to go with them."

Conspicuously absent from the AI conference was Pittsburgh's own Three Rivers Computer. The firm, according to sources close to the situation, has run into troubles developing an upgraded version of its Perq personal computer, which includes an increased microcode memory to handle Lisp. The memory, sources said, was delivered almost a year late to Carnegie-Mellon, which is implementing Lisp on the so-called Perq-1A. There was no chance of demonstrating a competent LISP by mid-August, so the company pulled out of the show at the last minute, university sources said.

Frank Williams, vice president of sales at Three Rivers, said that contrary to reports circulating at the conference, the company is not dropping out of the Lisp market. In fact, he stated, Lisp on the Perq will be shown at the Las Vegas Comdex show in November and delivered to its first customer, Schlumberger, in mid-December. He added that Three Rivers expects to do well with Lisp in the Japanese market, where it already has a "strong foothold in the Pascal market."

—John W. Verity

## VIDEOTEX

# BIG PLANS AT DASD

**Two years after it was bought by Cap Gemini Sogeti, this small Milwaukee firm finds itself thrust into the forefront of the videotex market.**

On the surface DASD Corp., (pronounced daz-dee) founded in 1974 in Milwaukee, Wis., appears to be a fairly typical software house providing contract programmers, program designers, consultants, data processing services, and training and conversion software products. It employs some 550 people in 26 branches across the country and posted \$23 million in revenues in 1981. But step a little closer.

In January of 1981, DASD was sold by its founder, Martin Marshall, to Paris-

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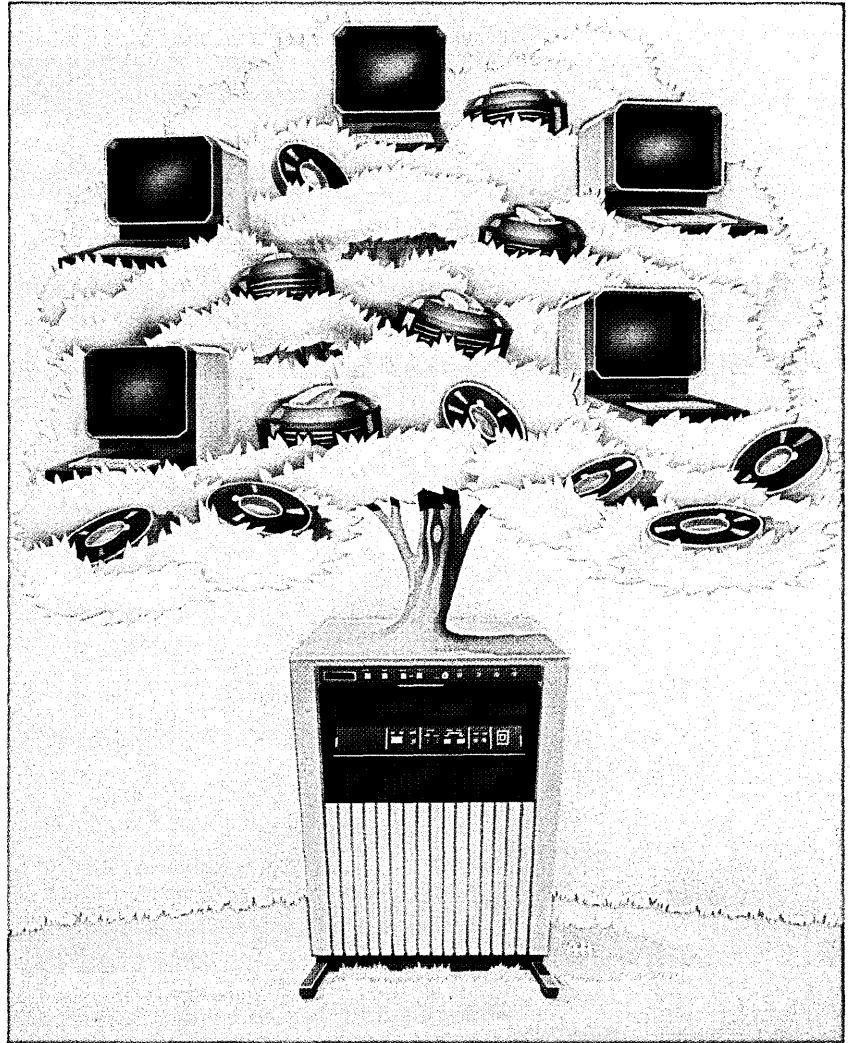
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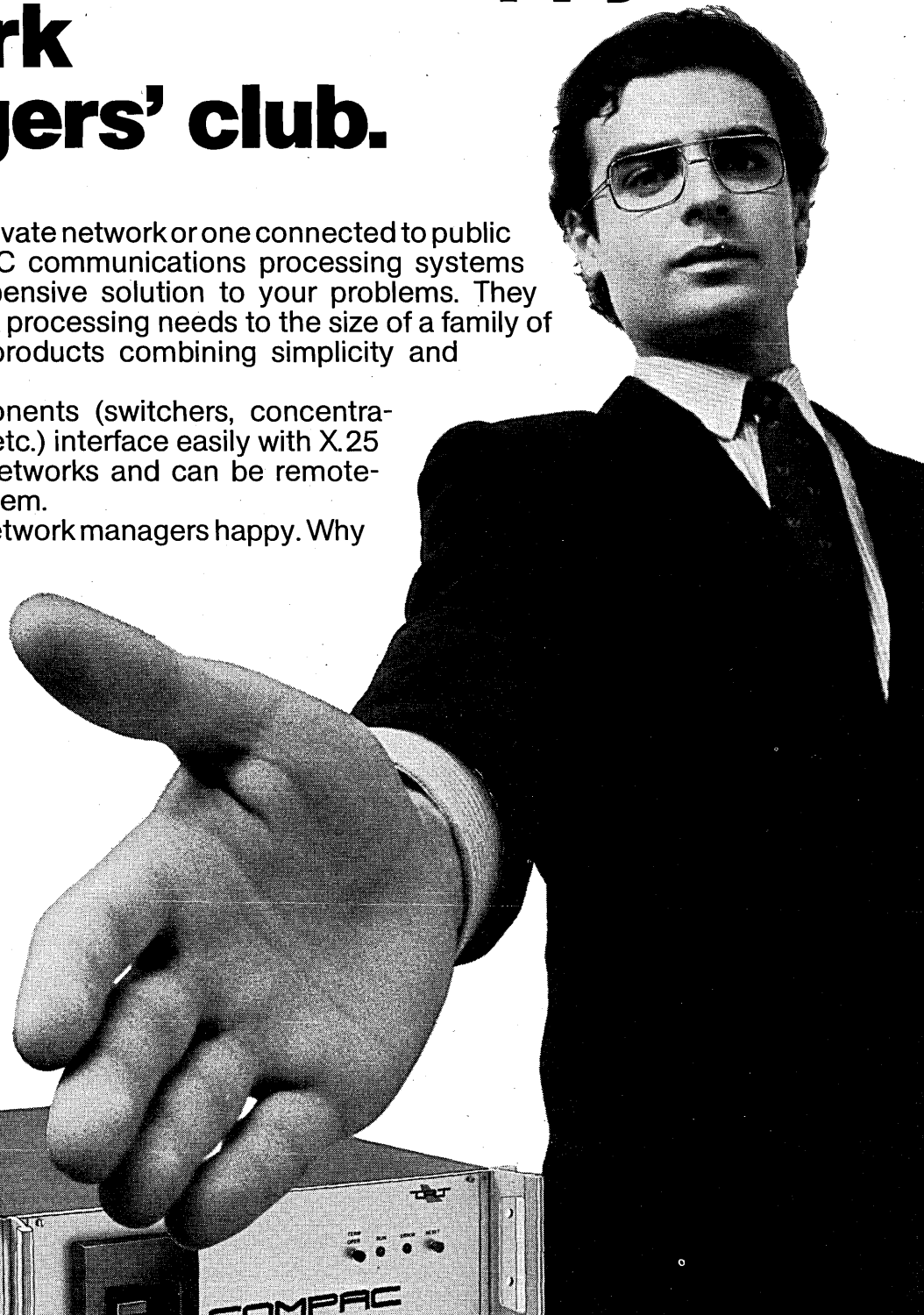
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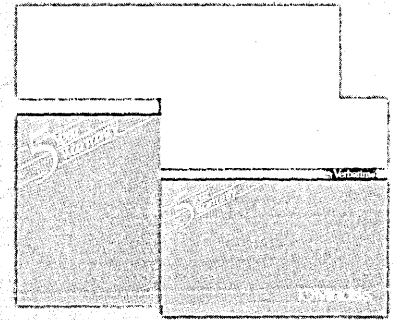
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based Cap Gemini Sogeti, Europe's largest computer software company and one of the prime contractors for France's national videotex project, Télétel. Cap Gemini bought a fully staffed U.S. distribution network for its videotex technology and a well-developed contract programming business that operates very similar to the way Cap Gemini operates in Europe. DASD suddenly became the U.S. base for an aggressive international software concern and found itself thrust into the forefront of the emerging U.S. videotex market.

This once-unassuming company has become a key part in some big plans. "My dream is to see Cap Gemini become the IBM of the professional services world," confided DASD president Michel Berty, who is also chairman of the Cap Gemini Sogeti U.S.A. group. His five-year goal is to see one half of Cap Gemini's revenues coming from the U.S. operation. And by the end of 1985 he expects the U.S. group to do \$100 million. Since taking over as DASD president in April, Berty has already expanded

### Paris-based Cap Gemini wants to become "the IBM of the professional services world."

the company's reach into New York. In June DASD agreed to purchase Spiridellis & Associates Inc., a professional software services company with a "strong presence", according to Berty, in New York and New Jersey.

With the Spiridellis acquisition under his belt, Berty said he has no more plans for big acquisitions, preferring instead to focus attention on developing new methodologies inside and to "spend a lot of money on videotex."

"When I arrived at DASD in September [1981] I was optimistic—and still am—about the possibilities of the videotex system," begins Berty, when asked about his marketing plans for videotex. "I was successful with the electronic directory project [in France], and to try to do the same thing with the U.S. was one of my dreams." Berty's approach has been methodical: first, to establish a foothold, DASD and its network of branch offices were purchased; second, the DASD marketing and technical people were trained on videotex.

But DASD has already run into a little competition in the U.S. videotex market, and from none other than a French-based company. Competitor Steria was the other prime contractor in the Télétel Project and has now inked a videotex pact with First Bank Systems Inc. of Minneapolis. The bank announced the first fully transactional videotex system in this country.

Wayne Miller, First Bank assistant vice president of marketing and videotex project director, recalled that his company became interested in videotex after watching the progress of the French experiment.

They chose to go with Steria, he said, because "we weren't interested in an electronic directory system"—the project Cap Gemini was most closely associated with—and Steria was offering a software package called Videopac. "It's a multifaceted piece of software," said Miller, "offering customer interfaces, network control, database management, electronic mail, interfaces to page creation devices, and the ability to gateway to other information providers." First Bank has one DPS6 that handles the Videopack software and all data communications and up to 100 on-line customers at one time.

"Cap Gemini didn't have much to offer in terms of a marketable product back in September 1981, when First Bank started negotiations with Steria," countered Dominique Mathieu, videotex project manager for DASD. "CGS didn't become ready until January 1982, about the time I joined the company," said Mathieu. Now, Steria's VideoPac and Cap Gemini's Multitel differ "only in terms of a few features," claimed Mathieu, adding that Multitel actually is more powerful in its ability to build a screen and update databases on-line. All the ingredients for a French marketing war on U.S. soil appeared to be present between Steria and Cap Gemini/DASD. But before a bloodbath could begin, the companies went into negotiations to find how they could work together instead of against each other. Although an agreement has yet to be reached, said Hubert Stijms, a Cap Gemini executive in France who is participating in the negotiations, he gives it a 61% chance that by the end of the year a joint effort will be struck and the two companies will be sharing capital and expertise.

Even if Steria becomes an ally instead of a foe, Cap Gemini faces numerous other competitors, such as Honeywell, Telidon, and teletex. Members of the Cap Gemini camp believe Honeywell is still shopping and has not yet formulated a marketing approach. Looking ahead to the day when Honeywell may turn into a competitor, Mathieu said Cap Gemini is taking steps to reduce its dependency on Honeywell or any other hardware vendor. It is developing its own hardware, a turnkey microcomputer-based videotex system. Currently, all of the French videotex companies have built their systems to run on minicomputers, specifically the DPS6, the IBM Series 1, and the Evolution, a minicomputer marketed primarily in Europe.

As for Telidon, Mathieu does not consider it a threat. "It is almost out of the market. It is good in teletex and has nice pages to display, but on the videotex side, the terminals are too expensive." Many of those with Cap Gemini feel that the pattern is not clear yet as to which technology, teletex or videotex, will move more quickly into the home. Each has its advantages. Teletex is good for moving a little information

to a mass market, say industry watchers, while videotex is good for moving a lot of information to a small market. Its limitations are the number of access ports per system and the cost of the home terminal device. Whereas on the teletex side, the recent advances at RCA and IIT in digital tv—microprocessor equipped televisions that will be capable of processing audio and video signals in the form of digital data—seem to have tipped the scales toward that technology. At least for the moment, Cap Gemini executive Stijms agrees: "The tv market appears to be emerging more rapidly than the videotex terminal." Meanwhile, nine months ago the Japanese demonstrated a fast scan video screen that runs on a twisted pair.

Which way to turn? It's like going out to buy a local area network or a microcomputer. There are lots of technologies offering similar functions, so you go with what is best suited to the specific problem at hand. Said Dan Parman, advanced technology consultant with DASD, "I don't think it's a matter of a right solution for everyone, but rather you have to look at the customer and meet his specific needs. Cap Gemini is in a position to make recommendations on these issues to our clients."

—Jan Johnson

## MICROCOMPUTERS

# ATTACK OF THE MICRO

**In the last decade, dp managers have had their hands full trying to cope with the microcomputer's invasion into business.**

More than 10 years have passed since computing power was first compressed onto a chip. In that time span, microcomputers have changed the face of the computer industry like nothing else before them, and dp managers and others are still reeling from the effects.

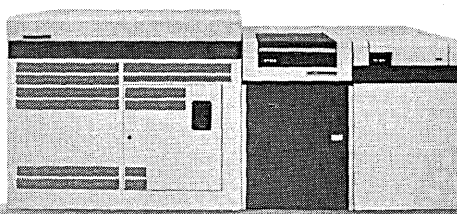
Who would have thought 10 years ago that a computer system could be bought from Sears, Roebuck and Co.? Yet by the end of this year Sears expects to have some 50 business systems centers open throughout the country where customers can buy such things as small computer systems, software, electronic typewriters, word processors, printers, desktop copiers, calculators, and dictation and communications equipment.

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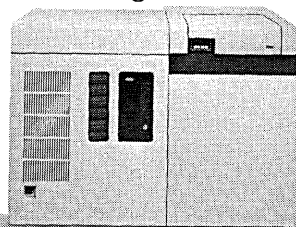
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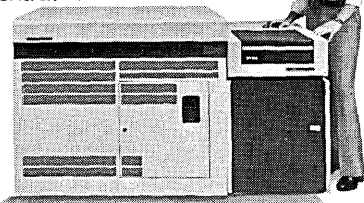
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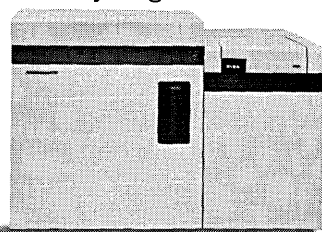
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chief executive officer of Sears' Merchandise Group, says the centers are designed to meet the needs of small businesses and business professionals.

Sears isn't setting a trend, it's following one. The first computer store was opened in Santa Monica, Calif., in 1975 and they've been popping up like mushrooms all over the country ever since.

Projections for the microcomputer abound. Advanced Resources Development Inc. (ARD), a Medfield, Mass., market research firm, has published a study that concludes that the market for microcomputer-based management workstations will grow at 40% a year through 1986 and that more than \$4.5 billion worth will be shipped between now and 1986.

A survey by International Resource Development, Inc., Norwalk, Conn., indicates that 283,000 personal computers are being used by white collar employees in their daily work and that this number will swell to 394,050 by 1985.

Jack Nilles, senior research associate for the Center for Futures Research at the University of Southern California's Graduate School of Business Administration, says, "Some 8 million personal computers will be on office desks by 1990, profoundly affecting both the internal workings of organizations and their relationships with customers."

### **The market for microcomputer-based management workstations will grow at 40% a year through 1986, and more than \$4.5 billion worth will be shipped between now and 1986.**

Nilles is directing a study to examine the future effects of microcomputers on business. The study will review existing corporate information management policies and examine alternative organizational futures involving microcomputers. In addition, it will identify the critical features required of the technologies presented to the users.

"The key for both groups—users and producers—is the development of better foresight in planning over the next 20 years," Nilles says. He has lined up several organizations that agree with him and that are sponsoring the USC study, including AT&T, ARA Transportation, Fairchild Semiconductors, Northrup Corp., Safeco Corp., Xerox Corp., and the U.S. Postal Service.

Among the problems to be investigated by the study are deciding how to allocate information processing resources among micros, minis, and mainframes; assessing the effects of the use of micros on organizational communications and organizational stability; and maintaining compatibility among corporate micros and between micros and larger computers. These issues have already rewritten the job descriptions of dp managers, who have been caught try-

ing to retain control of the databases and information processing in their companies while individuals and departments are spending their own money to acquire personal computers.

The dp manager's job has expanded to include maintaining compatibility among the various computer systems that he may find in his corporation. Several strategies have been tried. Some companies try to maintain control by centralizing the purchase of personal computers under their dp departments. Others are issuing lists of ap-

### **The trend is clearly toward user departments having their own micros rather than being tied into the dp department.**

proved models. Still others are negotiating bulk discounts from manufacturers of computers.

"We try to limit the number [of vendors] passively," says Robert A. Reffelt, vice president of Chase Manhattan Bank. He explains that the bank has many Apples and is dealing with IBM in discount qualities. "That may in itself encourage users to stay within those guidelines" of preferred vendors.

At McGraw-Hill, compatibility is encouraged through an arrangement with a bookstore in the company's New York building that sells Apples at 20% discount to McGraw-Hill employees. At Time Inc., the dp department buys micros and then does them out to users. "We buy, they [users] pay," says Time's Sam Moss. Metropolitan Life employs a similar strategy of buying and deploying small computers.

The trend is clearly toward user departments having their own micros rather than being tied into the dp department. Researchers at the Diebold Group Inc. have estimated that for every dollar spent by a corporate dp department, an additional 30¢ is spent directly by various user departments, up from only 7¢ in 1975.

The result is a new attitude in the user departments. Now, says Chase Manhattan's Reffelt, "It's a fairly local cost decision. It's like buying a piece of office equipment." A study by the Palo Alto, Calif., research firm Input indicates that from \$10 billion to \$12 billion of computer power is being acquired each year by user departments without the authorization of the corporate dp departments.

Input surveyed some 30 big dp users and found they are trying to establish new forms of control over user department expenditures for computing power. These include technical standards for equipment, software, data communications, and development tasks; budgetary financial controls; independent reviews of expenditures and requests for computing capabilities; and consulting and marketing services provided by dp departments to departments that want

to buy their own equipment.

These controls and services are designed to retain centralized control of computing expenditures—if not control of databases and usage—while allowing individual departments some leeway in choosing appropriate models and giving them the opportunity to rely on the dp department for help. These dp departments want to reverse users' perceptions that they are pro-centralization. Time's Moss says he wants his dp department to be seen as "helpful and responsive. People believed we were against micros or saw them as highly suspect, to say the least."

But while this view was prevalent at Time, Moss says, people chose a wide variety of microcomputers, including "anything I can think of and some I haven't even heard of since." These choices were not always made wisely, however. "Micros picked were often underqualified or overqualified for the task, and many of the users were the same," says Moss.

Jim Bandy of Softech Microsystems, San Diego, who nurtured the use of microcomputers among executives at Texas Instruments, his former employer, believes dp managers should see microcomputers "as a logical next step, a tool" and should at all costs "avoid paternalism."

Walter F. Bauer, chairman and president of Informatics General Corp., Woodland Hills, Calif., takes this attitude to an extreme. "The personal computer sweeping the United States and other countries today takes the computer out of the hands of the priesthood of professionals in information processing."

To what extent this happens in large companies is largely up to the individual professional. Most have learned not to fight micros, and they cannot afford to ignore them, so the dp managers try with different degrees of success to control and coordinate the use of micros.

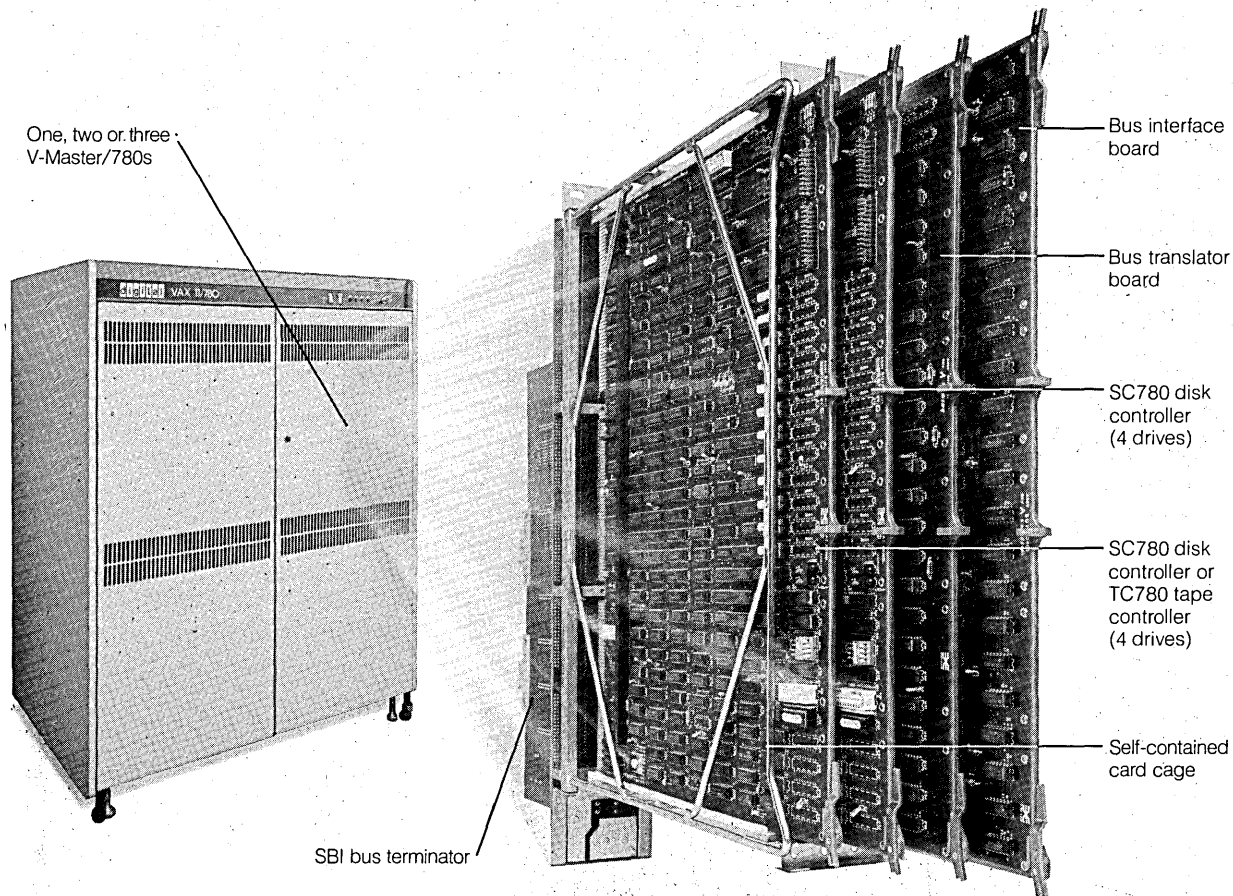
How well they do this also varies, but the biggest problem seems to be documentation. Richard L. Van Kirk, with Ar-

### **"Micros picked [by users] were often underqualified or overqualified for the task, and many of the users were the same."**

thur Young & Co. in Los Angeles, sees documentation as "more a matter of education than control. Too many users of micros just aren't doing any documentation." If a manager who stores information on a computer leaves his company, his data can leave with him because no one else would know how to gain access to his files, he notes.

McGraw-Hill has attacked this problem with what it calls Micro Computer Resource Centers. McGraw-Hill exec Jon Diesem says that a typical center is

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1982-06-01	RENT	25.00	125.00
1982-06-15	PAYROLL	50.00	175.00
1982-07-01	RENT	25.00	150.00
1982-07-15	PAYROLL	50.00	200.00
1982-08-01	RENT	25.00	175.00
1982-08-15	PAYROLL	50.00	225.00
1982-09-01	RENT	25.00	200.00
1982-09-15	PAYROLL	50.00	250.00
1982-10-01	RENT	25.00	225.00
1982-10-15	PAYROLL	50.00	275.00
1982-11-01	RENT	25.00	250.00
1982-11-15	PAYROLL	50.00	300.00
1982-12-31	CLOSING BALANCE		300.00

**Branch & Mortgage Association Limited**  
 Ontario Data Processing

Branch & Mortgage Association Limited is pleased to announce the opening of its new office at 1000 Sheppard Avenue East, Toronto, Ontario. This new office will provide a full range of services to our clients, including mortgage services, branch services, and more. We are committed to providing the highest quality of service to our clients and to maintaining the highest standards of integrity and honesty in all our dealings.

Branch & Mortgage Association Limited is a member of the Canadian Mortgage Association and the Ontario Mortgage Association. We are also a member of the Canadian Branch Association and the Ontario Branch Association. We are committed to providing the highest quality of service to our clients and to maintaining the highest standards of integrity and honesty in all our dealings.

DATE	DESCRIPTION	AMOUNT	BALANCE
1981-12-31	OPENING BALANCE	100.00	100.00
1982-01-15	PAYROLL	50.00	50.00
1982-02-01	RENT	25.00	25.00
1982-02-15	PAYROLL	50.00	75.00
1982-03-01	RENT	25.00	50.00
1982-03-15	PAYROLL	50.00	100.00
1982-04-01	RENT	25.00	75.00
1982-04-15	PAYROLL	50.00	125.00
1982-05-01	RENT	25.00	100.00
1982-05-15	PAYROLL	50.00	150.00
1982-06-01	RENT	25.00	125.00
1982-06-15	PAYROLL	50.00	175.00
1982-07-01	RENT	25.00	150.00
1982-07-15	PAYROLL	50.00	200.00
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1982-08-15	PAYROLL	50.00	225.00
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1982-01-15	PAYROLL	50.00	50.00
1982-02-01	RENT	25.00	25.00
1982-02-15	PAYROLL	50.00	75.00
1982-03-01	RENT	25.00	50.00
1982-03-15	PAYROLL	50.00	100.00
1982-04-01	RENT	25.00	75.00
1982-04-15	PAYROLL	50.00	125.00
1982-05-01	RENT	25.00	100.00
1982-05-15	PAYROLL	50.00	150.00
1982-06-01	RENT	25.00	125.00
1982-06-15	PAYROLL	50.00	175.00
1982-07-01	RENT	25.00	150.00
1982-07-15	PAYROLL	50.00	200.00
1982-08-01	RENT	25.00	175.00
1982-08-15	PAYROLL	50.00	225.00
1982-09-01	RENT	25.00	200.00
1982-09-15	PAYROLL	50.00	250.00
1982-10-01	RENT	25.00	225.00
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**Reminder**

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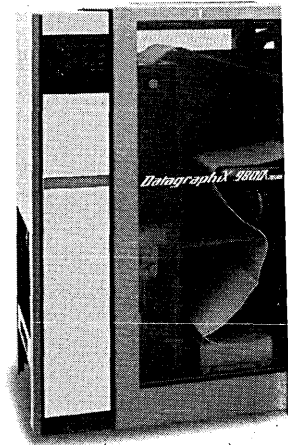
**Reminder**

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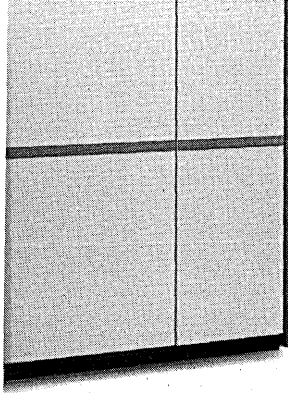
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CIRCLE 77 ON READER CARD

## NEWS IN PERSPECTIVE

equipped with an Apple II Plus with 48K memory. Each center is the responsibility of someone within the user division. "It is enclosed but accessible. It is the site of an ongoing literacy program and the focal point for informal sharing," Diesem says. "Central support is there to help. Our approach is nontechnical."

Time Inc. has established a new data center that was designed to be more an information center than a production center. It contains a "help desk" where users can go for problem solving. Chase Manhattan has also tried to centralize by creating a user group for its micro users. The bank's intention is to minimize duplication of ef-

### Most dp managers see the best use of microcomputers by executives to be in the area of decision support.

fort, says Reffelt. "If someone does something good and useful, we will know." Finally, Citicorp offers a training course for potential users for which the diploma is a micro.

While they are learning to accept the use of micros in business, most dp professionals still have pretty firm ideas of what should not be done with these little computers—things like creating data (which should be central, they say), processing il-

legal transactions, writing legal reports, and keeping electronic files for sensitive transactions.

Dp managers see the best use of micros by executives to be in the area of decision support. "The key to management effectiveness is the decision-making capability and efficient use of time," says Chase Manhattan's Reffelt.

Van Kirk of Arthur Young says the advent of micros has moved the data processing function from solely transactional to transactional and decision support.

But there's the old "garbage in, garbage out" fear, and dp managers worry that their personal computer-using executives might not use the correct data and assumptions in making their decisions. To this end managers tend to want to control the data either by central storage or by what McGraw-Hill's Diesem calls "insistence on adherence to data standards."

However they're doing it, dp managers are doing it outside their traditional realm—the dp department. They're being pulled into the mainstream of their companies. And they're doing much more. They're creating a whole generation of computer literates who will one day make their way into the business world.

There are an estimated 100,000 computers in this country's schools today, roughly one for every 400 students. This

number is constantly growing as micro makers vie with one another in attempts to give away their wares. If the Technology Education Act of 1982 (June, p. 66) becomes law, the giveaway trend could accelerate drastically.

It isn't only schools that are exposing kids to computers. There are the computer games found in a range of places from

### Dp managers are creating a whole generation of computer literates who will one day make their way into the business world.

grocery stores to pizza parlors, the computer stores, and even computer camps, which seem to be sprouting up everywhere.

Softsel Computer Products, Inc., a two-year-old Los Angeles firm that distributes software for microcomputers, says it gets four to eight unsolicited software products through the mail each day, many of them from kids. The company sells one product created by a 15-year-old who gets \$100,000 per year in royalties.

But perhaps the real clincher comes from the Boy Scouts of America. The youth organization now offers a computer merit badge. The Girl Scouts, less serious about it, offer their badge in "computer fun."

—Edith Myers

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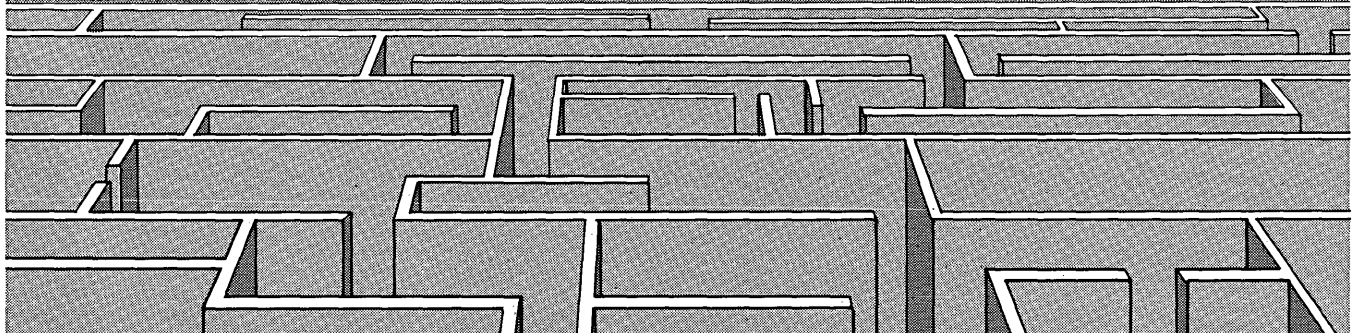
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# Dear Ma: Racal-Vadic's new Error Controller can reduce data communications errors to one in every 37 years!

## 99.999% Accuracy

Data transmission over a 2400 bps telephone line can result in an error a minute. Install Racal-Vadic's VA845E and VA855E controllers and errors can be reduced to as few as one every 37 years. Incredible, Ma, but true.

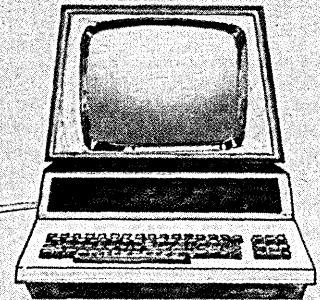
You see, Racal-Vadic's error controllers detect better than 99.999% of all possible errors and correct them with an Automatic Request for Retransmission of Data (ARQ).

## Completely Transparent

These low-cost, full-duplex units operate at 110, 300, 1200, and 2400 bps. They are completely transparent so users do not have to alter operating procedures or software. The error controllers pass 7-bit codes with or without parity, and 8-bit codes as well. Just plug them into your system using a standard RS232C interface and begin error-free communications.

## Remote and Central-Computer Site Packaging

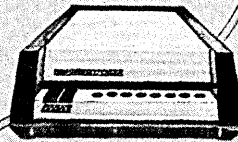
The VA845E is designed for central-computer site use. It's packaged on a single PC board that fits inside Racal-Vadic's 7-inch-high rack-mount chassis. For remote-terminal use, specify model VA855E with its new, super-low profile, desk-top cabinet.



DATA TERMINAL



VA855E ERROR CONTROLLER



DATA MODEM:  
110 BPS, 300 BPS,  
1200 BPS, OR 2400 BPS

## Handles Sustained Outages

The buffer is large enough to handle sustained outages of longer than 8 seconds at 2400 bps and more than 200 seconds at 110 bps. The error controller has a flow-control signal that stops data transmission when the buffer is nearly full, thus preventing overflow.

## Collects Statistical Data, Too

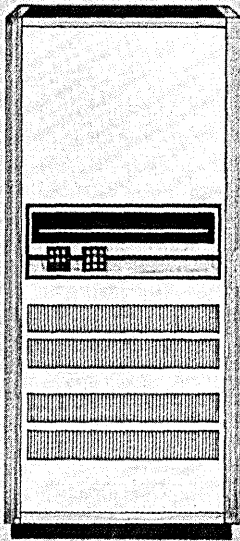
And look, Ma... Racal-Vadic's error controllers can generate important statistics including: number of connections, elapsed hours of connect time, number of characters transmitted and received, and number of errors detected by the local and distant error controller.

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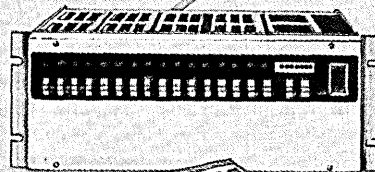
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VA845E ERROR CONTROLLER OCCUPIES ONE CARD SLOT IN RACAL-VADIC'S VA1680 MULTIPLE DATA SET CHASSIS

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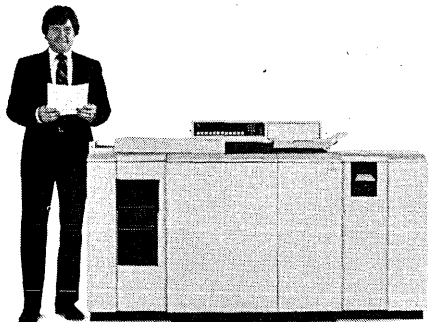
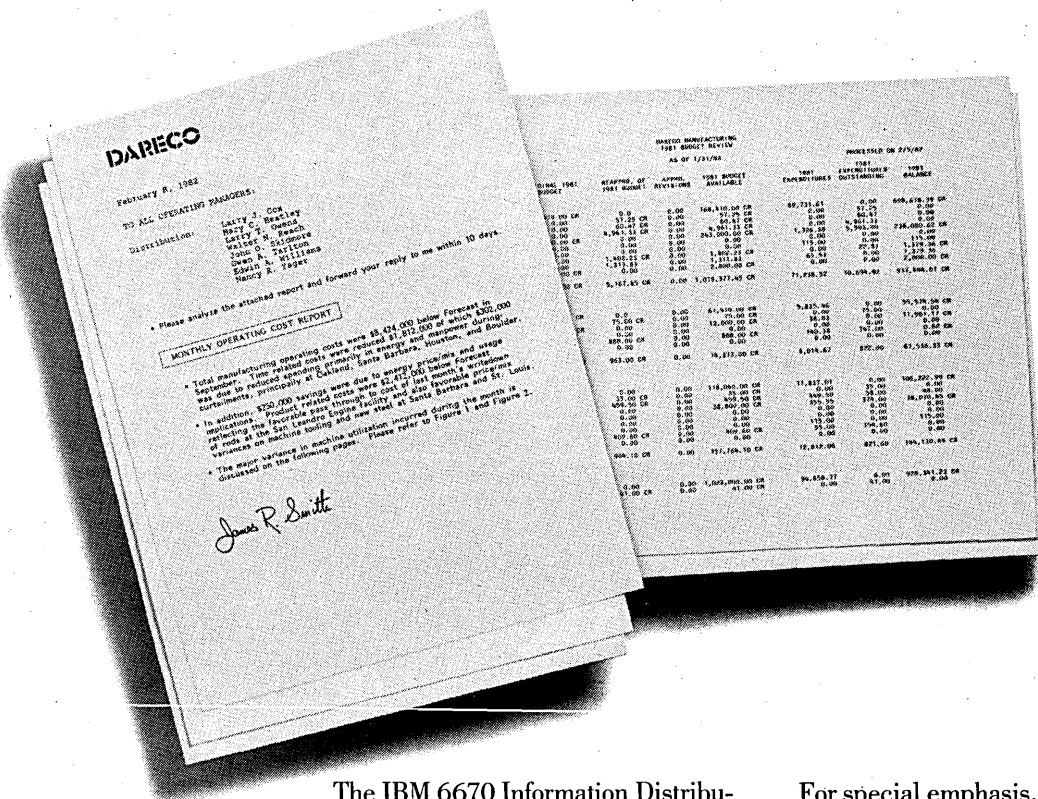
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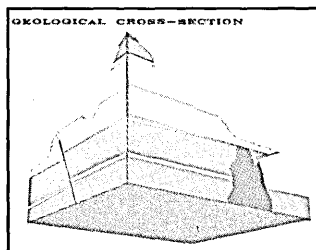
Precision Visuals' software tools are standardized, user-callable subroutine packages. They will save you hundreds of programming hours by forming the foundation of your graphics application programs. Their unique distributed-network design provides extraordinary economy of computer resources.

### 2. Versatility

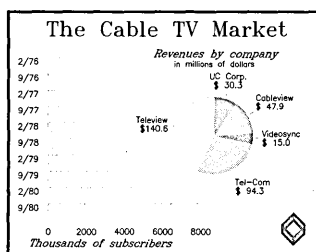
Precision Visuals' software tools provide the capabilities for performing virtually any graphics application: full-color, 3-D, dynamic image manipulation, full access to graphics input, graphics data structuring, a device-independent picture library, a business graphics vocabulary, and much more.

### 3. Adaptability

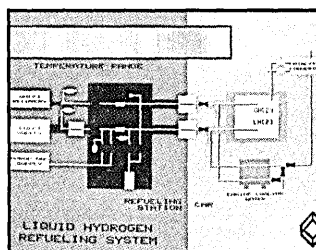
Precision Visuals' software tools currently run on 15 different computer systems, driving 26 different graphics display devices. They take full advantage of today's—and tomorrow's—most sophisticated graphics hardware, and are upward compatible with emerging hardware technologies.



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### 4. Simplicity

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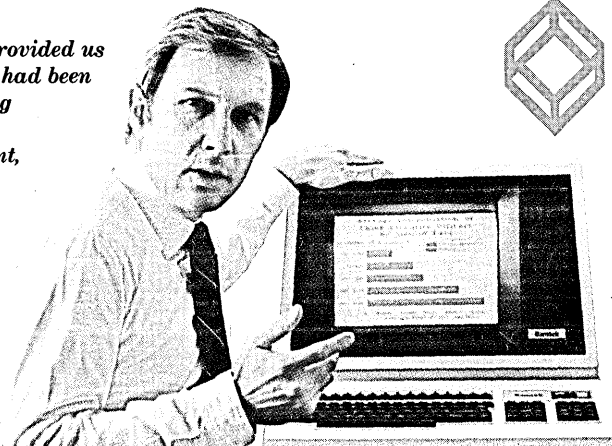
Precision Visuals' software tools are being used in virtually every major industry, including aerospace, energy, communications, engineering, government, service bureau, systems integration and education . . . for applications such as computer-aided design, business graphics, process control, mapping, geological data analysis, and document layout. In fact, Precision Visuals' software tools have become the corporate-wide graphics standard for many of our customers.

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CIRCLE 81 ON READER CARD

**The dp manager has a choice: master the financial intricacies of procurement decisions or risk having them taken out of his hands.**

# YOU CAN'T PLAY IF YOU DON'T KNOW HOW

by John Thackray

The mood at colleges these days is back to basics and back to business. Seldom has there been such widespread fear about the future, never such concentrated attention on business education. The mood on the dp campus is similar: there is a growing awareness among corporate dp people that in buying equipment, their old skills and approaches—okay in the '60s and '70s—just aren't appropriate to the anxious '80s. Some of the old permissiveness has gone. And so has some of the non-dp managers' old technological awe.

In this far more exacting corporate climate, dp managers, when acquiring new equipment and systems, are generally compelled to justify their decisions far more rigorously than in the past—both as to returns expected and the type of financing selected. "For years most dp people have gotten away with murder. It has been unreal," says James Milano, head of dp at Pfizer Inc., the New York-based pharmaceutical firm. "Management was scared and gave in to everything they wanted. They were the only people in most companies who never had to worry about financial efficiency. But now those days are gone."

A combination of forces has created this new and tougher climate. First, of course, there is the matter of sheer size of dp operations. "The chairman of my company tells me that we're a significant statistical expense for the company. Something between one and three cents on the sales dollar goes for data manipulation alone," Milano says. A second cause is the growing integration of dp into the rest of the company: as applications have spread and increased in complex-

ity, dp managers have become more powerful but also more vulnerable to questioning of this newly won authority. Thirdly, there is the increasing spread of financing options. Older dp managers can look back to a much simpler world 10 or 15 years ago, when renting from IBM was the norm and everyone slept soundly at night. Today a perplexing array of financial alternatives is common on most large acquisitions. Fourth, there's the expanding power base of the finance department in the typical large firm. Surveys of the career backgrounds of ceos show many more financial types at the top than technical, marketing, or production specialists, and this trend has had a powerful influence on the whole corporate culture. Managers are increasingly subjected to powerful controls whose fundamental language and mode of thinking is financial, not technological.

Together these factors tend to cause increased conflict between dp managers and finance experts. It may be covert or overt, but conflict is inescapable. Frequently, too, it is destructive to the overall goals of the corporation.

Consider the case of the major California firm owning a subsidiary dp service company that regularly makes significant acquisitions. All of these are done by lease transactions—and for a simple reason. The subsidiary's dp managers have concealed from headquarters the significant investment tax credit angles that would be available if this equipment were purchased instead. Why? Because the division's accounting wouldn't reflect the benefits of such tax savings. When questioned by a consultant on this failing, the manager of this subsidiary is said to have replied: "What do you want

from me? If I showed them how, I wouldn't get any of the credit. They would."

A Rochester-based company has a special team in its finance department that buys tax credits on the open market, in order to lower profits for tax purposes. Yet its own dp manager refuses to retain an investment tax credit on new equipment purchased. "I'd fire both those men," says Jerry Minsky, president of Technology Finance, a Westport, Conn.-based computer leasing firm, who cites these two cases. "These people aren't fulfilling their obligation to the company. The only obligation they recognize is their own empire building."

Dp managers poorly schooled in finance can end up having decisions on new equipment partly taken out of their hands. "Most dp guys don't know any finance, and corporate finance guys make no distinction between dp gear and a sack of onions," says Philip Dorn, a New York-based consultant. "The result is very basic conflicts. Even in companies where they try hard to minimize the conflict, it's there."

The roots of the conflict lie in the dp manager's yearning for maximum flexibility to respond to new equipment introductions in the future, and the cost of that flexibility in financial terms—or, put another way, the relative cheapness of arrangements in which the user assumes the obsolescence risks. Julian Wachs, senior associate at Booz Allen & Hamilton, recalls a case where a company needed a 2 MIPS box. "The dp people figured that the price for this capacity was a million dollars. The company was growing at 25% a year, and the capital cost could be written off over two years." Then the accountants closed in. "They observed that a 4 MIPS box

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**CIRCLE 85 ON READER CARD**

## As applications have spread and increased in complexity, dp managers have become more powerful but also more vulnerable.

written off over four years would cost less because of the longer write-off period. So they ended up with an 8 MIPS box, to be written off over eight years. This was four times the capacity they needed! But that wasn't all. Since operating costs on new equipment were dropping at 25% a year, suddenly in two years the company's 8 MIPS were no longer cost competitive."

Phil Dorn remembers a situation where "the dp manager of a company and I didn't want to buy a particular mainframe. We had a very good idea that a new and superior model was going to be introduced soon by the manufacturer. But the financial guys hounded us because it was such a good deal in money terms. They accused us of all sorts of hanky-panky. 'How do you know there is a new model coming down the pike?' they asked. Well, we didn't for sure. But the IBM salesman was sending out subtle signals to wait, which we couldn't explain to the finance people. 'We know. Trust us,' we said, and stalled for time, and then bought the new model as soon as it was unveiled."

### POWER OF CORPORATE FINANCE

The dp-finance conflict is not head-on, but of an overlapping kind. "The power of the corporate finance people is being able to say no to a proposal. I doubt very much that there are many instances where they can say which things should be bought," says Bruce Hasenyager, vice president for information systems at New York's Kidder Peabody. The dp manager has broad latitude in framing and justifying new equipment acquisitions and in creating the technical parameters of the decision, but these choices also have to be translated into financial terms. "If you're a dp person and you don't have skills as to project cost analysis and choices of alternative projects, you're never going to go farther," Hasenyager believes. "I don't think most dp managers understand their limitations in this area and what it'll cost their careers. Because I don't think these financial skills are widely distributed among them."

"Some dp managers are very very good at financial analysis. But the majority aren't good at all," says Tom Martin, president of Computer Financial, a Hackensack, N.J., computer leasing firm. Only a minority of corporations reportedly put their dp people through any kind of formal financial training, even though it can be quick and cheap. "They should go back to school. The Wharton School gives a finance course for nonfinancial executives, which is very good. So does the American Management Association," says Philip Dorn. By the same token, some companies (Pfizer, for one) have programs to teach the rudiments of dp to non-dp executives, which makes the interaction be-

### WHO'S PLACING THE BETS

How do most corporations handle their dp financing decisions? To get some idea, Technology Finance, the Westport, Conn., computer leasing firm, recently surveyed the chief financial officers, treasurers, and MIS executives of 65 of the country's largest companies. Some of the findings:

*Who decides?* The poll showed that in 80% of the cases an acquisition's financial arrangements were decided on exclusively by financial experts. Only in 20% of the cases did the MIS manager have a say in the financial decisions.

*Who is qualified?* Although many of the companies in the survey relied upon the dp manager to do the financial homework to support a financing program, half of these managers had not been trained in financial analysis.

*How Much Autonomy?* In examining the spending authority of the typical MIS manager, the pollsters found that 52% had "no discretionary powers at all," while

47% of the group had the right to spend up to \$250,000 on individual purchases. MIS managers have greater freedom to commit to timesharing and rental agreements, but are more heavily restrained from executing purchases or financial leases.

*What kind of analysis?* In two thirds of the cases, a discounted cash flow/present-value analysis was performed by the dp manager, or under his supervision, then forwarded to the chief financial officer for approval.

*Most popular acquisition strategies?* The most common were leases that culminated in purchases. Favored only slightly less was a cash purchase, followed by rental and sale/leaseback, each of which was preferred by a fifth of the sample. The pollsters were surprised by the low popularity of sale/leaseback deals, a "method that protects end users from being stuck with obsolete equipment and is generally less costly than rentals or financial leases."

—J.T.

tween the two camps smoother and more productive.

The rift between the dp people and the finance folk is partly a jurisdictional one. Clearly the finance department has a responsibility to create and enforce standards and policies for appropriations. And in this sense dp equipment is equivalent to any capital item. Says Pfizer's Milano: "This stuff that we buy is no different, from a return on investment standpoint, from the real estate that the company buys or its machinery for factories—which is why we have ground rules that force our dp managers to be like everyone else. So when we want to run a discounted cash flow model, or a return on investment analysis, we go to the clerks who specialize in this—the same as everybody else."

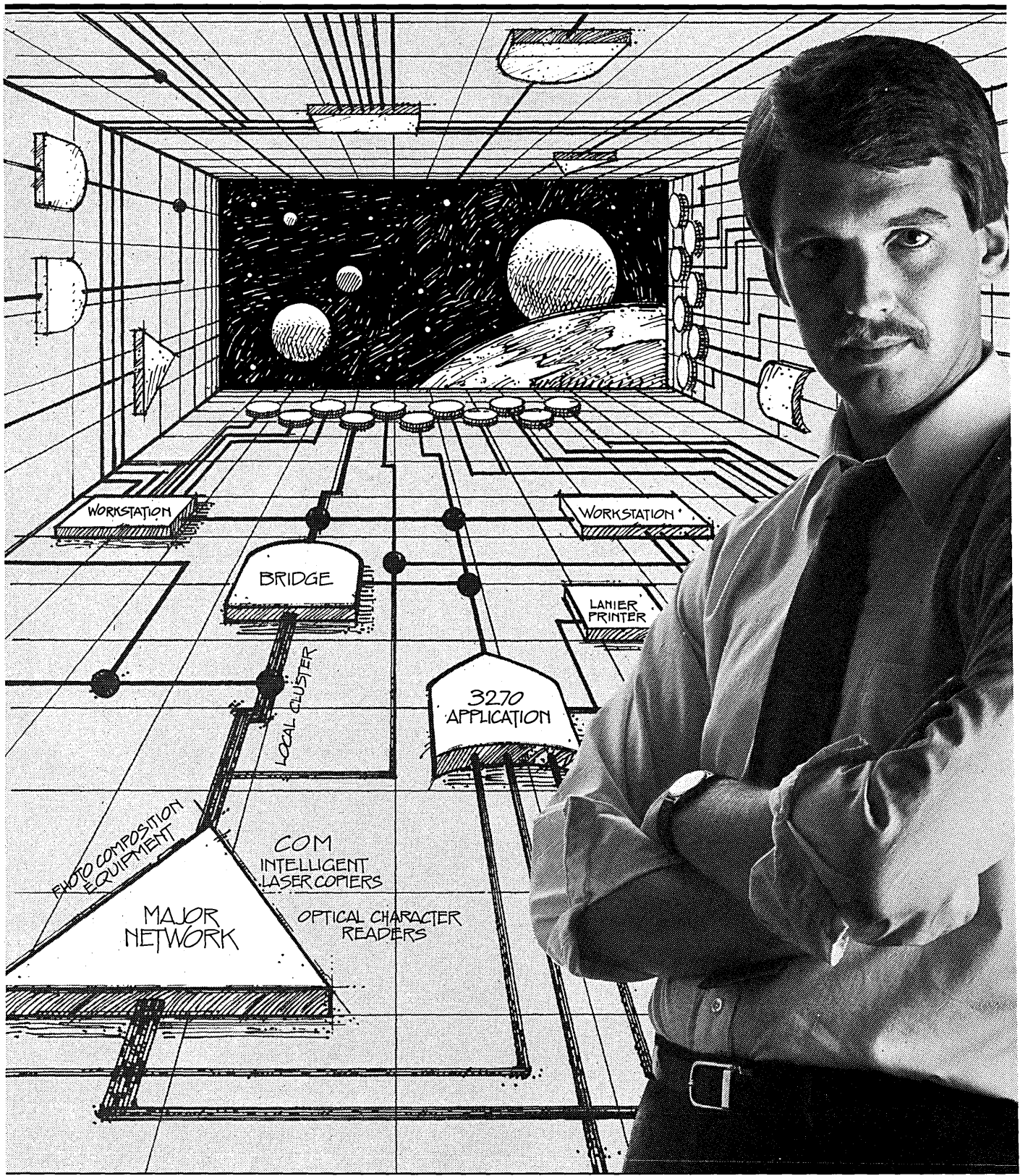
Just as clearly, dp equipment has unique characteristics: negligible wear and tear on mainframes, deep discounts for secondhand goods, uncertainty about the expected useful asset life of the latest models. These and other considerations must be incorporated into financial decisions. The cost of not knowing how to do this persuasively can be extremely high for a dp person. For almost a decade, the dp boss of one major chemical firm was regarded by senior management as a whiz kid. All his equipment had been acquired in small capacity increments and approvals from finance had been routine. Then two years ago the company considered a massive hardware buying program, with projected costs of around \$50 million. "It was a case of the emperor's new clothes," says the chemical company's chief financial officer. "When we asked him to fully justify the new program, it turned out he couldn't really han-

dle the financial concepts. We allowed him three or four different passes. Every time the effect was the same. His analysis just didn't ring true. He failed to convince us that he could think financially." The upshot: that dp manager, a whiz kid no longer, saw many of the key acquisition decisions taken out of his hands.

More and more technological options also tend to expose dp managers' inadequate financial know-how. "The old mainframes that everyone was buying for years have been generally easy to justify on a cost-performance basis," notes Frederic Withington of Arthur D. Little. But increasingly, Withington believes, dp managers are being involved in the acquisitions of such things as telephone systems or setting corporate policies for personal computer acquisitions. "Seeing the spread of personal computers in a company and adding up their total financial costs, which can be considerable, the finance people might say: 'Hey, let's inventory personal computers and save money through bulk purchasing.' But the dp people may caution against that, being more sensitive to the dynamics of change in personal computers and the dangers of being locked into standardization throughout a company," Withington notes.

"The backbone of dp has for years been cost displacement. And cost displacement is typically a pretty clear-cut calculation," says Joseph Ferreira, vice president, The Diebold Group, a New York-based management consulting firm. Under such circumstances, the dp manager's shortcomings weren't glaring. "But as we've moved to value-added applications, where the company is

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## The dp person must demonstrate that he or she is not merely a narrow specialist, but a manager with foresight and a grasp of the future.

going to change what it does as well as how it is done—for example, a decision-support system like videoconferencing—they become harder and harder to justify by normal financial yardsticks.” Ferreira believes that “tools like return on investment have their use. They force managers to explore all the barriers. I accept the value of that. My concern, however, is that it carries a connotation of scientific management that is unrealistic.

In the ultimate analysis, when you talk dp benefits these days you’re talking futures and probabilities.”

### FINANCIAL ANALYSIS FIRST

Still, the only way to consider the uncertainties of the future is to begin with financial analysis, without which no appropriation decision can be rational. After this, managerial judgment and

vision come into play. At this stage the dp person must demonstrate to peers that he or she is not merely a narrow specialist, but a manager with foresight and a convincing grasp of the future, able to counter any negative arguments raised by finance.

Ferreira believes that one of the reasons videoconferencing is such a “tough sell” today is that too many companies are using financial analysis as a way of denying the future. “Top executives make things happen despite financial analysis. For example, Arco is spending millions of dollars on videoconferencing,” says Ferreira. “Now you show me the calculations on paper that demonstrate that they’re going to get cost savings. They’ve even said, ‘We’re not going to do this on the basis of saving travel costs,’ which is the normal way companies proceed in this area. They say, ‘We need it because it’s the new and visionary way to work.’”

Appropriations decisions, economists say, tend to be “at the margins”—meaning that a corporation’s rates of profit between alternative new investments cluster numerically close together. Rare is the instance where a new dp application will fetch better investment returns of five or more percentage points than a new fleet of trucks or a new marketing program. In order to prevail in appropriation battles, therefore, the dp manager must convince the corporate leadership that his or her forecasts and projected benefits have a more probable and dependable outcome than competing claims on corporate resources.

Also, he must “do everything to be in the arenas of power in the company,” says Ferreira. “Those MIS executives who, by their stature, demeanor, and the way they perform, are able to go beyond function, usually manage to get into the management team of the company. Then, when they ask for something, it is viewed not as coming from an outsider, but from a member of the inner circle.” Adds Ferreira, “You do see today a growing, albeit small, proportion of MIS executives beginning to be on the operating committees of big companies.”

In sum, then, finance is a vital component of a dp manager’s total effectiveness. “To be a serious member of the business team, the dp person has to have financial acumen. It behooves him to have corporate finance on his side—so they aren’t a threat to decision-making,” says Hasenyager of Kidder Peabody. “There is an old phrase we use around here,” says Pfizer’s Milano. “It is this: Finance is the mother church of business. We all pray in that church.” \*

John Thackray is U.S. correspondent for the British magazine *Management Today* and a contributing editor of *Institutional Investor*.

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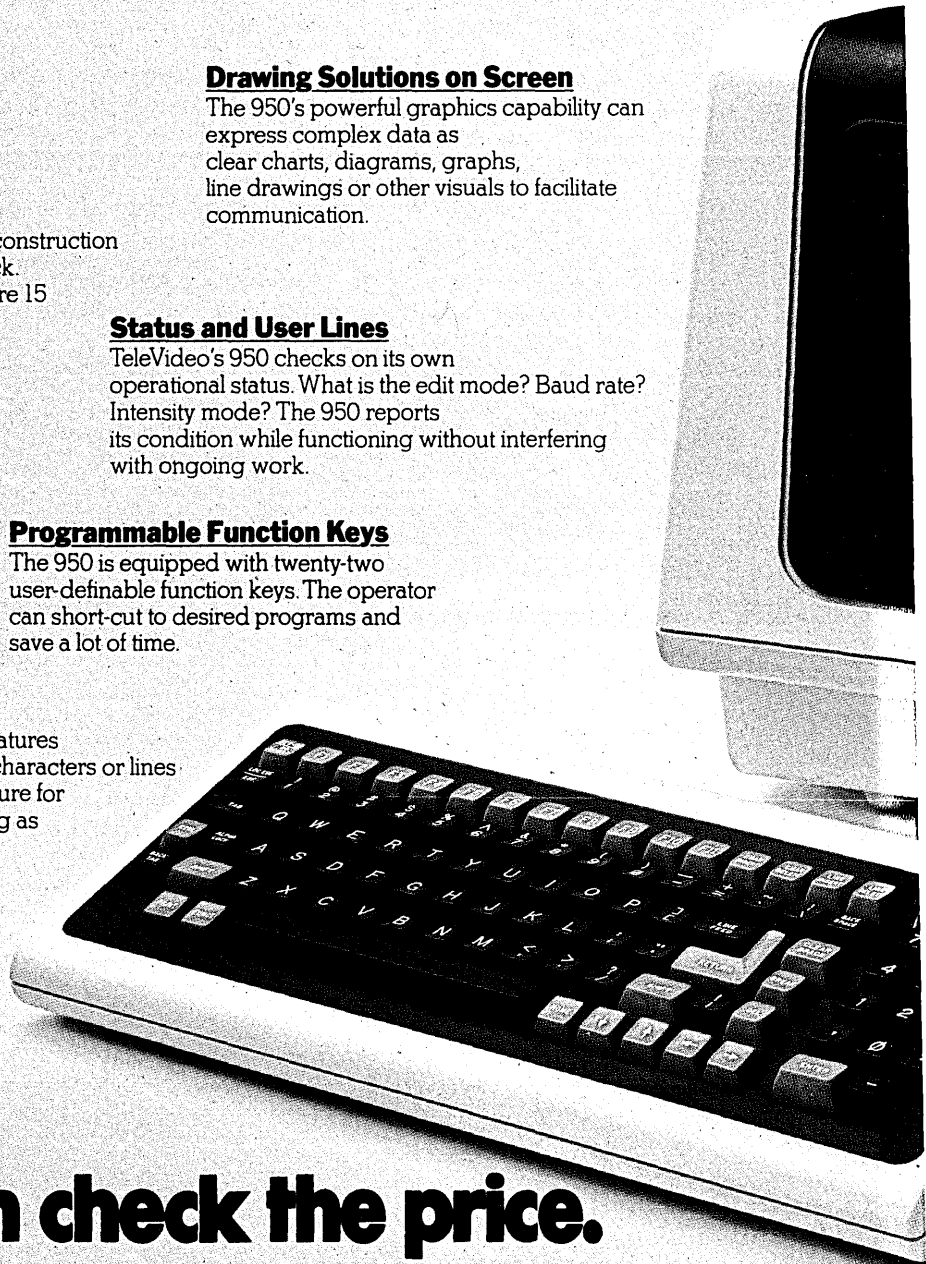
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## FORTTRAN

```
REAL X(26),Y(26),U(51),V(51)
REAL YY(26),CC(25,3),WK(156)
REAL RANGE(4)
NX = 26
M = 51
IC = 25
DO 10 I = 1,NX
  X(I) = 0.04*(I-1)
  Y(I) = SIN(3.0*X(I)) + 0.1 * COS(2.0*X(I))
10 CONTINUE
DO 20 I = 1,M
20 U(I) = 0.02*(I-1)
C   CALL IMSL ROUTINE ICSSCV
C   TO APPROXIMATE Y VS X
  IJOB = 2
  CALL ICSSCV (X,Y,NX,YY,CC,IC,IJOB,WK,IER)
  IF (IER.EQ.132) GO TO 40
C   CALL IMSL ROUTINE ICSEVU
C   TO EVALUATE V AT U
  CALL ICSEVU (X,YY,NX,CC,IC,U,V,M,IER)
C   CALL IMSL ROUTINE USPLO
C   TO PLOT V VS U
  NPLT = 1
  INC = 1
  IPOPT = 0
  DO 30 I = 1,4
30 RANGE(I) = 0.0
  CALL USPLO (U,V,M,M,NPLT,INC,'PLOT',4,'X',
*         1,'Y',1,RANGE,'1',IPOPT,IER)
40 STOP
END
```

## MATH/PROTRAN

```
$ DECLARATIONS
REAL VECTOR X(26),Y(26),U(51),V(51)
$ ASSIGN X(I) = 0.04*(I-1)
          Y(I) = SIN(3.0*X(I)) + 0.1 * COS(2.0*X(I))
          U(I) = 0.02*(I-1)
$ APPROXIMATE Y; VS X; AT U; IS V
$ PLOT V; VS U
$ END
```

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**A sound financial plan requires an educated tax strategy.  
Here are tactics the dp manager can  
use to improve his company's profit picture.**

# PLAYING THE R&D TAX GAME

**by William Wewer  
and Glen R. Dash**

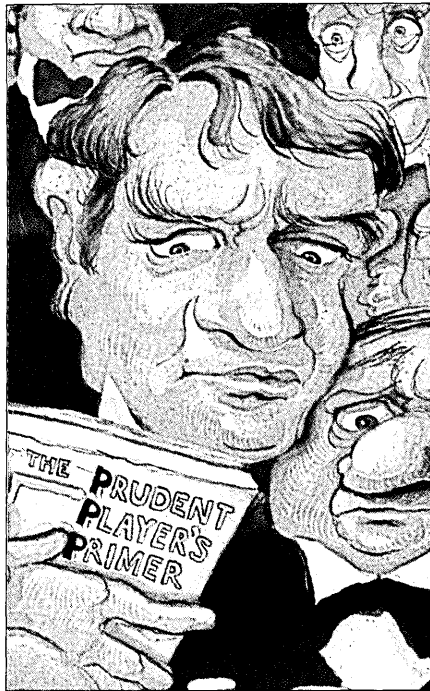
*Last spring DATAMATION (April, p. 157) explained how dp managers can use the Economic Recovery Tax Act, passed in August of 1981, to devise procurement strategies that save money. ERTA is also intended to encourage research and development efforts, and that means there's an opportunity for significant savings in this area as well. Here's the rest of the story.*

Last year's Economic Recovery Tax Act opened a bonanza of benefits for data processing support of a company's product development, software development, and other research and development efforts. By finding the proper mix of tax benefits, a company can recover in tax savings up to 71% of the cost of certain research projects. The data processing manager can boost the tax savings his company will obtain if he modifies his division's activities to conform with various artificial expectations of the tax laws. But if he looks at only one part of the new law and ignores the rest, he may find himself in the worst of all possible worlds—he may give up prospective benefits in the hopes of obtaining others that prove illusory.

Dp managers are often surprised to learn that when they design a tax strategy for their department or the entire company, they can use a planning process similar to the systems analysis they might do for a new software/hardware system. The tax laws that determine these strategies contain several very different benefits that are designed to promote research and development by American companies. These include:

- tax credit for some R&D expenditures
- accelerated depreciation for equipment purchased to be used for research
- investment tax credits, which vary according to the R&D situation
- the option to expense R&D activities at the time they are conducted or over a five-year period
- preferential treatment of profits made on patents.

Each of the R&D tax benefits interacts



with others, and the use of one may either improve or reduce the value of another. In this article we will review the R&D tax benefits available to the manager of a data processing division and then look at concrete strategies the manager can use to improve his division's profit picture.

**R&D credit.** The R&D tax credit provides a dollar-for-dollar credit for certain research spending. It is used to reduce a company's taxes "below the line" (as opposed to reducing a company's income subject to tax—see box, "Credits vs. Deductions"), but it only applies to companies that spend more on R&D in one year than they did in previous years.

The R&D credit can be used for the development of new products or in-house computer programs, as well as for significant improvements to existing products and programs. Tax credits are particularly valuable to a company, because they provide the same dollar benefit regardless of the tax bracket the

company is in, and if they cannot be used in one year they can be carried forward or backward to another year.

Although the R&D credit has received the most attention of the various R&D tax benefits, there are many limitations that make it less valuable than it may appear at first blush. For example, a company's R&D spending in previous years suppresses the amount of credit available for future years, because only "incremental" R&D expenditures, over and above previous years' research spending, are eligible for the credit. Although the credit is touted as 25%, because of certain restrictions in the law the highest effective credit it is possible to obtain in practice is 12.5% of total research spending. A company can obtain even that level of credit only if it nearly doubles its R&D expenditures each year (see box, "The Effect of R&D Tax Credit on Research Spending").

Unlike other R&D provisions in the tax code, the R&D credit sharply restricts the types of expenditures eligible for benefits. The credit cannot be applied to general administrative overhead, equipment purchased by the company, or many fringe benefits paid research staff. If a company contracts out its R&D, the contract expenses eligible for credit treatment are reduced to 65% of the total contract bill. Finally, the R&D credit cannot be used for startup companies or pure financing deals.

**R&D depreciation.** A second R&D tax benefit provides superaccelerated depreciation for equipment purchased to be used for research projects. This R&D depreciation applies not only to computers and telecommunications equipment, but also to such mundane items as desks, chairs, and typewriters (if they are used in the research division).

Before 1981, a company that purchased capital equipment (such as a computer) was required to write it off over the "useful life" of the equipment—and the IRS set this at six to eight years. Now R&D equipment can be depreciated over a three-year period, and front-end depreciation of 25% may be taken in the first fiscal year that the equipment is placed in service, even if that equip-

## CREDITS VS. DEDUCTIONS

Most of the R&D tax benefits discussed in this article are in the form of tax credits or deductions from income. In order to plan an R&D tax strategy, it is necessary to understand the effects that credits and deductions have upon a company's tax payments.

Marginal corporate tax rates jump incrementally from 15% at the lowest taxable income levels to 46% for taxable income greater than \$100,000. Although the marginal rate on each incremental dollar of taxable income earned may be at a given percent level, the effective tax rate on the corporation's taxable income as a whole generally will be less, because the marginal rates are applied to incremental amounts of earned income.

Thus, although the marginal rate on \$70,000 of taxable income is 30%, in fact that rate is made up of three components; 15% on the first \$25,000 of taxable income, 18% on the next \$25,000 of taxable income, and 30% on the remaining \$20,000. Therefore, the total tax is \$14,250, and the effective rate is only 20.4%.

Marginal rates and the effective rates that they produce are set out in Fig. 1a. As taxable income reaches the multimillion dollar levels, the effective tax rate approaches the marginal tax rate of 46%. At the lower taxable income levels, however, the effective rate is extremely progressive—the more a company earns, the larger the percentage it owes in taxes.

Fig. 1b sets out the corporate taxes imposed at relatively low taxable incomes. This table is formatted in terms of the dollar tax imposed, as opposed to the percentage tax rate set out in Fig. 1a. The curve in 1b is related to the curve of effective tax rates in 1a, but takes the form of five flat segments with varying slopes representing each marginal tax bracket. As the progressive tax rate increases, the slope of the curve increases.

A tax deduction allows the taxpayer corporation to reduce its taxable income (the X-axes of Figs. 1a and 1b) and thus move down the slope of the tax curve. As it moves down the tax curve, the corporation's taxes will decrease, as shown graphically in Table 1b. The amount of decrease is directly connected to the slope of the curve; thus, when the taxpayer is at high effective tax rates, a given deduction will have a greater value because it will reduce taxes more than it would at lower rates. In the example, \$10,000 of deduction generates \$4,600 worth of reduced taxes at the 46% marginal tax rate, but only \$1,500 of reduced taxes at the 15% marginal tax rates.

A tax credit simply reduces the total

FIG. 1A  
**CORPORATE TAX RATES—MARGINAL AND EFFECTIVE**

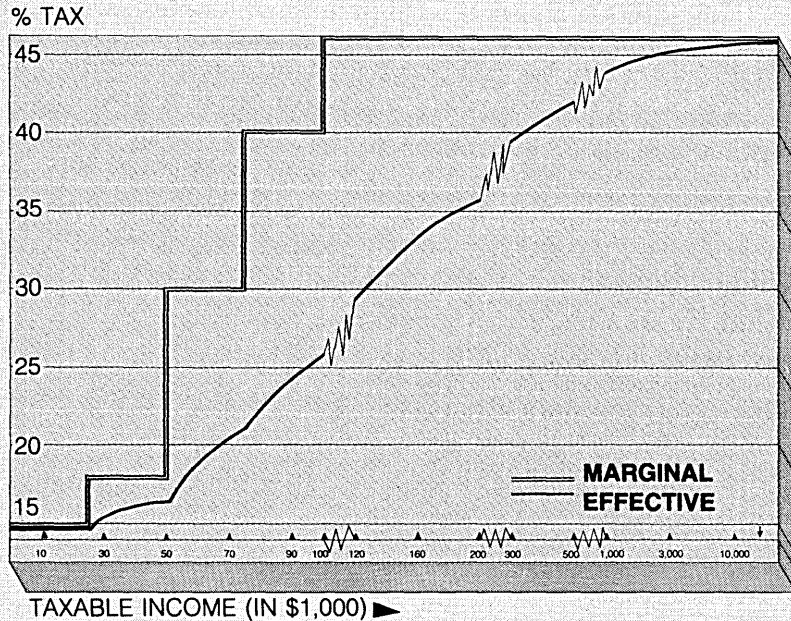
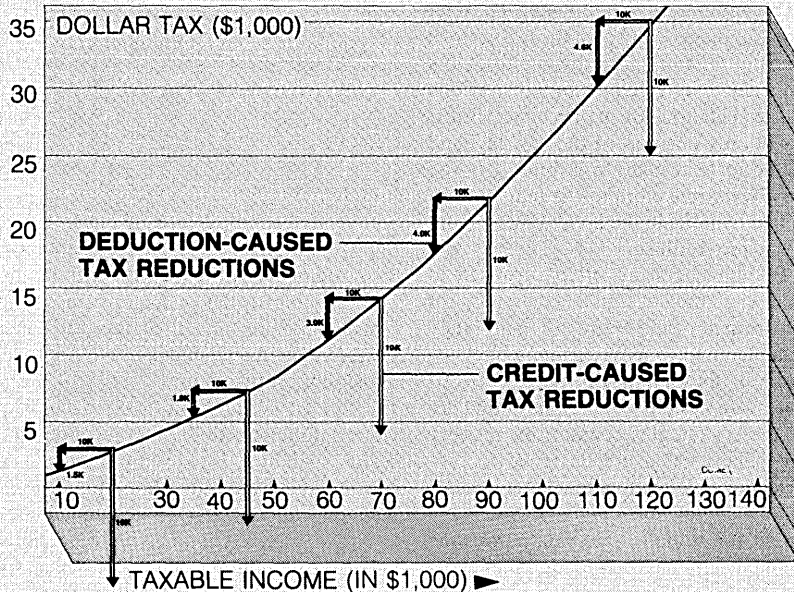


FIG. 1B  
**CORPORATE TAXES IMPOSED AT LOW TAXABLE INCOMES**



taxes due and owing by the amount of the credit. It is not affected by the taxpayer's tax rate. In Fig. 1b, a \$10,000 tax credit is worth \$10,000 no matter what the effective rate, although at the lower taxable income levels some of the credit must be carried

forward to future years.

Tax credits are always more valuable than the same amount of tax deductions, and that at the lower taxable income levels, credits are substantially more valuable than deductions. \*



## By finding the proper mix of tax benefits, a company can recover in tax savings up to 71% of the cost of certain research projects.

ment is placed in service the very last month of the fiscal year.

Other equipment not used primarily for R&D can be depreciated over five years (as opposed to seven or more years previously). As an additional incentive to purchase equipment, the first \$5,000 of equipment can be expensed in the year it is obtained, rather than being amortized over a number of years.

**R&D investment tax credit.** Purchased equipment not only qualifies for R&D depreciation; additionally a tax credit can be taken for it which has the same below-the-line benefits as the R&D Credit. This credit varies depending upon the use made of the equipment, and is known as the Investment Tax Credit (ITC). In a reversal of the depreciation payoff for R&D equipment, however, ERTA reduced the ITC for R&D equipment. Computers, peripherals, etc. that will primarily be used for research are eligible for a 6% credit against taxes, even if that equipment is placed in service the last month of the company's fiscal year. If the equipment will not be used for R&D, the ITC rises to 10%. We will discuss later in this article how the trade-off between R&D depreciation and ITC can be manipulated to achieve the greatest tax benefits.

**R&D expensing.** Whether or not they qualify for the R&D credit, all companies are given a valuable timing option in their treatment of R&D expenses. A company may deduct R&D expenses either immediately or spread them out over 60 months. If a startup company or subsidiary has low profits initially, but expects to have large taxable income later on, it may be to its advantage to delay deducting its R&D expenses until it finds itself in a higher tax bracket. (Unlike credits, deductions are worth less as low tax brackets.)

### BENEFITS FROM EXPENSING

In contrast to the strict limitations placed on qualified expenditures for the R&D credit, the timing option for R&D expensing applies to all expenditures "in connection with" research and development, including related administrative overhead, fringe benefits, etc. The broader language of this tax law allows it to be applied to new company startups and pure financing deals. Often a company will find it receives more tax benefit from R&D expensing than from R&D credits.

**Patent profits.** A final benefit provides preferential tax treatment for the sale of patents. For years, the Internal Revenue Service attempted to apply ordinary income tax rates to the profits companies made when they sold the rights to patents they had developed. Now a company may take preferential capital gains treatment on these patent profits. Under the 1981 Tax Act, the corporate capital gains rate is reduced to 20%.

Not only are these R&D tax benefits

complex by themselves but each provision interacts with the others and the chemistry can result either in spectacular tax savings or in an unexpected tax bite. If the dp manager knows in general terms how these provisions interact, he can vary the activities of his division to boost his company's after-tax profits substantially.

**Lease vs. purchase.** For example, when the dp manager is preparing to obtain new equipment, such as computers or peripheral devices, he must make a permanent choice between taking the benefits provided by either the R&D credit and R&D expensing or accelerated depreciation and ITC. He will get the R&D credit only if he leases the equipment. If he leases, however, he cannot get accelerated depreciation, and, with certain exceptions, he will not get investment tax credit either. When faced with a lease/purchase decision, therefore, the dp manager must put pencil to paper and decide how his department's activities will affect the tax benefits.

Remember that the R&D credit only applies to incremental R&D expenses, and these R&D expenses must be calculated across the entire company, not division by division. Thus, if a company's total R&D is increasing only modestly or not at all, the amount of credit available under a lease may be negligible. Additionally, the lease expenses may qualify for the credit only for a short period of time over the life of the lease, and to the extent the equipment is used for non-R&D activities, that portion of the lease payment will be lost for the credit.

If the equipment is purchased, on the other hand, accelerated depreciation and investment tax credit will be available whether or not the company makes an R&D use of the equipment, although the rate of accelerated depreciation and ITC will vary depending upon R&D use. Therefore, sometimes it is better to purchase equipment, obtain the certainty of ITC and accelerated depreciation, and forego the possibility of R&D credit.

**Ordinary use vs. R&D use.** Another interaction among tax benefits is the relationship between accelerated depreciation and ITC. If depreciation deductions are taken faster because the equipment is used for R&D (three years for R&D equipment as opposed to five years for other equipment), the amount of investment tax credit is reduced from 10% to 6%. Which is more valuable—high ITC or high accelerated depreciation? Here are some of the factors that must be considered.

The cost of money to a company will decrease as the prime rate decreases (reducing borrowing expense) and as internal productivity declines (making alternative uses of funds less valuable). As the cost of money declines, the relative advantage of three-year depreciation over five-year depreciation also

decreases. Thus, the benefit of superaccelerated R&D depreciation is less valuable if one predicts that interest rates and inflation will decline or productivity will stagnate.

Conversely, as a company's profits improve, and its taxes are pushed higher and higher by progressive tax rates (see Fig. 1a), the tax value of depreciation expense increases, and the benefit of R&D depreciation translates into more after-tax dollars. Now it becomes more beneficial to use the R&D rates. On the other hand, if the company is reporting marginal or no earnings for a year, depreciation will be almost useless to it, whereas tax credits will have the same value and may be carried forward to more profitable years. Now the 10% ordinary ITC becomes more valuable than the 6% R&D ITC (see Fig. 3).

This bewildering mix of variables must be considered every time a use decision is made on equipment that can be assigned either to R&D or to ordinary business purposes. In some cases, it is more valuable to characterize equipment as not being used for R&D. This might occur in times of low profits or low inflation, or if a high-profit company has large amounts of tax benefits from other sources (thus driving its marginal tax rate down).

**In-house software development.** Software development is specifically included in the R&D credit. Even if the software will be used for a company activity that would not itself qualify, the work done developing that software can qualify for credit. This would include software for internal administrative programs—inventory control, general ledger, report generator, etc.—or for market research models and analyses.

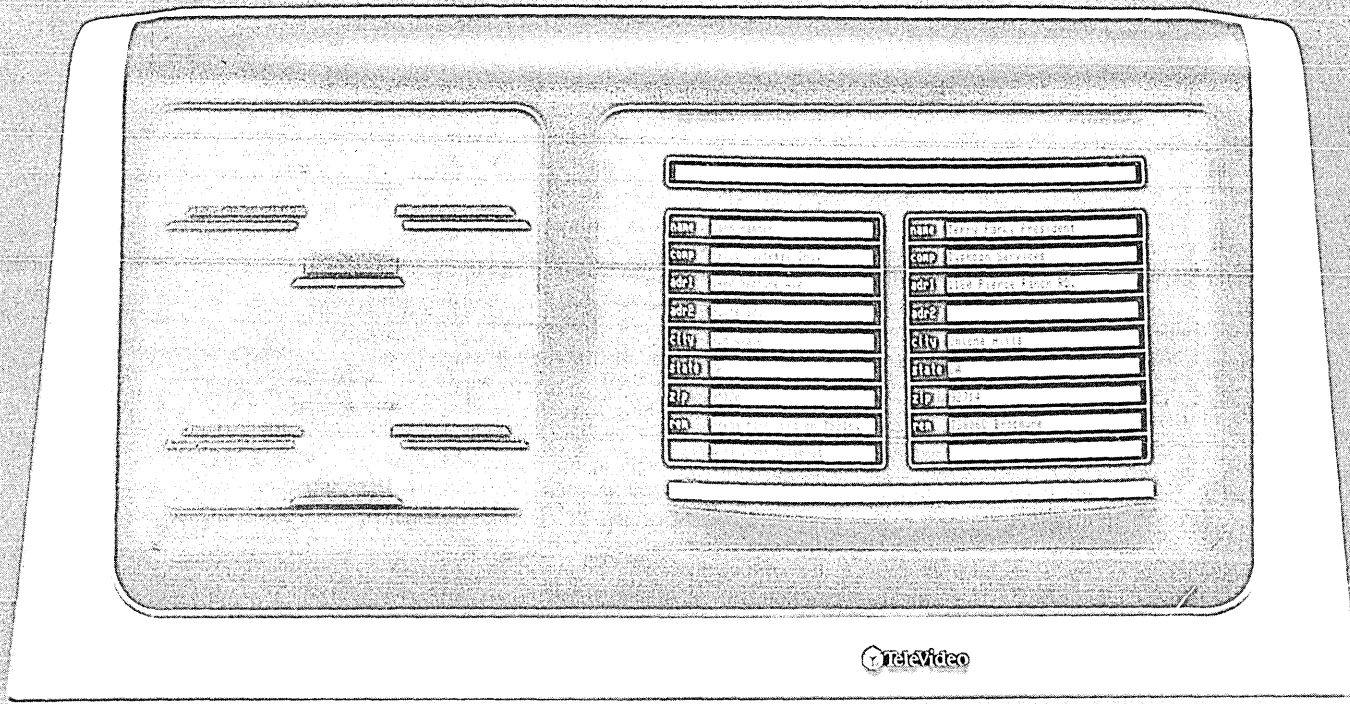
### QUALIFIED EXPENSE CREDIT

Although a substantial amount of the work in a dp division might qualify for the R&D credit, the language with which this work is described can determine whether or not it is a "qualified expenditure." Improvements to existing programs will qualify, for example, only if the changes are deemed significant and if the final result is in doubt until the improved program actually runs. If coding appears to be maintenance of an existing program, documentation of a released program, or mere patchwork, there is no research and development going on for the purposes of the R&D credit. Thus, the dp manager should have his new program running on a prototype or experimental basis as long as possible so his glitch-fixing expenses can qualify for the R&D credit.

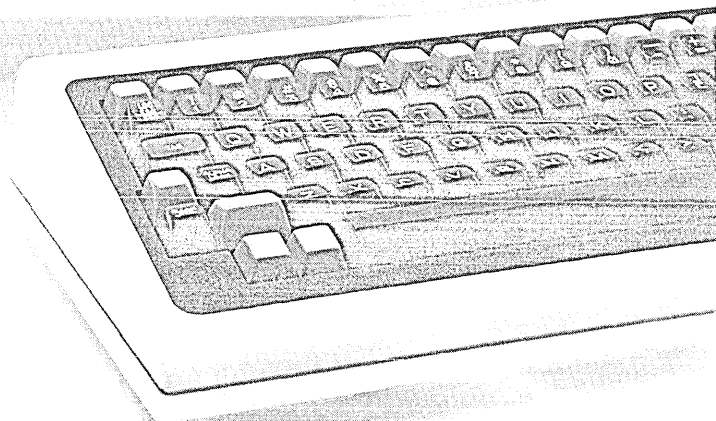
Finally, the classic problem of documentation rears its head. Anyone who has worked on a software development project knows that the last thing analysts and programmers want to do is document the code

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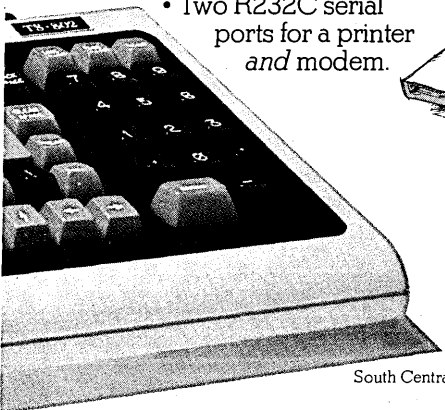
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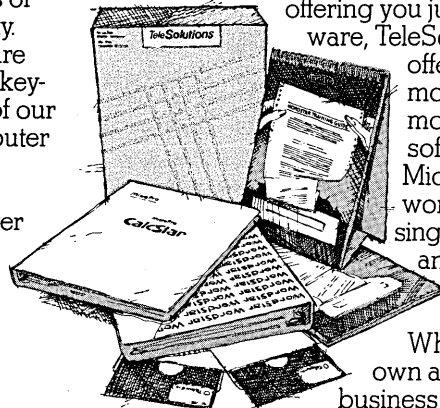
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they have written. But if this documentation is done before the program is completed and leased it should qualify as R&D; on the other hand, if the project manager waits until the program is released before going back and doing the documentation, this same work is not eligible for credit (although it is eligible for expensing).

**Outside software development.** If the dp manager decides to use an outside contractor for software development, to gain maximum tax advantages he must be careful to have a written contract, and to place the risk of the development on his own company, not on the outside contractor. The Internal Revenue Service has used a number of factors to determine if an outside contractor was engaged in "research and development" eligible for credit to the client, including: charges for the work performed were on an hourly or per diem basis instead of a fixed fee; the cost of correcting errors in the program was to be borne by the client, not the contractor; and the vendor did not guarantee that it could successfully write the desired program.

When a company contracts out its R&D—both for software and tangible product development—it must be very careful that the contract terms will support timing provisions for the R&D credit and R&D expensing. If a company does its accounting on a cash basis, prepayments to a contractor may be eligible for R&D expensing in the year the payment is made, but will not be eligible for R&D credit until the work is done.

The dp manager also should remember that when R&D is contracted out, the portion of the contract cost available for R&D credit is reduced to 65% of the total—although the entire contract cost generally may be expensed. If a company has low internal overhead, it may find it more valuable to keep its R&D work inside (for full R&D credit) and to contract out administrative and other ordinary matters (for example the use of a facilities management company or outside bookkeeping services).

**R&D timing.** Timing of expenditures can create tremendous fluctuations in income tax payments. For example, whether a piece of equipment is placed into service at the beginning or end of the tax year, the amount of ITC and accelerated depreciation will be identical. The same applies to depreciation taken in the first year of use. Therefore, if a computer purchase is scheduled for the beginning of fiscal year 1983, for example, it may be worthwhile to accelerate that procurement and place the equipment into service at the end of fiscal year 1982, because tax savings today are worth more than the same tax savings tomorrow.

Timing applies to the R&D credit as well. Because the law imposes certain ceilings on the R&D credit, a point can be reached

## THE EFFECT OF THE R&D TAX CREDIT ON RESEARCH SPENDING

The R&D tax credit is 25% of research and experimentation expenditures that are greater than such expenditures during an earlier "base period." For new companies, the base period is zero the first year, one year's previous expenditures the second year, the average of two years' previous expenditures the next year, and the average of three years' expenditures for every year thereafter. For established companies, the base period is set by statute and increases to the average of the three previous years' R&D expenditures by 1984. An "artificial" cap is placed on the amount of credit available, because in no event can the base period be less than 50% of the present year's expenditures. If in fact it is less than 50%, the base period is artificially set at 50% for calculating the credit.

Fig. 2a shows the amount of R&D credit available as a percent of total R&D expenditures during a given year. No credit is available at all until R&D expenditures reach the amount spent during the base period, point B on this table. The credit as a percent of total R&D spending then rises until the current year's R&D spending equals twice that of the base period (2B). At that point, the artificial cap is imposed, and the R&D credit stabilizes at 12.5% of all qualified R&D. If a company is rapidly increasing its R&D spending over a period of years, it will become more and more difficult to obtain significant amounts of R&D credit, because each year the company will have to overcome a larger base period expenditure. Fig. 2b shows the effect of the ever-expanding base period upon the R&D credit available to a company (which is assumed to have engaged in negligible R&D in previous years). In the first year, the R&D credit will equal 12.5% of the total expenditures for R&D—the artificial cap. In the second year,

the company must double its R&D expenditures to achieve the 12.5% credit. If it increases its R&D expenditures less than 100%, its R&D will be pulled down the curve of Fig. 2a, reducing the R&D credit as a percent of total R&D expenditures. In Fig. 2b, for example, an increase of 50% of R&D expenditures in year two will produce only an 8.3% R&D credit.

Ever-increasing amounts must be spent for R&D in order to keep the R&D credit at significant levels. If a company, however, does continue to spend geometrically (a constant percent increase each year) rather than incrementally (a constant dollar increase each year), it becomes relatively easier to boost the R&D credit. For example, if a company consistently increases its R&D by 50% per year, by the fourth year it will once again cap out at the 12.3% limit. In the process, of course, it is committing enormous amounts of corporate cash to research and development. If, on the other hand, a company maintains its R&D expenditures at a constant level (no dollar increase), it will receive no tax credit at all after the first year. If the company increases its R&D at a constant dollar rate, its percentage increase will drop substantially the second year, climb moderately the next two years, and then decline gradually, thus reducing the effective R&D credit to about 3.5% (see Fig. 2c). Note that the new R&D credit has a "sunset" expiration date of 1986. There is no guarantee that Congress will extend the life of the credit at that time.

These tables show that a spending program for R&D predicated upon recovery of costs via the credit can, without compensating factors, commit a company to very substantial out-year expenditures that may or may not be justified by the results of previous years' research.

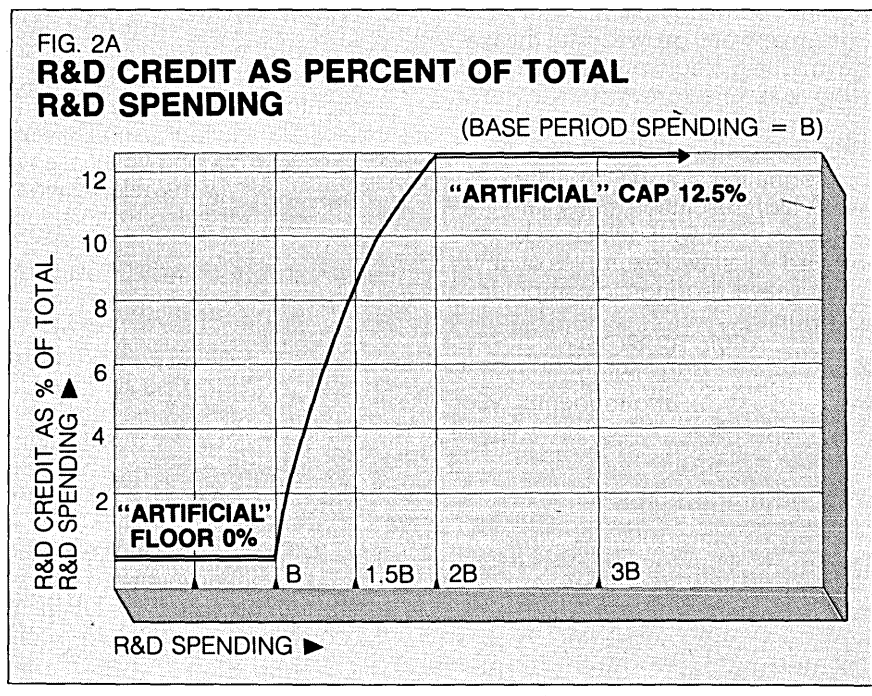


FIG. 2B  
**R&D CREDIT AS A PERCENT OF TOTAL R&D BUDGET**

(R&D BUDGET INCREASES BY A CONSTANT PERCENTAGE ANNUALLY)

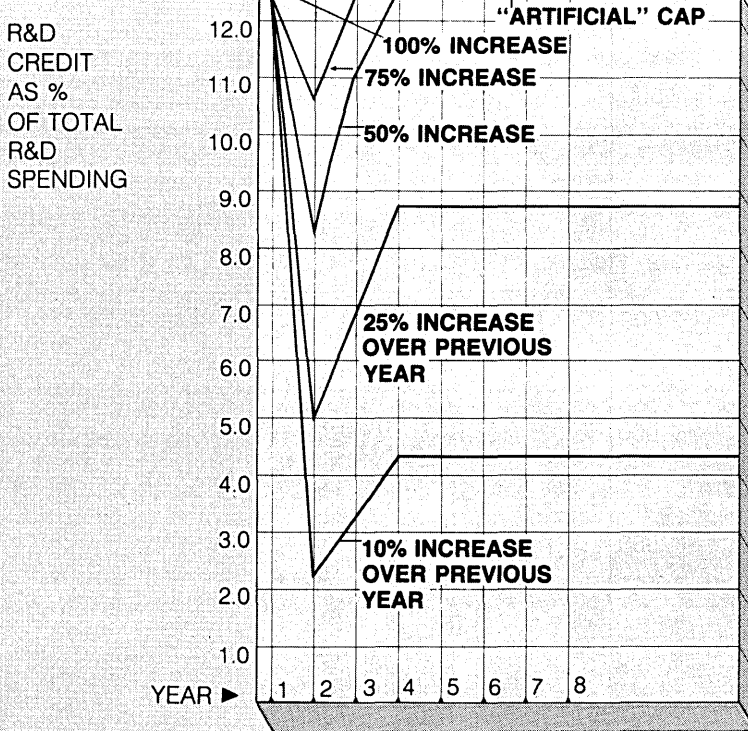
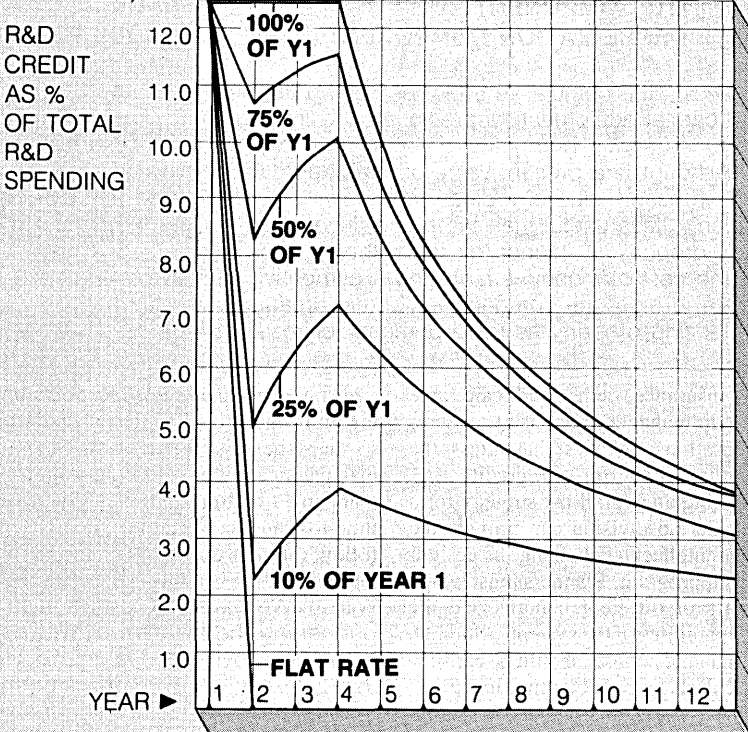


FIG. 2C  
**R&D CREDIT AS A PERCENT OF TOTAL R&D BUDGET**

(R&D BUDGET INCREASES BY A CONSTANT DOLLAR AMOUNT ANNUALLY)



where a company can spend incremental dollars on R&D with no incremental increase of the percentage of credit. If these expenditures would be made toward the end of a fiscal year, it may be worthwhile, if consistent with good management, to delay these expenditures until the next fiscal year, when they can be used to get a running start on the higher R&D base. On the other hand, if R&D is expected to stay level next year or decline, it is best to pull more R&D into a high spending year and not lose the credit forever (see box, "The Effect of the R&D Tax Credit on Research Spending").

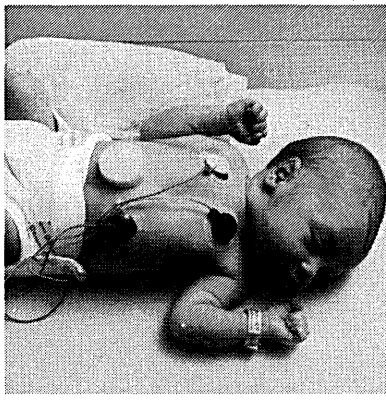
**Researchers and supplies.** By moving bodies around within his division, the dp manager can, in effect, create tax savings that he would not obtain from identical activities conducted with a different staff mix. For example, the R&D credit is available for wages paid to research staff in the proportion of time that they spend doing actual research, directly supervising research, or providing direct support for research (secretarial services, lab assistants, etc.). Therefore, a staffer who spends half of his time on R&D and half of his time on administrative and marketing activities can have only 50% of his wages applied to the credit. However, once a staffer spends at least 80% of his time on R&D, the law allows the dp manager to assign 100% of his wages to the credit. Therefore, if he has a staffer who is spending 75% of his time on R&D, by increasing this amount by five percentage points (from 75% to 80%), the dp manager can increase the amount of wages applied to the credit by 25 percentage points (75% to 100%).

**SEGREGATE R&D SUPPLIES**

Supplies used for R&D should be segregated from supplies used for administrative, marketing, and other nonresearch matters. Tax auditors will look with a baleful eye at a company that claims to use 90% of its supplies for R&D if its marketing and administrative supplies are pulled from the same cabinet and no record is kept of who uses which for what. On the other hand, if R&D supplies are accounted for separately, kept in a separate storage cabinet and staff is instructed to segregate its use according to function, on audit it will be much easier to sustain claims for R&D credit based on use of supplies.

Finally, when working up compensation packages for research staff, the dp manager should be aware that certain fringe benefits can be included under the R&D credit and other fringe benefits cannot. Among the fringe benefits eligible for credit are bonuses in cash or in kind, meals, car leases and parking, and (after 1983) continuing education supplements. Among the fringe benefits not eligible for credit are medical care plans,

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FIG. 3  
**TAX BENEFIT OF \$10,000 CAPITAL ASSET PURCHASE**

(R&D USE VS. ORDINARY USE—20% COST OF MONEY)

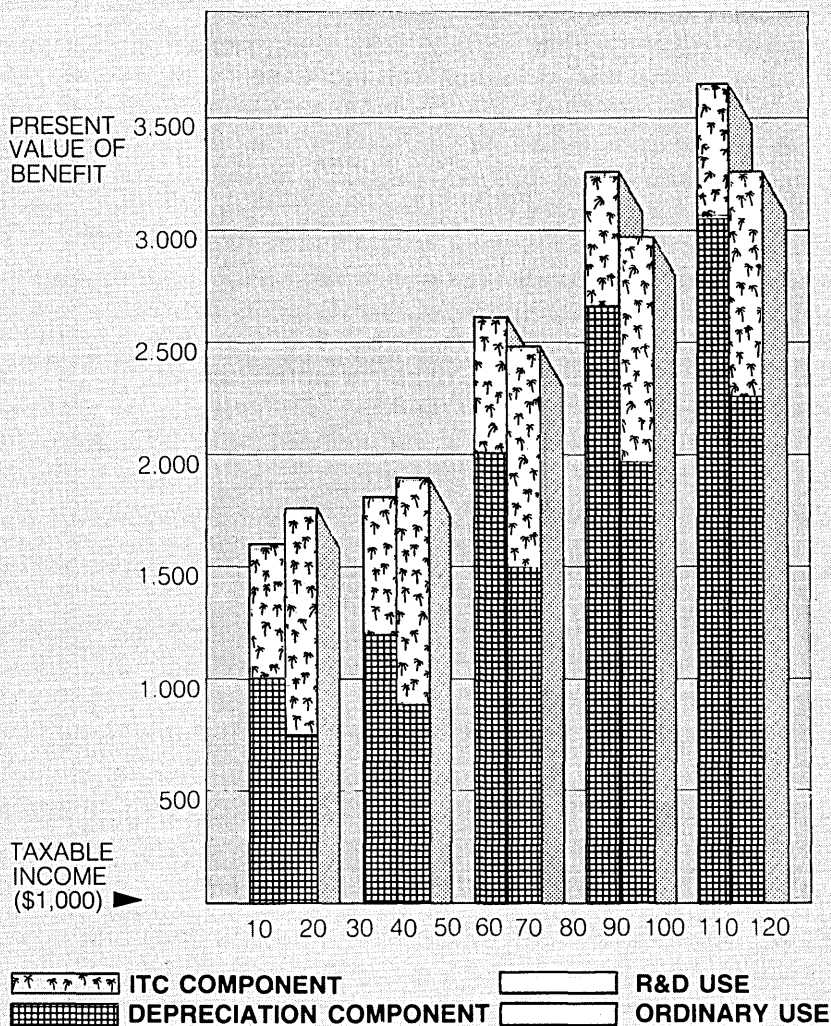


Fig. 3 shows the cumulative effect of the two tax benefits derived from owning capital equipment: depreciation and investment tax credit. This table assumes a very productive company and continuing high borrowing costs. Although the present value of R&D depreciation always is higher than the present value of ordinary depreciation, at lower tax rates this depreciation is less useful than the higher investment tax credit applied to ordinary property. At higher tax rates, the situation is reversed. Thus, where the cost of money is high and a company's effective tax rate is moderate to high, the company will obtain greater overall tax benefits by characterizing property as used primarily for research purposes.

group life insurance, and child care programs. The dp manager may wish to assemble compensation packages that stress the fringe benefits eligible for R&D credit.

Planning an overall tax strategy for a company or its dp division can provide the same kind of intellectual challenge as designing an elegant program. Planners must weigh the trade-offs of different benefits and the rules and capabilities of the system. Although legal and financial counsel should be consulted for particularly complex or one-time transactions (such as the acquisition of a new company or a new pension plan), line management can bring about substantial gains in the

after-tax profit picture of most data processing divisions. Now that the tax code contains so many benefits for research expenses, dp managers can appear to work miracles on a company's bottom line if they will take the time to plan a coherent R&D tax strategy and follow through on it. \*

William Wewer and Glen R. Dash are partners in the law firm of Wewer & Mahn, P.C., with offices in Washington, D.C. and Boston. The firm specializes in representing high-technology clients in tax, finance, and regulatory matters.



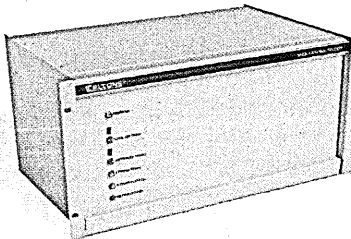
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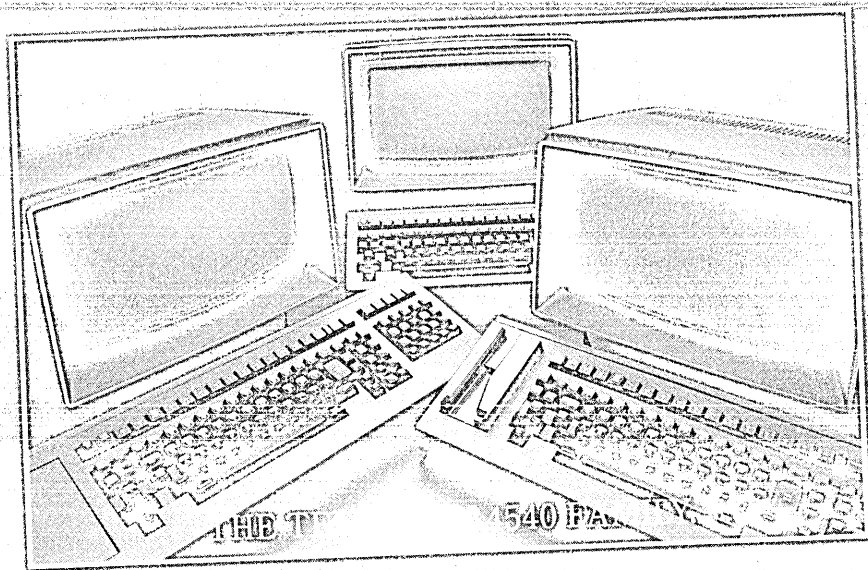
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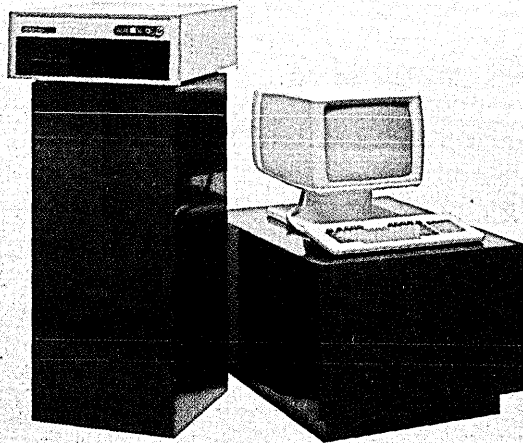
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Pay increases for the next year will barely keep up with inflation.

by Stephen B. Gray

# 1982 DP SALARY SURVEY

You know the feeling. It's Friday, paychecks are being distributed, and you're just dying to peek over your coworker's shoulder as he eyes the bottom line. What's more, you open your own check and wonder if you're really getting paid what you're worth. You may even wonder if you could earn more money doing the same job—but in another industry, or in another city.

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Well, wonder no more. The results of DATA-MATION's annual survey of salaries are in, and in the next few pages you'll be able to sate your curiosity about pay scales in the data processing industry. You may even be surprised by some of the findings.

So where's the money? For the record, the highest paid dp professionals are in the transportation industry, where vice presidents of MIS earn as much as \$68,500 per annum. Geographically, firms in New York

paid more than firms elsewhere, with MIS vice presidents earning \$68,700 on average. And managers in the biggest dp shops generally earn more than their counterparts in smaller shops. Alas, if you're in the medical, education, or insurance field, you'll find your industry pays poorly compared to other fields, and if you hail from Philadelphia or St. Louis you're probably not unaware that those are the least lucrative locations.

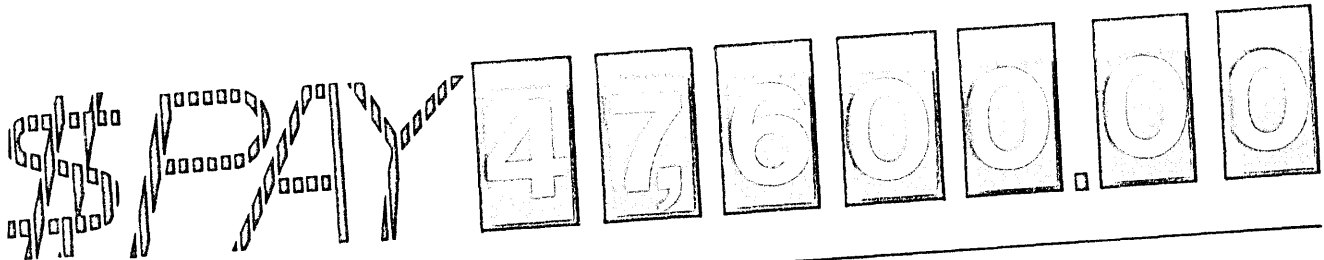
On the whole, the good news is

that salaries are up compared to last year. The bad news is that they have not risen much. Indeed, they have barely kept pace with the spiraling inflation rate. One of the factors that traditionally affected salary increases is the dp turnover rate: higher turnover means higher salaries. But this year, turnover is down substantially from previous years.

But when rummaging through the results of our salary survey, keep in mind that all that glitters is not

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## The turnover in dp personnel is down, and the demand for such people is slowing.

gold. Some noncash perks can be—and have been—arranged for by the more financially savvy dp people in lieu of a higher sum on the paycheck. While this practice is not yet widespread, several survey respondents indicated they had given up a few percentage points on their annual raise date in return for such perquisites as commutation fare, free parking in a city garage, a company car, or even child care reimbursements. Others considered corporate offers of expense-paid club memberships and free access to recreational facilities as a fair trade for the less hefty surge in salary. After all, if the company makes out-of-pocket payment for some of your personal expenses, you end up with that benefit plus the fact that your annual salary may come in under the line for the next higher tax bracket.

Our 1982 survey was conducted as a joint effort with Edward Perlin Associates Inc., a New York City-based management consulting firm with expertise in compensation and personnel practices. We have incorporated several changes from previous surveys to reflect the growth and increasing diversity of dp departments and to make the tabulations as meaningful and accurate as possible. Throughout, we have tried to compare people of similar functions and responsibilities rather than similar titles. We've asked for years of experience and number of people they supervise as another way to ensure that respondents matched their personnel to appropriate job descriptions on our questionnaire (see p. 128 for Job Description Guide). Other changes were designed to increase the statistical reliability of the results. Installation-size groups have been reduced from the five used last year to two: those with dp budgets over or under \$1 million. Industry categories have been reduced from 12 to nine, and what previously were regional breakdowns have been changed to city figures.

The net effect of these changes has been to reduce the presence in some categories of numbers so small as to be statistically invalid. Questionnaires were mailed to a randomly selected sample of DATAMATION's end-user audience. The data are based on the 300 valid responses that were returned. (Much to our surprise, nearly 70% of those who responded are in shops with dp budgets under \$1 million, and thus our decision to list only two installation-size groups.)

### INDUSTRY PAY IS UNIFORM

In-depth analysis of the survey data is not always simple, due to some imbalance of the sample.

After making adjustments for the factors involved, however, we see substantial uniformity across industries. The transportation and utility firms are higher paying than government, finance, and manufacturing, but not by much. A senior systems analyst, for ex-

ample, makes about \$34,600 in transportation and around \$34,000 in a utility firm, whereas the job pays an average of \$28,400 in government, \$29,500 in finance, and \$25,800 in manufacturing.

These latter categories, in turn, pay better than medical and educational firms overall. A senior systems analyst gets about \$23,200 in medical firms and about \$24,200 in education.

In management positions, manufacturing companies fare better, while utilities drop down a notch. A director of dp averages about \$38,000 in a manufacturing concern, which is higher than the \$36,800 made by his counterpart in the financial industry. It is still less, however, than the \$45,000 average for the same position in transportation.

Looking a little closer, we see that applications development jobs show a wider spread in pay level, and industries fall into four salary levels. At the top are government, transportation, and utilities, followed closely by finance and the "other" category. A more discernible break in pay rates separates these industries from insurance and manufacturing, and there is another break as we move down to medical and educational firms.

In operations positions, the government, insurance, and finance firms are followed closely by utilities and transportation; a gap separates these industries from manufacturing. Medical and education firms again pay the least.

Now that salaries are tabulated for major metropolitan areas instead of regions, comparisons can be made between, for in-

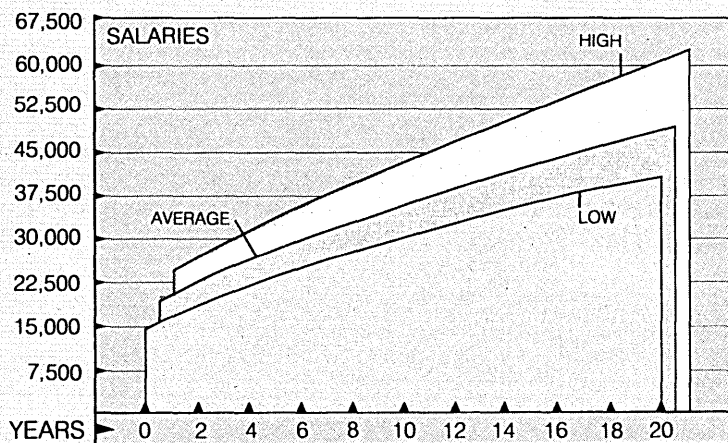
stance, New York and Philadelphia. These cities previously were listed in the same region, but each draws from a different labor market. Because salaries may differ widely between cities within a region, tabulations by metropolitan area should be more meaningful than our previously used "east north central" and "west south central" figures.

The top cities are fairly close in pay rates, and it is difficult to say which city pays higher than the next. Nonetheless, one can separate them into five pay levels. The most lucrative cities seem to be New York, Houston, Washington, and Atlanta; a notch lower are the two sets of twin cities, Dallas-Fort Worth and Minneapolis-St. Paul; at a slightly lower level are Chicago, Detroit, and Denver; at the fourth level, Boston; and at the bottom, Philadelphia and St. Louis. Insufficient data were received from Los Angeles for inclusion in this ranking.

The Big Apple is particularly lucrative for corporate staff, while the Washington area pays operations systems programming management and data communications managers best. But datacom analysts are paid poorly in the nation's capital, while Atlanta pays well for both managers and analysts in datacom. For junior management positions, New York and Texas seem to pay the best.

But there is a catch to all of this: different cities have different costs of living, and what will buy lamb chops in one city is only good enough for ground chuck in another. So if you're the corporate-level manager itching to move to greener pastures in New York, think twice. It costs more than 20%

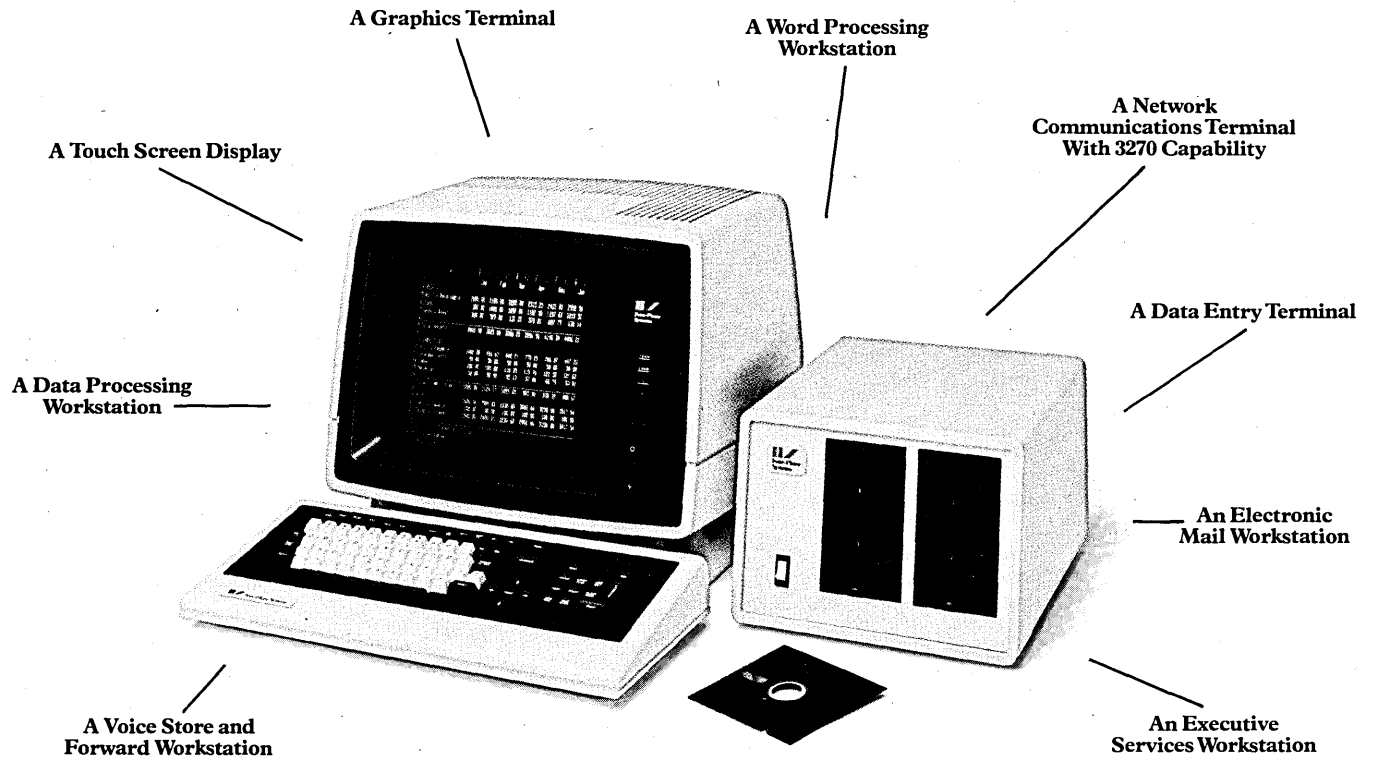
FIG. 1  
**SALARY VS. YEARS OF EXPERIENCE**  
SYSTEMS ANALYSTS/PROGRAMMERS



Source: EDWARD PERLIN ASSOCIATES, N.Y.C.

LOW: Represents trend line through lowest salary value reported for each number of years of experience.  
AVERAGE: Represents trend line through all values reported.  
HIGH: Represents trend line through highest salary value reported for each number of years of experience.

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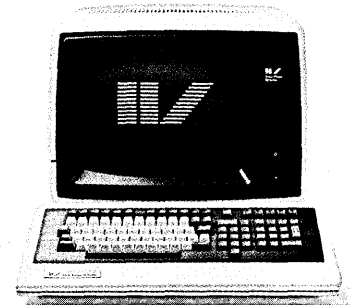
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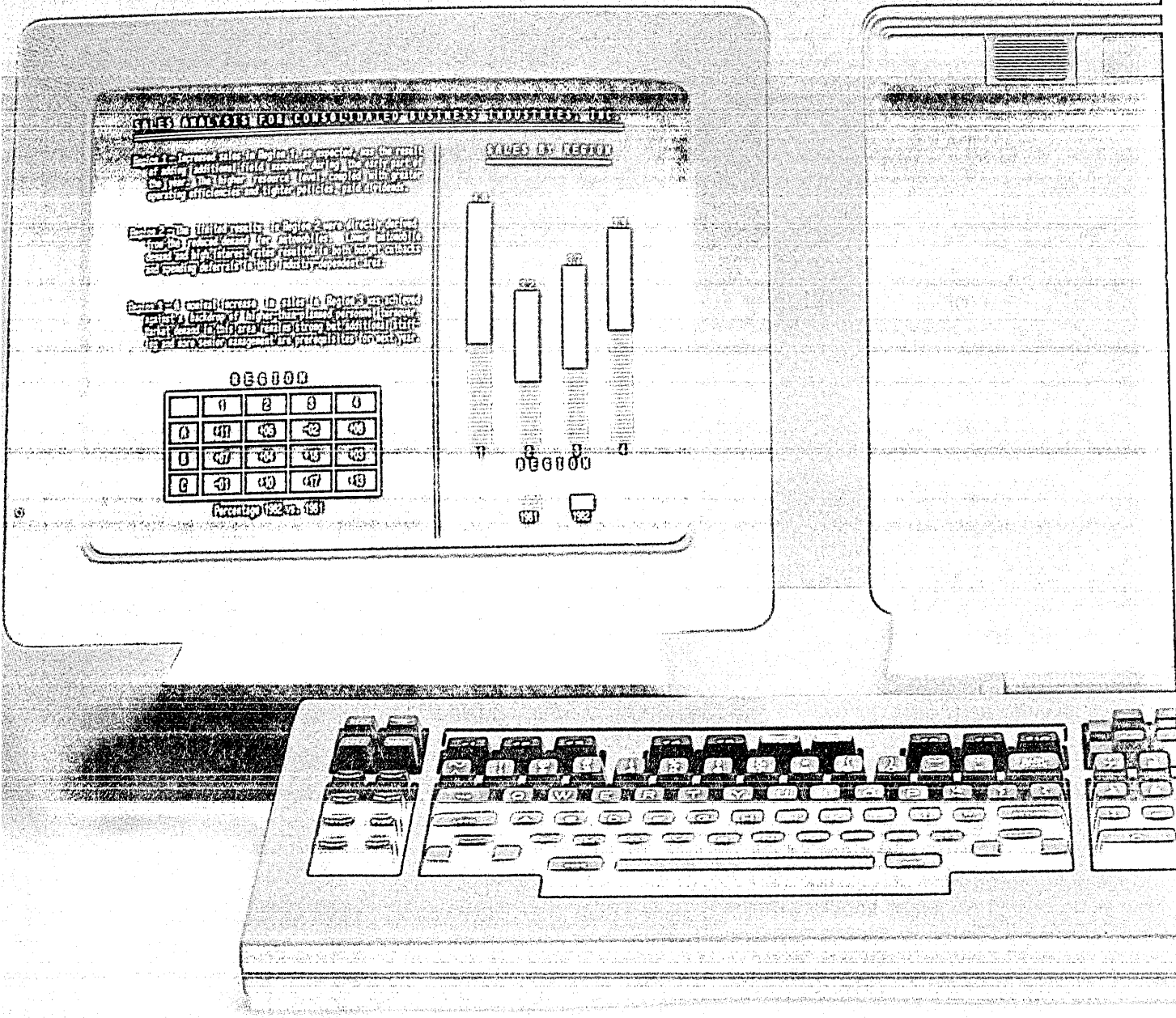
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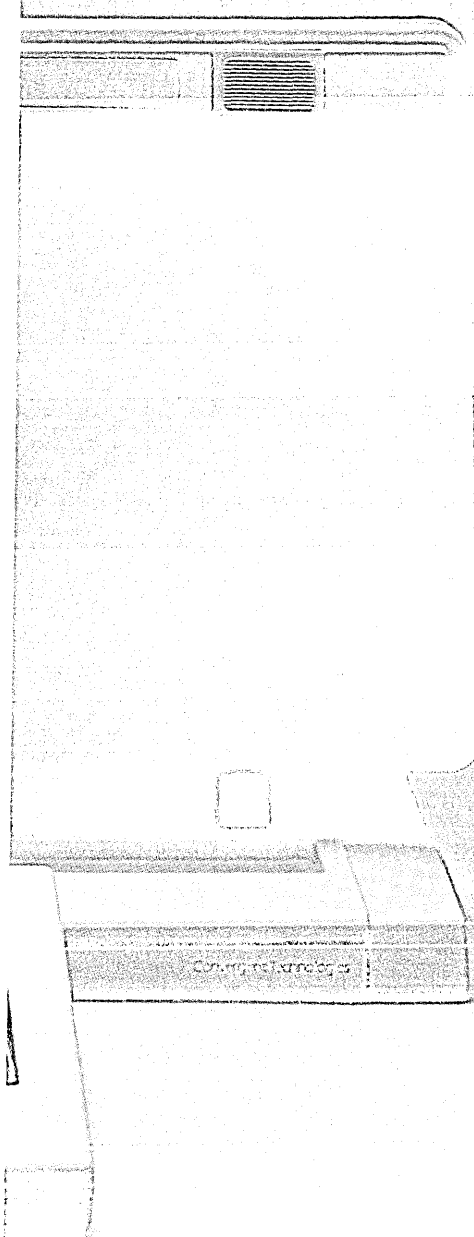
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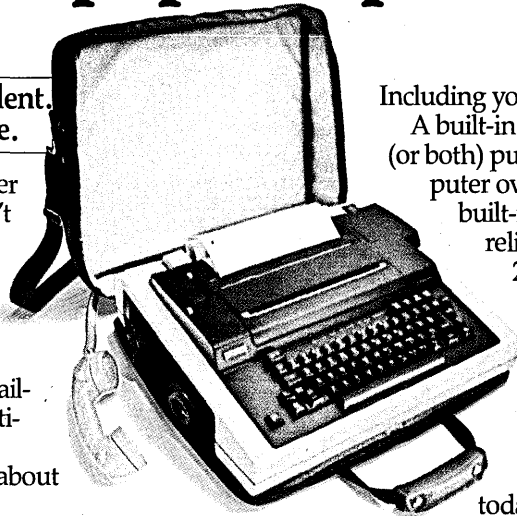
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TABLE I

## AVERAGE SALARY BY INSTALLATION SIZE DETERMINED BY TOTAL ANNUAL DP DEPARTMENT BUDGET

(IN THOUSANDS OF DOLLARS)

JOB TITLE	ALL	UNDER \$1 M	OVER \$1 M
<b>CORPORATE STAFF</b>			
1. Vice President of MIS	47.6	39.1	52.7
2. Director of Dp/MIS	39.6	34.2	50.7
3. Director of Communications	42.4*	35.0*	45.0*
4. Services Coordinator/User Liaison	31.6*	28.3*	34.9*
<b>SYSTEMS ANALYSIS</b>			
5. Manager	37.0	33.3	40.1
6. Lead	32.8	30.5	33.7
7. Senior	27.6	26.1	28.0
8. Intermediate	23.7	23.4	23.8
9. Junior	20.4	17.5	21.4
<b>APPLICATIONS PROGRAMMING</b>			
10. Manager	36.6	33.5	37.3
11. Lead	29.0	28.4	29.5
12. Senior	27.8	25.9	28.2
13. Intermediate	22.5	19.8	23.5
14. Junior	16.2	16.5	15.7
<b>SYSTEMS ANALYSIS/PROGRAMMING</b>			
15. Manager	34.1	31.2	37.1
16. Lead	32.2	27.8	35.6
17. Senior	28.4	26.9	28.6
18. Intermediate	23.4	20.3	25.7
19. Junior	19.4	19.0	19.8
<b>OPERATING SYSTEMS PROGRAMMING</b>			
20. Manager	34.8	32.9	35.5
21. Senior	32.5	23.8	35.3
22. Intermediate	27.2	22.3	33.5
23. Junior	24.3	19.1	26.6
<b>DATABASE ADMINISTRATION</b>			
24. Manager	39.2*	—	39.2*
25. Administrator	32.2	29.0	33.6
<b>DATACOM/TELECOM</b>			
26. Manager	40.2	23.0*	41.6
27. Analyst	28.1	—	28.1
<b>COMPUTER OPERATIONS</b>			
28. Manager	26.4	22.5	31.1
29. Lead	18.1	15.0	23.2
30. Operator	15.3	12.9	19.3
31. Magnetic Media Librarian	18.7	—	18.7
<b>PRODUCTION AND I/O CONTROL</b>			
32. Supervisor	20.6	15.7	22.4
33. Lead Production	17.2	14.3	18.6
34. Control Clerk	15.6	13.4	16.4
<b>DATA ENTRY</b>			
35. Supervisor	17.4	13.8	19.9
36. Operator	14.5	13.4	15.6
<b>OTHER</b>			
37. Word Processing Supervisor	17.0	16.1	17.7
38. Word Processing Operator	12.6	11.9	14.7
39. User Services Staff	18.9	18.0	19.8
40. Technical Writer	18.3	—	18.3
41. Librarian	15.6	16.5	14.9
42. Remote Site Administrator	28.6	22.0*	28.8
43. Remote Terminal Operator	23.1	16.2	24.0
44. Minicomputer Specialist	34.3*	—	34.3*
45. Training and Education Specialist	33.0*	—	33.0*
46. Computer Security Specialist	36.2	32.4	37.0
47. Field Service Engineer	19.0*	—	19.0*

\* Fewer than three installations reporting

— Data not available

additional to live in New York than in Baltimore, the major city whose cost of living most closely approximates the U.S. average. In fact, if you earn \$35,000 in Baltimore, according to a recent Chase Econometrics study, you need to earn \$43,398 to maintain the same standard of living in New York. In Washington, D.C., only a short hop from Baltimore, you'd need \$37,800. Of all the well-paying cities, only Atlanta has a below-average cost of living: \$31,814. Lower salaries are compounded by high costs of living in Boston and Philadelphia, where \$41,183 and \$36,351 are needed to equal \$35,000 in Baltimore. On the other hand, St. Louis, Denver, and Chicago are relatively inexpensive (\$33,047, \$33,979, and \$34,337, respectively).

Another factor meriting consideration is the location of a firm within a city or metropolitan area. The salaries paid in the major city within a metropolitan area often control the labor prices throughout the area. The marketplace comprising Long Island, Connecticut, and New Jersey pays salaries that are more in line with New York City salaries than with other suburban areas in the country, for example; this is not surprising, since they draw from the New York City labor pool.

Generally, salaries tend to decline as one moves away from the city center, but the rate of decline is by no means constant. In some cities, particularly the older, more centralized cities, salaries drop off quickly in sites away from the city center; in others, such as Houston, the market drops off slowly, if at all, because of the urban sprawl.

### SHOP SIZE AND SALARIES

The data seem to indicate a correlation between installation size and salary for almost every job category.

But there is also reason to believe that the relationship is not strictly between installation size and salary, but between technical sophistication and salary as well. This has been supported in conversations with both dp executives and corporate personnel executives. As a shop becomes more state of the art, with more on-line systems, greater use of communications software and gear, and more sophisticated operating environments, salaries there generally tend to rise.

As expected, this "dp sophistication" tends to increase with the size of the installation, but size is not necessarily the driving factor. There are some small shops at the top of the pay structure because of sophisticated environments or the applications they maintain. Conversely, there are large shops that lag behind the market pay rates because they still rely on more readily available batch-oriented personnel. Not many of the small, \$100,000 shops are dp-sophisticated, but for a vast range of budgets, salaries are

TABLE II

**AVERAGE SALARY BY INDUSTRY**

(IN THOUSANDS OF DOLLARS)

JOB TITLE	ALL	MFG.	FINANCE	INS.	GOVT.
<b>CORPORATE STAFF</b>					
1. Vice President of MIS	47.6	54.1	40.2	42.5	—
2. Director of Dp/MIS	39.6	38.0	36.8	34.3*	35.9
3. Director of Communications	42.4*	50.0*	45.0*	—	—
4. Services Coordinator/User Liaison	31.6*	36.0*	—	—	26.7*
<b>SYSTEMS ANALYSIS</b>					
5. Manager	37.0	30.6	37.8	30.5*	33.7
6. Lead	32.8	27.0	34.0	27.0*	33.4
7. Senior	28.4	25.8	29.5	—	28.4
8. Intermediate	23.4	24.4	—	19.5	23.3
9. Junior	19.4	17.5	—	16.0	—
<b>APPLICATIONS PROGRAMMING</b>					
10. Manager	36.6	31.0	38.5	33.3*	40.6
11. Lead	29.0	26.1	27.7	30.4	31.7
12. Senior	27.8	24.3	24.8	—	26.2
13. Intermediate	22.5	21.2	23.8	19.5	23.6
14. Junior	16.2	17.0	15.4	17.1	15.8
<b>SYSTEMS ANALYSIS/PROGRAMMING</b>					
15. Manager	34.1	31.5	36.0	33.3	—
16. Lead	32.2	25.5	31.8	27.7	32.3
17. Senior	28.4	23.9	28.7	26.4	24.9
18. Intermediate	23.4	23.1	—	23.1	19.5
19. Junior	19.4	20.5	—	17.8	15.8
<b>OPERATING SYSTEMS PROGRAMMING</b>					
20. Manager	34.8	30.7	36.0*	37.7*	39.9
21. Senior	32.5	28.6*	32.8*	31.1	38.8
22. Intermediate	27.2	21.2*	—	28.1	31.0
23. Junior	24.3	18.2	—	—	29.5
<b>DATABASE ADMINISTRATION</b>					
24. Manager	39.2*	—	—	37.0*	44.0*
25. Administrator	32.2	33.0*	—	—	33.8
<b>DATACOM/TELECOM</b>					
26. Manager	40.2	—	35.6	32.5*	46.3
27. Analyst	28.1	—	27.0	22.0*	30.5
<b>COMPUTER OPERATIONS</b>					
28. Manager	26.4	24.2	25.3	28.7	25.8
29. Lead	18.1	14.8	16.4	16.8	20.3
30. Operator	15.3	13.1	13.6	12.1	18.6
31. Magnetic Media Librarian	18.7	15.2	—	13.5	13.5*
<b>PRODUCTION AND I/O CONTROL</b>					
32. Supervisor	20.6	17.2	17.4	26.0	23.5
33. Lead Production	17.2	13.8	12.1	20.8	18.2
34. Control Clerk	15.6	12.9	11.5	14.2	13.3
<b>DATA ENTRY</b>					
35. Supervisor	17.4	16.2	14.6	17.4	17.5
36. Operator	15.6	12.4	11.0	14.5	13.3
<b>OTHER</b>					
37. Word Processing Supervisor	17.0	14.0*	18.5	20.7	—
38. Word Processing Operator	12.6	9.6	13.6	12.2	12.0
39. User Services Staff	18.9	—	—	19.8	—
40. Technical Writer	18.3	—	—	18.0*	—
41. Librarian	15.6	13.4	—	—	—
42. Remote Site Administrator	28.6	27.5	30.0*	—	—
43. Remote Terminal Operator	23.1	23.1	—	—	—
44. Minicomputer Specialist	34.3*	—	—	—	35.4*
45. Training and Education Specialist	33.0*	—	—	35.0*	—
46. Computer Security Specialist	36.2	—	—	—	34.0*
47. Field Service Engineer	19.0*	—	—	—	—

\*Fewer than three installations reporting —Data not available

MEDICAL	TRANS.	EDUC.	UTIL.	OTHER
37.3*	68.5*	—	50.0*	59.5
33.0	45.5	32.4	36.9	41.5
—	39.6*	—	—	30.0*
23.9*	—	—	—	—
42.0*	47.5	34.5	—	34.8
30.3	38.4	33.3	—	—
23.2	34.6	24.2	34.0*	34.7
—	—	20.3	—	23.0
—	—	18.5	—	22.0
—	37.8	28.2	—	34.2
25.5	33.1	23.6	—	29.7
22.5	32.2	21.2	—	24.8
19.1	25.2	18.4	21.2	22.0
17.3	19.2	15.5	21.5*	17.2
31.0	37.8	30.9	43.8	33.4
27.0	30.0	26.0	42.0	29.8
23.0	28.6	24.8	36.7	25.9
16.0*	23.8	17.9	26.8	22.8
16.0*	18.1	16.1	21.0	16.2
38.0*	37.4*	31.9	49.0*	31.8
24.0*	33.6*	24.1	38.9	26.8
—	24.4	21.1*	34.6	26.5*
—	21.6	—	28.2	22.0*
—	36.8*	—	—	—
—	27.6*	23.3*	34.3*	34.8*
—	44.0*	23.0*	44.0	—
—	25.2	20.2*	32.0	—
22.5	31.1*	20.4	32.1	28.2
15.8	28.7	15.7	26.5	18.8
13.0	18.6	13.8	17.4	15.5
—	24.7	—	23.1	17.0
13.2*	31.6	20.0	33.0*	17.5
13.0*	23.8	14.1	24.0*	13.9
13.0*	—	11.4	21.3	13.8
12.5*	21.4	13.5	22.8	15.7
11.8	18.2	11.4	17.7	12.6
17.0	21.6*	—	17.7	18.3
—	—	11.9	13.5	11.5
13.8*	—	13.5	—	18.5
—	—	17.1*	24.7*	—
—	22.2*	—	—	—
—	—	—	—	—
—	—	—	—	—
—	—	—	—	28.0*
—	34.9*	29.0*	29.0*	—
—	43.6*	—	34.0*	—
—	—	19.0*	—	—

driven by the sophistication factor.

There is no simple way to measure dp sophistication quantitatively, that is, to come up with a meaningful index figure. Provided one could identify the factors that contribute to dp sophistication, could they be expressed in a single figure that would make any sense? Or would a profile, a string of numbers be better? So far, we've seen no such thing as a "Data Processing Sophistication Index," but we're working on it.

**PERSONNEL TURNOVER DOWN** The turnover in dp personnel has come down out of the stratosphere, apparently because of the recessionary economy and prevailing uncertainty about the future. The increase in demand for dp professionals has been running about 15% a year. A large number of firms are now reporting plans for a stable size of work force for the next 12 months because of budget freezes, and they're using head-count controls to stay within plan—"Replace people who leave, but don't hire more; keep your head count," as one dp manager put it.

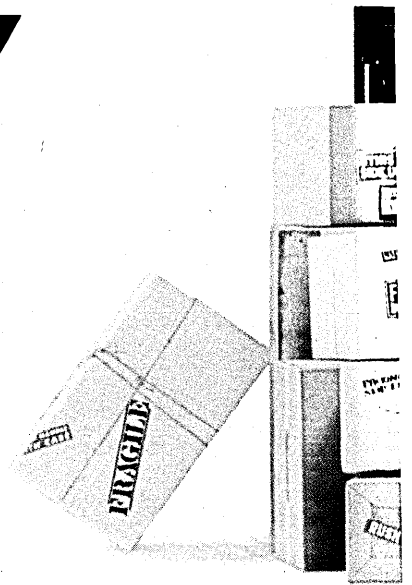
Previously some firms could never reach their maximum authorized complement of dp personnel because their hiring couldn't keep up with turnover. People were leaving faster than qualified replacements could be found. But now that many other firms are being held back from adding dp personnel, the high turnover organizations may well grow to their authorized numbers; they're competing for dpers against fewer other firms. This factor, coupled with some growth at other firms, should increase the overall total number of personnel in the dp work force, but probably by only about 10% for this next year.

Although turnover among dp personnel has been running about 20%, it's now about 15%, still high for a professional area but close to the lowest level for dp in recent times.

Many salaries have been moving up fairly quickly in the last decade, primarily due to inflation. But, in fact, "real" salaries, as measured in buying power, have decreased slightly. In the past few years, dp salaries have increased 12% to 15% a year, keeping well ahead of the rate of inflation. The average dp salary is now about \$24,000, give or take a thousand dollars. But lately the rate of increase has dropped off, and for the next year will be challenged to stay higher than inflation.

But despite the fact that salaries aren't increasing at the percentages they used to, the biggest problem for dp managers is an old one: the continuing shortage of qualified dp professionals. Personnel management—recruiting and maintaining a good staff—is still very likely the greatest challenge of the job.\*

**"THE GREAT  
SHIPPING  
DEPARTMENT  
KNOWS HOW  
TO PASS THE  
BUCK!"**



**ANYTHING GOES**

**T** In every great shipping department, there's somebody who, no matter what comes in, no matter when (usually 5 minutes before closing), can still get it out.

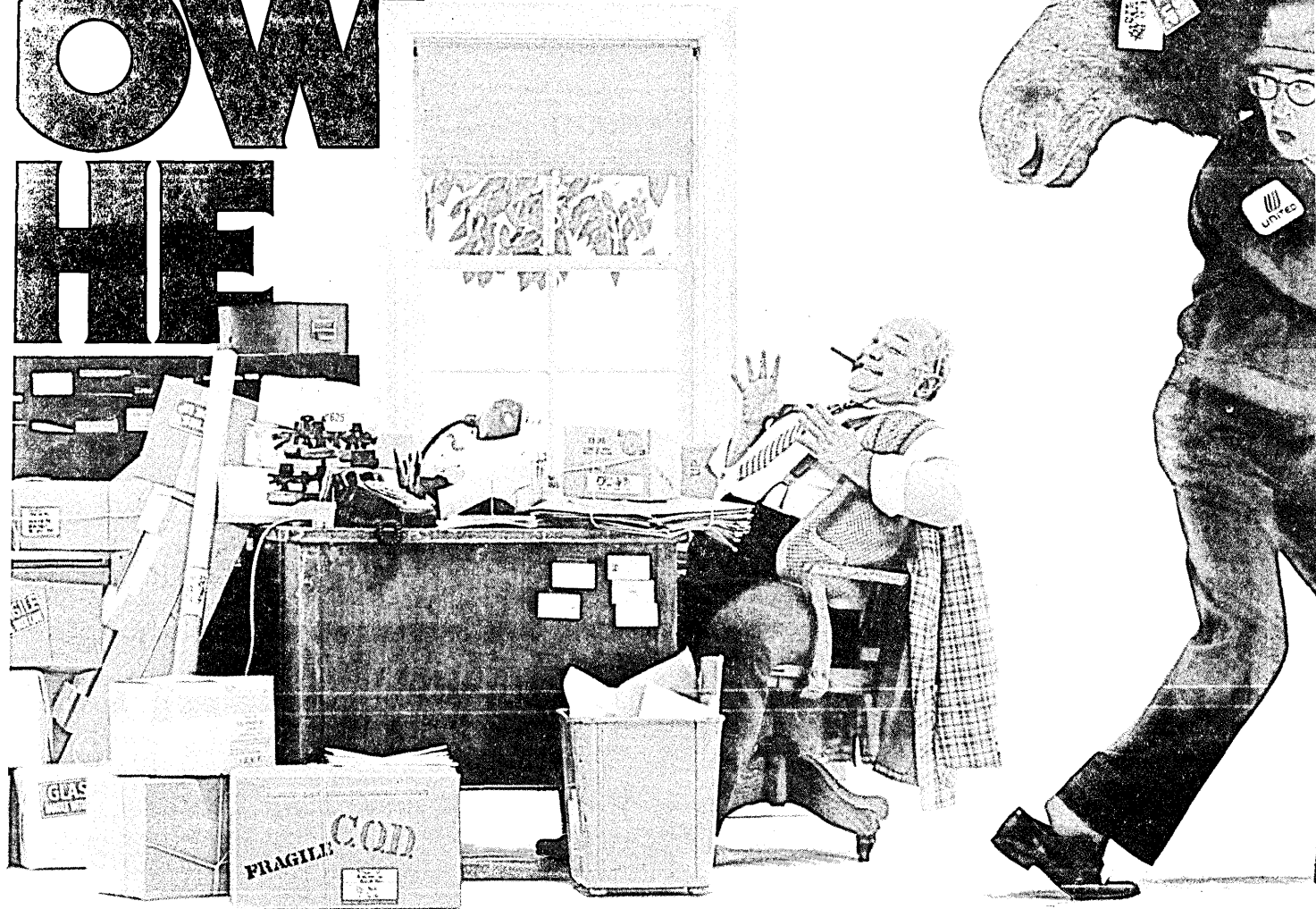
While everyone around him panics, he simply picks up the phone and dials the same number time after time, job after job. The number of United Air Cargo. That one call starts **ANYTHING** . . . no matter how big, small, awkward or fragile, on its way to **ANYWHERE** . . . whether anywhere is Canton, Ohio or Canton, China (if it's China, he knows United Air Cargo will arrange the connecting flights for him, deal with tariff regulations, customs, everything).

**ANYTIME** . . . next week.

Tomorrow. Even the next flight out today!

Some day, they'll no doubt make a plaque for this guy. It will simply read, "The buck *never* stops here."

**ENT  
OW  
HE**



**UNITED AIR CARGO**

 **UNITED AIRLINES**

CIRCLE 100 ON READER CARD

TABLE III

**AVERAGE SALARY BY MAJOR CITIES**

(IN THOUSANDS OF DOLLARS)

JOB TITLE	ALL	BOSTON	NEW YORK	PHILA.	WASH.
<b>CORPORATE STAFF</b>					
1. Vice President of MIS	47.6	43.5	63.7	—	46.5*
2. Director of Dp/MIS	39.6	37.4	51.1	34.4	51.4
3. Director of Communications	42.4*	—	—	—	—
4. Services Coordinator/User Liaison	31.6*	—	—	25.0*	36.0*
<b>SYSTEMS ANALYSIS</b>					
5. Manager	37.0	35.0*	37.6	35.2	46.8
6. Lead	32.8	28.5*	34.8	34.5	39.8
7. Senior	27.6	26.0*	31.6	26.0	34.1
8. Intermediate	23.7	22.3*	27.3	20.0	25.0
9. Junior	20.4	18.5*	21.2	—	—
<b>APPLICATIONS PROGRAMMING</b>					
10. Manager	36.6	34.0	36.5	45.5*	45.0
11. Lead	29.0	28.6	32.0	25.3*	33.5
12. Senior	27.8	26.3	29.4	24.0*	33.6
13. Intermediate	23.4	19.0*	22.0	17.0*	26.6
14. Junior	16.2	13.2*	15.0	16.0	14.6
<b>SYSTEMS ANALYSIS/PROGRAMMING</b>					
15. Manager	34.1	42.8*	37.5	—	36.8
16. Lead	32.2	29.0*	32.0	26.0*	33.6
17. Senior	28.4	28.0	30.0	—	28.9
18. Intermediate	22.9	19.7	26.5	19.0*	23.2
19. Junior	19.4	15.0*	23.0*	16.0*	14.6
<b>OPERATING SYSTEMS PROGRAMMING</b>					
20. Manager	34.8	33.0	40.0	—	44.1
21. Senior	32.5	—	33.5	26.0*	39.7
22. Intermediate	27.2	—	25.0	—	33.0
23. Junior	24.3	—	21.0	—	30.9
<b>DATABASE ADMINISTRATION</b>					
24. Manager	39.2*	36.0*	40.5*	—	41.2*
25. Administrator	32.2	—	33.0	30.0	35.6
<b>DATACOM/TELECOM</b>					
26. Manager	40.2	—	43.2	23.0*	45.7
27. Analyst	28.1	—	34.2	—	27.4
<b>COMPUTER OPERATIONS</b>					
28. Manager	26.4	28.0	28.7	27.1	29.9
29. Lead	18.1	16.0	18.1	20.7	28.3
30. Operator	15.3	14.1	15.6	15.5	23.8
31. Magnetic Media Librarian	18.7	—	—	17.5*	14.6
<b>PRODUCTION AND I/O CONTROL</b>					
32. Supervisor	20.6	16.0	19.5	17.0	26.6
33. Lead Production	17.2	15.0	13.5*	—	21.0
34. Control Clerk	15.6	13.0	13.2	—	11.5
<b>DATA ENTRY</b>					
35. Supervisor	17.4	17.8*	20.0	14.0*	24.2
36. Operator	14.5	15.0	15.7	10.3	18.5
<b>OTHER</b>					
37. Word Processing Supervisor	17.0	—	19.3	—	18.5*
38. Word Processing Operator	12.6	—	12.7	11.0	13.3
39. User Services Staff	18.9	—	21.5	—	—
40. Technical Writer	18.3	—	19.0*	—	—
41. Librarian	15.6	—	—	—	—
42. Remote Site Administrator	28.6	30.0	27.5	—	—
43. Remote Terminal Operator	23.1	—	—	—	—
44. Minicomputer Specialist	34.3*	—	31.0*	—	37.0
45. Training and Education Specialist	33.0*	—	—	29.0*	37.0*
46. Computer Security Specialist	36.2	—	—	—	46.2
47. Field Service Engineer	19.0*	—	—	—	—

\* Fewer than three installations reporting — Data not available



ATLANTA	DENVER	HOUSTON	DALLAS/FT. W.	CHICAGO	MINN./ST. P.	DETROIT	ST. LOUIS
—	—	55.0*	49.3	—	54.0*	—	—
48.7	60.0*	48.8*	37.7	—	35.9	33.8	34.1
—	—	—	47.5*	—	39.3*	—	—
—	—	—	36.0*	—	—	—	—
—	35.0*	—	38.3	—	31.2*	34.5*	—
—	—	—	35.3	32.3*	29.8	—	—
—	—	30.0*	30.0	30.0*	26.2	25.0*	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	43.3*	36.0	34.9	33.0*	30.0*
—	30.0	—	29.6	31.0	33.0	30.6*	—
—	25.0	—	26.1	24.5	26.8	—	19.7*
22.0	—	21.3	23.0	22.1	23.9	20.4	—
16.0	—	—	18.8	18.0	18.6	18.2	—
39.0	—	34.7	38.0*	34.0	34.9	—	29.1*
34.0	—	34.4	29.8	30.0	30.0	—	—
27.5	—	32.5	28.0	27.2	27.7	22.1	25.3
20.0	—	26.4	22.0	24.0	—	—	24.4
13.0	—	22.0	21.0	16.0*	19.3	—	—
—	29.0	—	38.3	—	33.6*	—	—
—	—	38.8	34.8	—	30.5	—	32.0*
—	—	31.0	29.1	—	22.3	—	28.5*
—	—	24.4	—	—	20.4	—	—
—	—	—	—	—	37.4	—	—
29.5	—	—	—	—	29.9	—	23.8*
48.0*	—	—	45.0*	—	39.0	—	—
37.5	—	—	36.0*	—	25.2	—	—
46.5*	24.0	30.2	29.5	25.1	36.5	25.2	17.3
17.0*	—	23.6	18.3	16.5*	20.9	17.0	—
13.4	15.0	14.9	15.2	16.1	17.4	14.6	14.7
—	—	18.7*	16.6*	—	—	—	—
—	—	—	17.7	17.0*	27.8*	—	—
15.0	—	—	—	—	—	18.5*	—
13.0	—	—	13.2	16.0	—	14.7*	15.7*
15.0	—	21.5	14.1	15.0	16.8	26.5*	—
11.1	—	15.4	11.8	12.4	16.4	13.0	12.2
—	—	—	18.3*	—	18.3	—	—
—	—	13.5	12.4	—	11.8	—	—
—	—	—	—	—	—	—	—
—	—	24.7	24.7*	—	—	—	—
—	—	—	—	13.1*	22.2*	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—

## JOB DESCRIPTION GUIDE

The following 47 job descriptions were used for classification of data processing personnel on the 1982 salary questionnaire. Respondents were asked to match their personnel to our job descriptions and levels as closely as possible.

1. *Vice President of MIS:* The senior executive for all corporate information systems. Responsible for long-range planning, budgeting, and operations.
2. *Director of Dp:* In charge of all dp at the divisional/departmental level. Responsibilities parallel those of corporate officers, but may be at least partially guided by decisions made at corporate level.
3. *Director of Communications:* Responsible for planning, implementing, and managing all corporate telecommunications facilities.
4. *Services Coordinator/User Liaison:* Interfaces between dp department end users; represents users when operational problems occur. (For the job levels in each of the next four categories, see the separate box on job levels.)
- 5-9. *Systems Analysis:* Confers with users to define and formulate logical statements of business problems and devise procedures for solutions through use of dp systems.
- 10-14. *Applications Programming:* Develops, designs, and prepares computer programs.
- 15-19. *Systems Analysis/Programming:* Performs the functions of both the systems analysis and applications programming positions.
- 20-23. *Operating Systems Programming:* Programs, maintains, and introduces modifications to systems software.
24. *Manager of Database Administration:* Plans, organizes, and schedules the activities of the database section. Establishes standards, maintains dictionary, coordinates corporate database needs.
25. *Database Administrator:* Analyzes an application's computerized information requirements, coordinates data collection and storage needs.
26. *Data Communications/Telecommunications Manager:* Responsible for the design of data communications networks and the installation and operation of data links.
27. *Data Communications Analyst:* Specializes in network design, traffic

analysis, and data communications software.

28. *Manager of Computer Operations:* In charge of computer operations, including scheduling, assignment of operators, and monitoring efficiency.
29. *Lead Computer Operator:* May be responsible for the operation of large-scale computers for the duration of a shift or the operation of a remote site.
30. *Computer Operator:* Assists in running the computers and may operate console under general supervision.
31. *Magnetic Media Librarian:* Maintains the library of magnetic tapes, disks, and/or cartridges.
32. *Production Control Supervisor:* Responsible for setting up and scheduling jobs for processing so as to maximize utilization and meet turnaround requirements.
33. *Lead Production Control Clerk:* Responsible for the data control function for the duration of a shift or the data control function of a remote site.
34. *Production Control Clerk:* Prepares jobs for processing, enters the appropriate job commands, gathers output for routing.

### JOB LEVELS:

*Manager:* Advanced degree and minimum five years' experience or equivalent combination. Strong management skills, works independently, performs personnel evaluation, budgeting progress reporting, and project management.

*Lead:* BS and minimum four years' experience in dp with two of those years in a supervisory capacity. Works on own and performs all levels of supervision, generally as a project leader.

*Senior:* BS and minimum four year's experience including some supervision.

*Intermediate:* BS and minimum two years' experience or equivalent combination. Works on own most of the time, requiring direction on some activities.

*Junior:* Two to four years' college and minimum six months' experience or equivalent combination. Directly supervised but works on own on some aspects of job.

35. *Data Entry Supervisor:* Responsible for a staff that performs data entry and verification functions.

36. *Data Entry Operator:* Qualified to operate one or more data entry devices; requires only general supervision.

37. *Word Processing Supervisor:* Responsible for supervising word processing equipment, operators, work flow, setup, and distribution of results.

38. *Word Processing Operator:* Qualified and experienced in the operation of intelligent typewriters, wp systems, terminals for text editing/wp.

39. *User Services Staff:* Knowledgeable in broad aspects of data processing; provides guidance to users; helps in debugging specific problems and understanding system procedures.

40. *Technical Writer:* Writes manuals for application systems for user and internal reference.

41. *Librarian:* Responsible for organizing and maintaining the library of technical documentation.

42. *Remote Site Administrator:* In a distributed environment, often not a dp professional, but manages a remote site as an additional duty. Responsible for physical security, sets operational priorities, supervises operations, and initiates problem-determination actions as required.

43. *Remote Terminal Operator:* Operates terminal and telecom facilities remote from central site.

44. *Minicomputer Specialist:* Generalist in a single make/model/configuration of minicomputer hardware installation, application design, programming, testing, and initial production operation. Can troubleshoot, diagnose, and frequently can repair hardware and software as required.

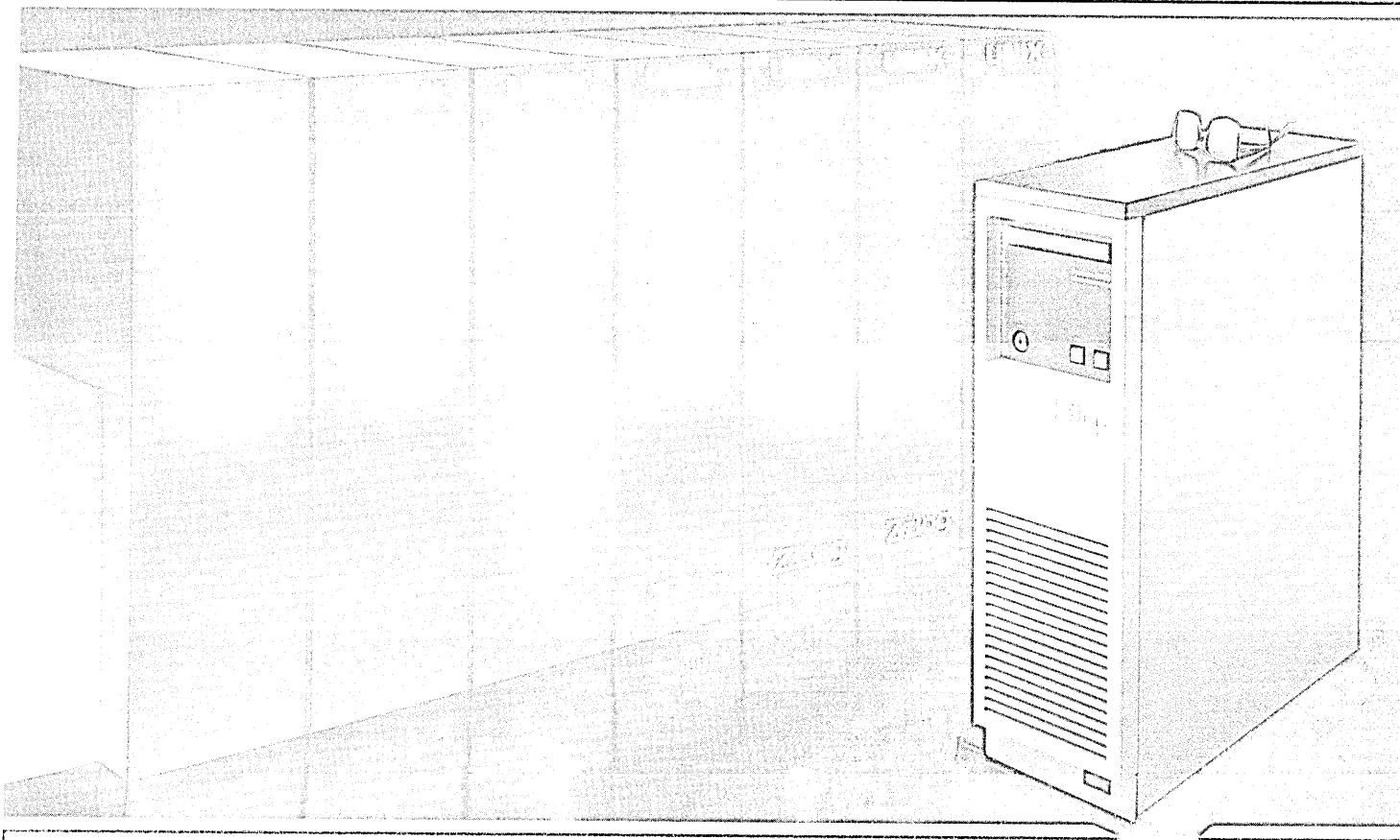
45. *Training and Education Specialist:* Organizes, prepares, and conducts training courses for dp personnel under general supervision.

46. *Computer Security Specialist:* Concerned with protection of data and computer resources.

47. *Field Service Engineer:* Vendor-trained electronic technician who can service mechanical equipment, replacing and repairing malfunctioning electronic components; also performs software-problem determination.

\*

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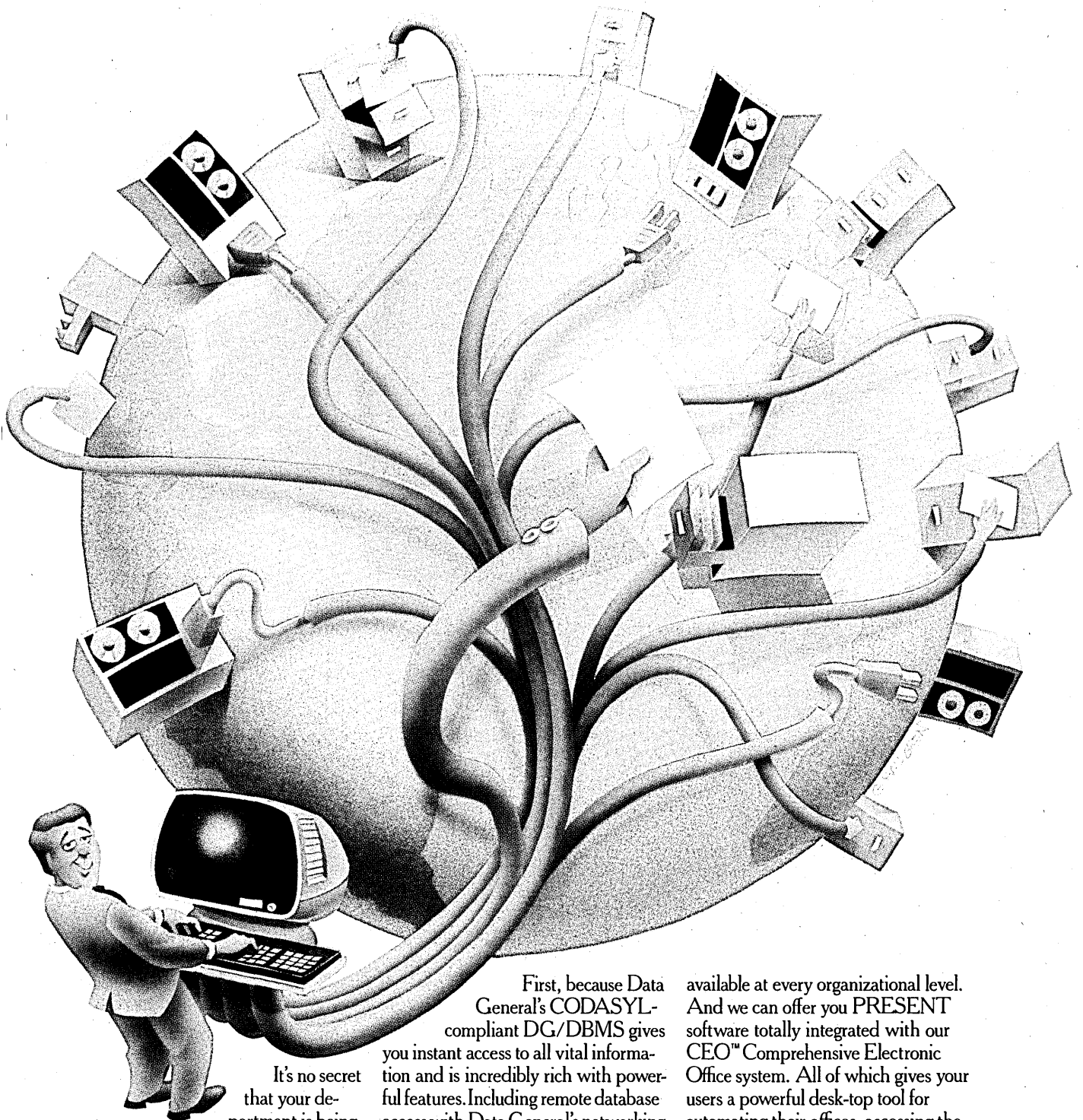
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SOFTWARE.**



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OUT OF COMPUTERS.

**One way to ease the programmer shortage is to simplify programming and let the users do it themselves.**

# VISUAL PROGRAMMING

by Alan MacDonald

There has been a somber cloud hanging over the information processing marketplace for the past year or more, and it has grown increasingly dark and gloomy during the past few months. The reason for this pocket of internalized gloom within an industry that looks rosy from the outside is the problem of programming/software.

Many of the respected authorities within our industry have been warning that the applications increases will not be attained, the current and future backlogs of applications will swamp our ability to function within the MIS community, and even the most optimistic projections of programmer productivity gains will never keep up with increased demands.

Even the popular business press has picked up on the programming/software problem, pointing out that the continued growth of the information processing industry may be in doubt, artificially limited by the failure of software development to keep pace with hardware improvements.

The conceptual difficulty in overcoming this software limitation problem lies in the traditional manner in which those closest to the problem view programming and software. This cautious view is based on the real historical evidence—and firsthand experience—that the creation of software has been a particularly difficult and arduous task.

The tentative steps that are typically suggested in overcoming this limitation are based on past empirical evidence. Among them: reuse as much existing software as is possible or spread the cost of new software development across a very large base of users. Another approach heralded as a possible solution to the software problem is to increase somehow the productivity of programmers.

Because of past investments and efforts involved in reaching a particular plateau of software methodology, there is a tendency to concentrate on the standardization and continued reuse of that development method-

ology and the body of software that was created through it. Examples of this tendency include hanging on to OS/360 software and the more recent temptation to view the vast body of CP/M-based personal computer software as a sacred treasure.

Neither the reuse of existing software nor the attempts to improve the relative productivity of a moderately limited number of programmers will be sufficient, however, to satisfy the insatiable demand of end users for the useful application of information processing technology. In fact, Daniel McCracken, the author of one of the first books on programming digital computers, recently said, "I think we're in the process of switching away from procedural languages. . . . If you think of the problem as programmer productivity, you've prejudged how the work ought to be done. Instead we should discuss applications development productivity. . . . If we supply 'tools' for the end user to handle an application on his own, we avoid communication problems between the computer specialist and the end user. End users are getting a lot of work done in less time than it would take merely to explain what they want to a programmer."

Author James Martin has also called for a revolution in methodology. Martin suggests that the coming years will involve "chaos" with respect to traditional computer programming languages, and that none of the traditional implementation methodologies will survive. Instead, he suggests that revolutionary design methodologies will be employed to implement the high percentage of applications that are database oriented.

The consensus of industry participants in the microcomputer software business, however, does not seem to acknowledge revolutionary improvement in development methodology. In fact, a recent Mini-Micro conference, "Future Directions in Microcomputer Software," concluded that the future software development methodology will not be substantially different from the past, traditional methodologies employed on mainframes.

Some of the quotes from panel participants include the assessments that "the micro world is a close parallel to the mainframe world. . . . we are going around in a loop," and "not much has been done with microcomputer software that has not been attributable to new hardware." A general comment was that it continues to be hard to get software up.

Not surprisingly, the consensus of microcomputer software experts who are approaching the problem in the same context as their predecessors see little or no opportunity for a conceptual breakthrough. They view the microcomputer or personal computer as no more than a less expensive engine on which to reimplement the software techniques devised over the past two decades on mainframe computers.

## EXPERTS RESIST CHANGE

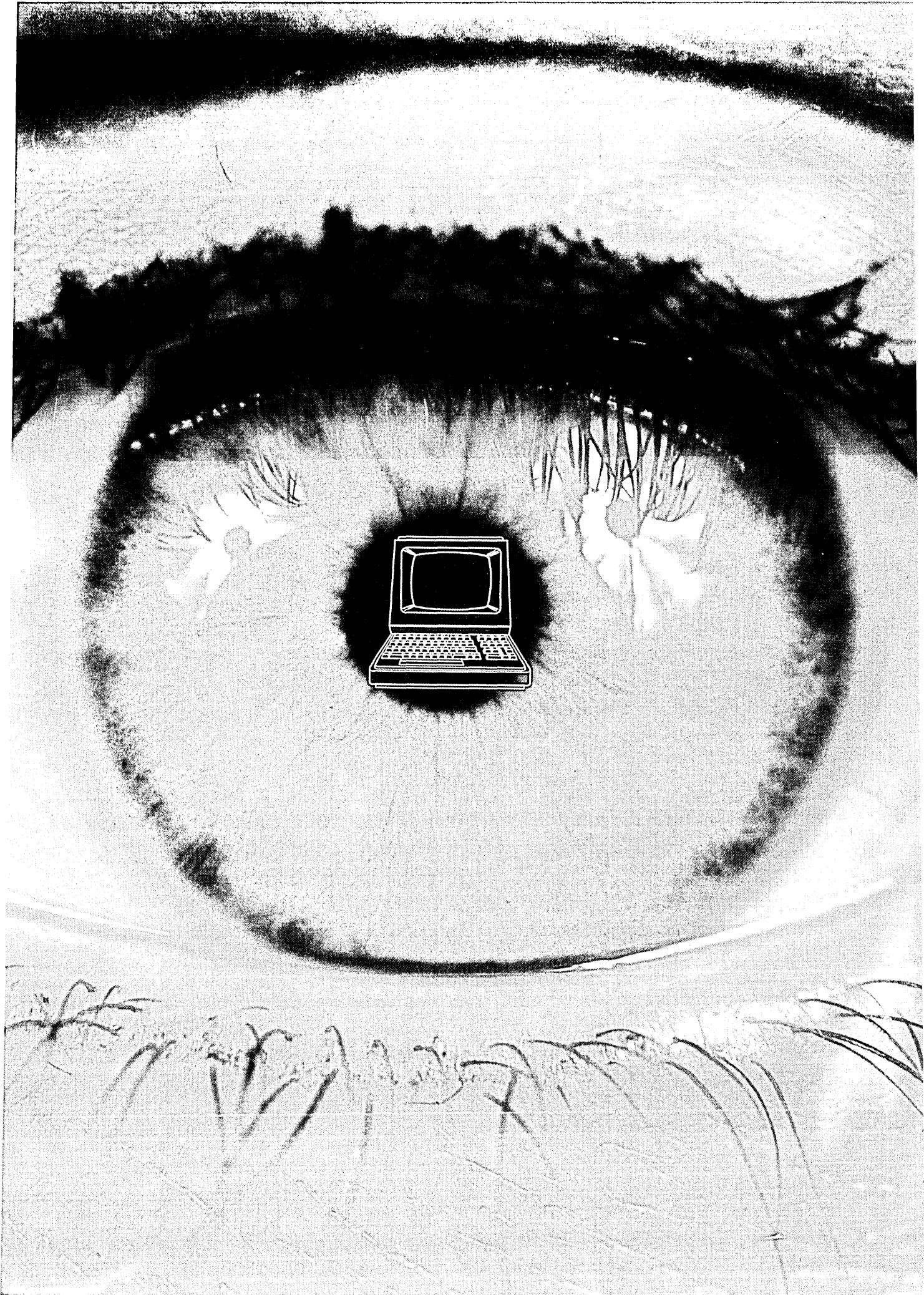
There appears to be a moderate reluctance on the part of microcomputer software experts to recognize the opportunity for a revolutionary conceptual breakthrough in the area of software. This may well be based on the perspective from which they view the issue. But the real extent of the resistance is not seen until one looks at the vested interests and extreme linkage with the past which are common to the software language standardization fraternity, and the traditional commercial dp community.

In *Programming Language Standardization*, Dr. T. William Olle, a member of the ISO working group associated with database management, recounts the subjugation of this inherently novel methodology to the interests of the traditional programming language fraternity.

"In May 1974, the top committee on data processing standards of the International Standardization Organization, ISO/TC97, assigned responsibility for database management to its subcommittee, SC5, responsible for programming languages. It further instructed SC5 to establish a study group to recommend the actions required.

"This ISO study group on DBMS was

PHOTOGRAPH BY MITCHELL FUNK



## There is an insatiable demand by end users for the useful application of information processing technology.

duly launched and met four times between June 1975 and November 1977, when it took the opportunity of the fact that its parent committee SC5 was meeting during the same month, to seek formal status as an ISO working group with a more clearly defined scope of work. The group became ISO/TC97/SC5/WG3 on DBMS. . . ."

Thus, this standardization body presumed that the newer occurrence of database management was to be pigeonholed within the traditional framework of data processing methodology, and specifically subservient to the programming language subcommittee. This is an expected danger in the very activity of standardization organizations: that a new-born but potentially broader methodology will be tucked under a more traditional category. The real danger, of course, is that such novel methodology will be stunted and constrained by subjugation.

Dr. Olle goes on to categorize the somber reaction of the established "programming language fraternity" to DBMS in general, and to the potentially amazing opportunities opened up by relational DBMS in the 1980s.

"The programming language fraternity has seen this all before. . . . Predictably, considerable progress will be made during the '80s on these problems. However, the community of data processing users will not accept evolution any more than they did in the mid-'60s. . . ."

He concludes: "It should be clear from the foregoing discussion that standardization in the area of database management has far to go. Although standardization in programming languages should settle down somewhat during the '80s, the most significant perturbation to the otherwise *tranquil* picture will be the infusion of database facilities into the programming languages. *Database management can never be divorced from programming languages.*" (Emphasis added.)

A solution to the restraints inherent in traditional programming already exists in the form of visual programming. What is visual programming? Simply stated, visual programming is a methodology by which a person can direct a computer by "showing" it rather than "telling" it what to do.

Visual programming represents a radical departure from the syntactical interfacing procedures which are common to traditional programming languages, and instead employs a "visual" interface between the user and the system. The user does not write a lengthy and exacting description of how his information should be formatted for entry into or retrieval from the system. Instead, he simply draws a visual representation of how he would like the information to be entered or retrieved.

Traditional programming languages operate on descriptive principles and employ syntactical rules for the interface between the programmer and the computer system. The specific languages available to support this methodology have evolved from languages that are very close to the natural language of the computer (machine language) to languages that are closer to the natural language of the programmer (BASIC, COBOL, etc.). This evolution of programming languages, however, has been just that, evolutionary rather than revolutionary, and has not made the conceptual leap to benefit from the natural tendency of people to draw pictures or images of the information processes that they are attempting to perform. In fact, in COBOL there is a "picture" clause, but, ironically, it is a highly cryptic and syntactically exacting description of what the crt screen should look like, rather than a simple visual image of what it does look like.

Though experts may argue about the exact chronology of programming language evolution, and specific examples of the three generally accepted generations of computer languages (machine, assembler, and "higher level"), there is no question that this evolution has always been conceptually based on the notion of a syntactical language as the point of interface between human and machine. Likewise, the evolution from batch programming to interactive programming (particularly in higher level languages) deserves credit for promoting programming productivity by speeding up the descriptive cycle through which the programmer instructs the system, but the language vehicle is still the same.

Probably because visual programming represents such a revolutionary leap in the fundamental methodology through which the user interfaces to a system, it is not surprising that it has not been recognized as a programming language per se. Nor should it be. Visual programming is not a programming language, but rather a change in the methodology of programming which steps beyond strict dependence on language. As such, visual programming is not a fourth generation programming language, nor a non-procedural programming language, nor a natural programming language. Rather, it is a revolutionary, not evolutionary, step which alters the interface methodology between the user and system from one primarily based on language syntax to one primarily based on visual images.

### YOU GET WHAT YOU SEE

The history of visual programming is actually quite long and varied, and there were dozens of actual working examples of the phenomenon before a common name was proposed.

The heritage of visual programming springs primarily from crt-based word processing and intelligent data entry during the 1970s. (Database query facilities and simplified report generators should also receive some credit for parenting visual programming.)

If we look specifically at the development of word processing, we should be able to see very clearly the conceptual leap from syntactical and command-string-oriented human interface to the highly visual interfacing that characterizes successful word processing systems today. It will also be clear in hindsight why there was such confusion about the supposed distinctions between word processing and data processing.

The comparison between word processing and data processing which reached a heightened pitch (and some competitive fervor) during the late 1970s was not actually a confrontation between processing words and processing data. Rather, it represented a major conceptual confrontation between a revolutionary visual approach to man-machine interfacing and the traditional syntactical language approach. During this period, both types of systems were actually processing both words and data and could accurately be termed information processing systems. But the fundamental difference was that word processing systems had already gone through a revolution in their human interface methodology. In fact, these systems from the mid-1970s on were actually termed "visual" word processors, to distinguish them from their code-oriented and syntactical command string predecessors.

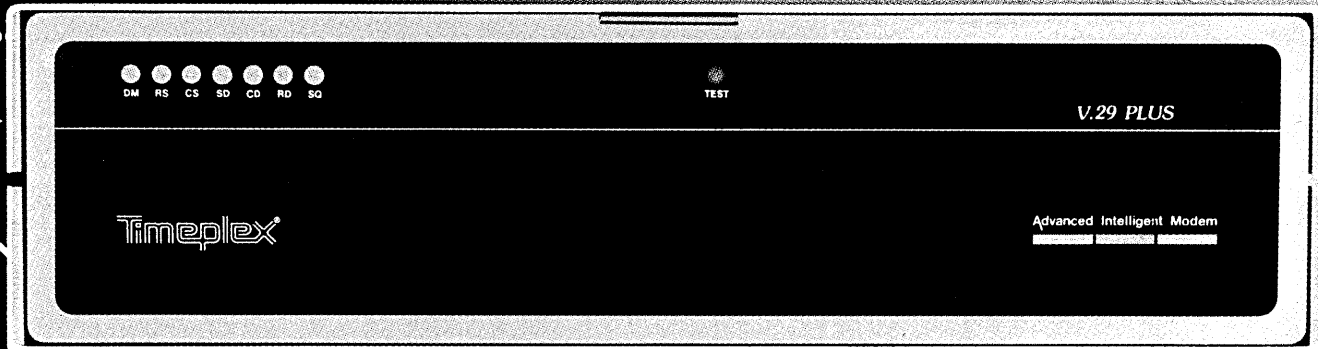
In addition to the independent occurrence of visual programming techniques in word processing systems and intelligent data entry systems, the phenomenon also occurred in several database products that were oriented toward direct use by nonprogramming professionals or managers. Here the application of visual programming concentrated on providing the basis for ad hoc query capabilities and/or modeling by personnel who were not comfortable investing a great deal of their own time up front in learning to converse with the system in a traditional programming language.

Including all of the systems in various market areas that have employed visual programming, it is clear that the reality existed before the name itself or any substantial sense of commonality in this phenomenon surfaced. A partial listing of examples would include: Datapoint's DataForm, Data General's Infos and Present, Texas Instrument's TI Form, Wang's Ideas and Visual Memory, Professional Software's PFS, MicroPro's DataStar, Univac's Mapper, Hewlett-Packard's Rapid, Xerox Star's Cusp, DEC's List Processing, and, of course, Software Arts'



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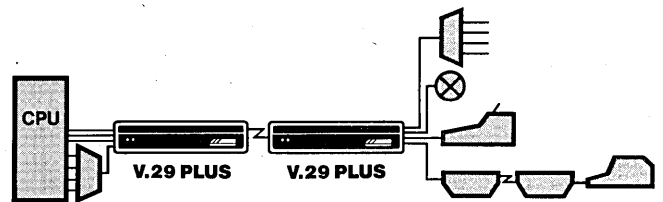
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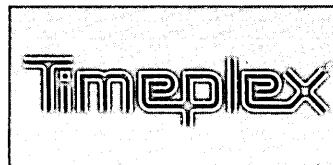
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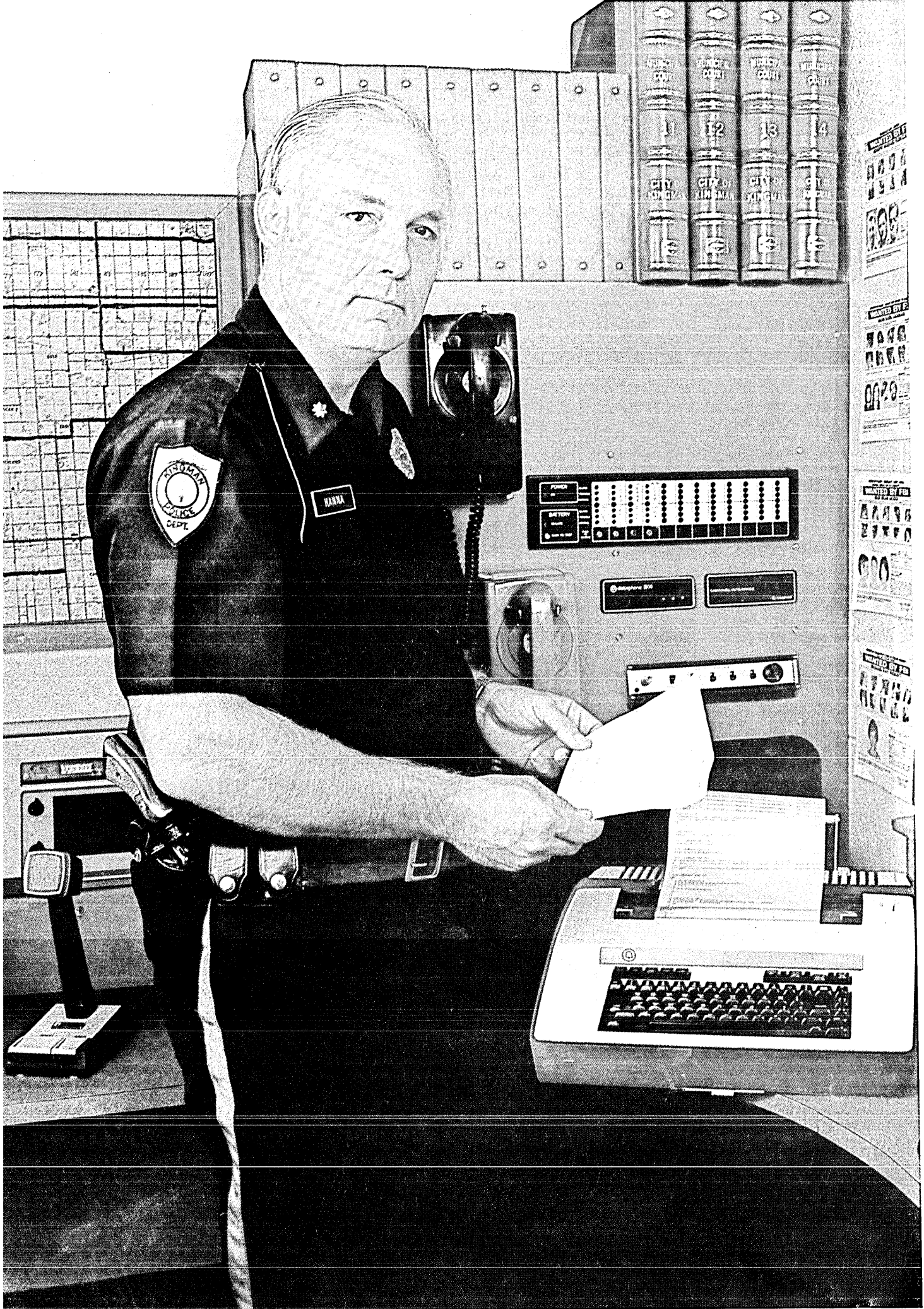


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# Visual programming is a radical departure from the syntactical interfacing procedures common to traditional programming languages.

VisiCalc.

If visual programming is to assist in overcoming the perceived and real limitations of traditional programming methodology, and if it is to provide the solution to the software problem that is currently limiting the growth of our industry, then a reasonable understanding of this important phenomenon must be shared among both the system developers and the user community.

It is not surprising that many real examples of visual programming came into existence independently and from varied backgrounds, but now that their essential design philosophy has been recognized in the generic term "visual programming," the identification of this common basis should serve to improve rapidly the quality of such products. Typically rapid improvement in the price, performance, features, and functions of a new product area does not occur until the marketing terminology catches up with the new product. It seems that there must come into existence a commonly understood terminology, and at heart a generic product descriptive name, before the full impact of a technology-driven phenomenon can be integrated into the marketplace.

As a historical example, the process of manipulating text via some form of computer logic existed under many ill-suited generalized descriptions (such as source editing, text manipulators, text editing, and the like), and under many supplier specific names (such as ATS, Wylbur, MTST, AutoTyper, and the like) before the term "word processing" crystallized the essence of this market. When the accepted generic term word processing was adopted, it led to a very rapid and accurate identification of a complete set of terminology that described the features, functions, and operations to be expected by systems deserving of the title. Thus, a common means of comparing systems was established, predominantly via independent consultants and user organizations that were formed to address the new opportunity. In this way, realistic and nonsupplier-dominated definitions of system functionality led to a reasonable and comparable method for customer evaluation of such systems and paved the way for volume adoption of systems meeting the new criteria. This common terminology and body of knowledge which made the comparison of systems possible also led to an accelerated improvement to the breed, as suppliers put focused development effort into creating new features and increasing the operational ease of the systems.

If we look at the word processing or text editing facilities from the early 1970s—both in terms of computer-based editors like ATS, Wylbur, etc., and standalone word processing equipment like MTSTs and Mag Cards—we can see functionality that is simi-

lar to many systems of the later '70s. In other words, the earlier and later generations of systems could all insert text, delete text, move text, assemble merged documents, and adjust margins. The seminal difference between the generations is found in a revolutionary change in the human interface methodology. In the earlier systems, the user instructed the system in much the same manner as a traditional programming language, but a programming language that was syntactically specific to the magnetic media and text manipulation operations of each brand of system. In the later systems, the user was spared this cryptic and command-oriented approach, and was able to manipulate the text through a highly visual man-machine interface. In fact, the rallying cry of many word processing consultants and system selection advisors became, "What you see on the screen is what you should get as printed output."

## THE NORMAL MODE

Thus, visual programming became the normal mode of operation for the highly successful word processors produced by many different equipment manufacturers in the mid- to late 1970s. These systems led to the use of computer-based equipment by a large new audience of nontechnical users in the offices of most major firms, and many smaller firms. With the new visual approach to system operation, a user could merely position a cursor to some point in text on the display screen, and touch "insert" to allow the insertion of any additional text in the sentence.

A major conceptual hurdle had been overcome, in that the user did not have to understand the underlying methodology associated with the manipulation and storage technology of the system. He simply pointed to the location for insertion, and the system presented immediate visual confirmation that the addition had been entered. This ability to act directly and visually upon information stored in the system represented a conceptual revolution of epochal proportions. Instead of constructing in some contrived language a long set of syntactically explicit instructions for the system to carry out, the user could now simply point, and "show" the system what he wanted done.

The importance of the leap from total dependence on language to the ability to employ visual techniques in programming methodology cannot be overstated. It opened the floodgates to potential nontechnical system users.

During approximately the same time frame, a similar revolution was occurring in the intelligent data entry and distributed data processing markets. The same microprocessor workstation technology which allowed visual word processors to make the manipula-

tion of text a simple matter for nontechnical secretaries was used to put the visual definition of data entry and reporting within the grasp of other nonprogramming office employees. A plethora of simplified screen definition and data entry software products appeared on the market. They almost universally employed a highly visual technique for positioning fields on a data entry crt screen, requesting records for editing and even defining the visual image of local output reports. Like the visual word processors, these data entry products were differentiated from their own data entry predecessors not so much because of the functional operations they could perform, but because of the dramatic change to a visual human interface and style in their methodology.

In visual programming, just as in word processing, the understanding of a common terminology and the comparison of systems in terms easily understood by the potential buyers will lead to a concentration of the best creative minds and development efforts from the systems development community. Conversely, if word processing had not been identified, but had been allowed to wallow in the terminology of a specialized branch of data processing, it is almost certain that very few of the innovative product advances and considerably less of the spread of this technology out into the nontechnical office landscape would have occurred.

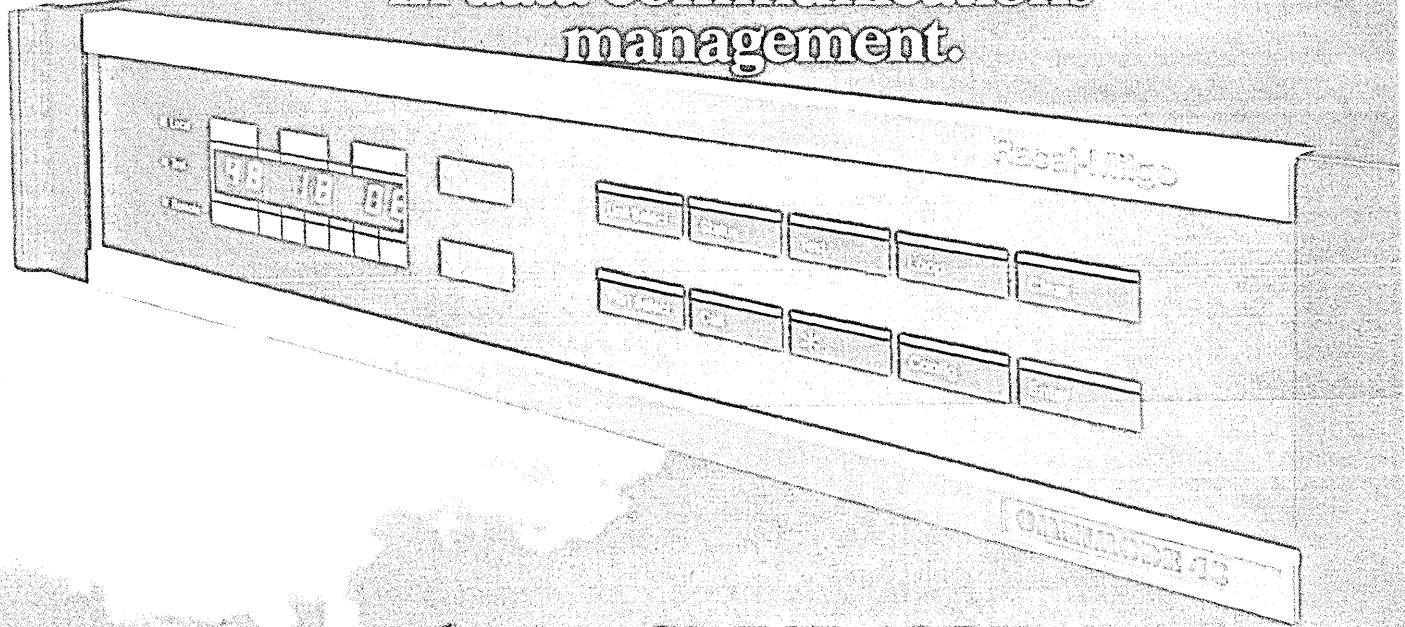
## PROVIDES RATIONAL APPROACH

The dictates of the free market, and particularly of the information processing market, are such that the clear definition of user demands, coupled with the supply of innovative technology, can overcome any perceived problem.

One of the few inhibitors that prevent even greater accomplishments in our industry is the limitation of the communication channel between system builders and the user community. A clearer definition of what is technologically possible and what facilities the user community wants would certainly increase the effectiveness of products in our industry.

It is suggested that the generic term visual programming can serve as a common ground for reasonably comparing the facilities of many systems that have independently adopted a revolutionary approach to the common problem imposed by traditional programming. More importantly, the communities of both users and consultants should be able to indicate clearly additional system features, functions, and facilities in the context of visual programming such that the system development community can focus major resources on the enhancement of this revolutionary methodology. By doing so, the users of information processing technology will

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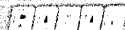
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## A reasonable understanding of visual programming must be shared among both system developers and the user community.

surely have a more united and effective voice in the course of progress in our industry, and the suppliers will benefit from the consistency of market demand that leads to rapid and effective development efforts.

The opportunity certainly seems to exist for some of the innovative consulting and system evaluation firms such as DataPro, Dataquest, IDC, and others to develop some meaningful formats in which visual programming systems could be evaluated. Both the encapsulated (laundry list) style of comparison and the more detailed (road test) type of evaluation could be applied to a significant number of systems that are current examples of visual programming.

A review of the evaluation techniques applied by the above-mentioned firms to systems such as word processors, data entry systems, and the like suggests the type of comparisons that make valid evaluation possible for even the nontechnical audience.

Roughly speaking, an evaluation of visual programming systems might review the methods by which the systems allow the user to "draw," or visually construct the equivalent of all the software modules that would otherwise have to be written in a tradi-

tional programming language. For instance, does the system allow the user to visually define record structures including field images and all associated edit checks? Are fields of variable length and expandable on an ad hoc basis? Is data entry screen definition performed by literally drawing an image on the desired screen? Can the user create multiple query masks that provide alternate views of information? Is the query method itself truly visual, or must complex queries be posed in a query language? Can the user visually define on the crt screen the exact image of an output form in which he would like his information printed, and can there be an unlimited number of such forms? Is textual information simply treated as fields of infinite length? Can queries be performed on any and all information fields? Do changes to the record structure which the user thinks of at a later time require maintenance programming, or are they also visually definable after the fact? Can derived fields and full report generation be visually defined without recourse to exits into a traditional programming language? And are all of the system's own facilities for defining information input, storage, query, processing, and output accessed

through visual menus which are themselves self-descriptive?

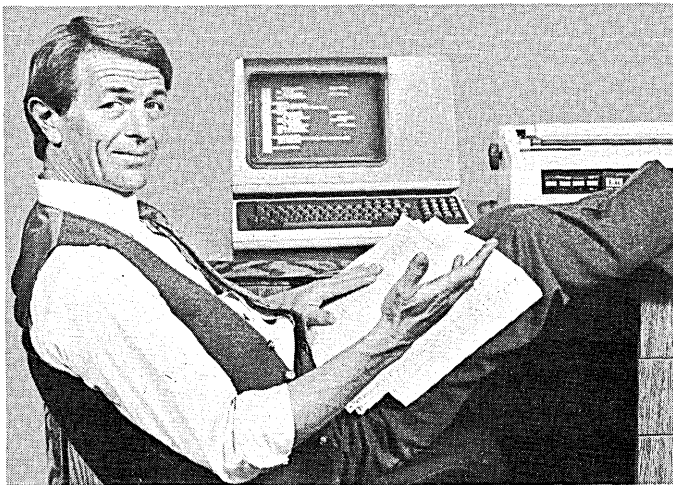
A comprehensive methodology for evaluating these relatively new and conceptually revolutionary visual programming systems should quickly point out the areas in which users require additional functionality. Most of the systems mentioned in this article are already capable of allowing users to perform rather completely the type of information processing operations which only a few years ago would have required traditional programming language skills for implementation. By focusing on the areas for further development in visual programming methodology, the user and consultancy communities can get the kind of systems they want. They will also challenge system suppliers to employ visual programming not just as a data entry adjunct or report generation adjunct to traditional programming languages, but as a whole methodology for the application of computers by end users. \*

Alan MacDonald, product manager, management communications systems at Wang Labs, specializes in datacom and communicating word processors.

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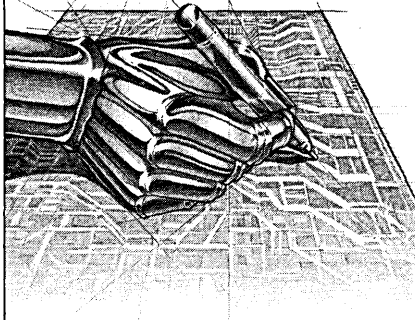
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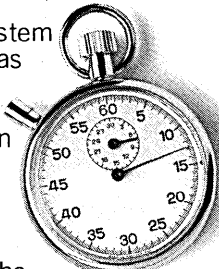


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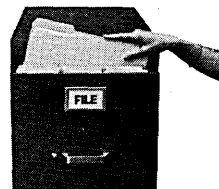
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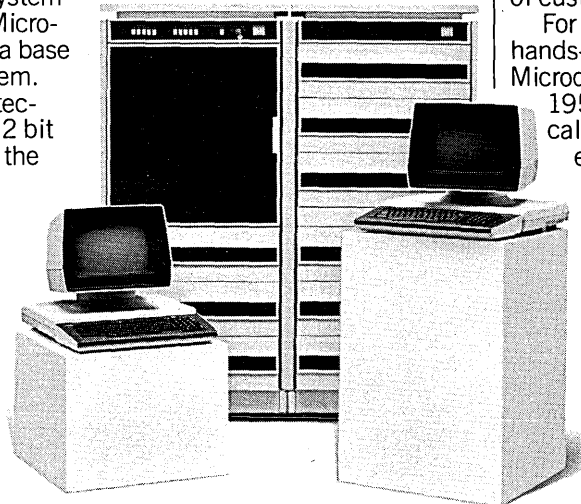
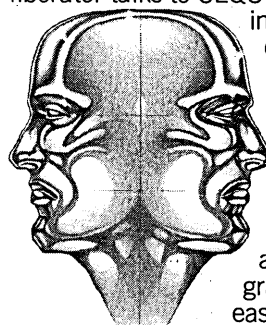


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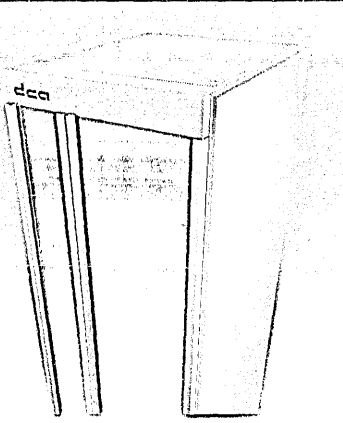
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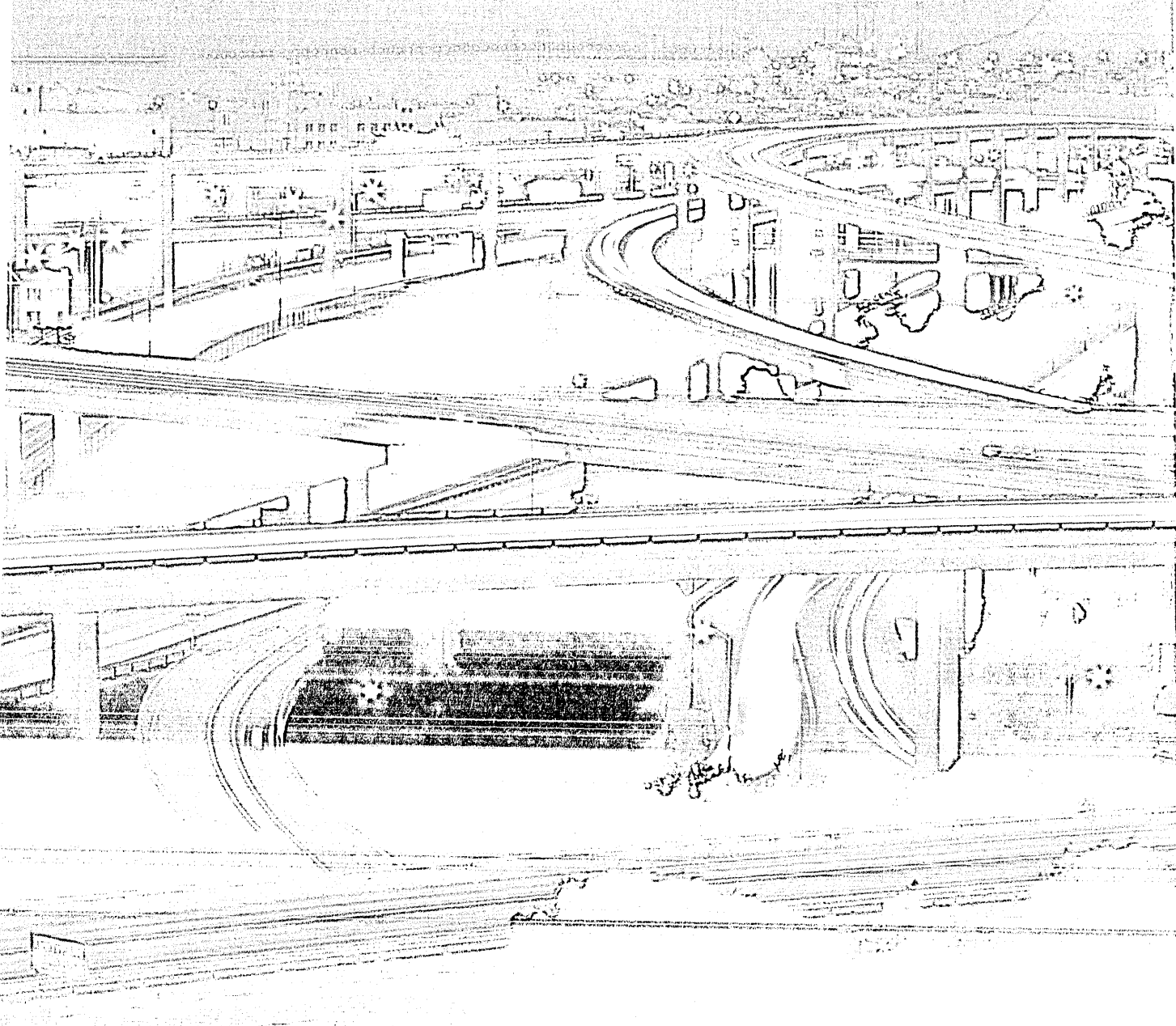
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# 100 WAYS TO AUTOMATE YOUR OFFICE

**by David Macfarlane**

Okay, you've made the decision to take the first step—or the next one—toward an integrated office system. Now what?

Well, as you've probably learned from a plethora of periodicals, seminars, conferences, and books, the implementation of office systems raises a lot of questions. Many of the questions are of an organizational or social nature and require much mulling; we'll leave those aside for the moment. There remains, however, a great deal that can be done right away.

What technical measures are possible and useful today? Because you'll want the systems you end up putting in place to fit your requirements, budget, existing systems, and attitudes, it makes sense for you to be aware of as many alternatives as possible. To that end, here are 100 suggestions on how to automate your office. They range from rather simple, entry-level ideas to advanced notions that may require some extra effort on the part of your system supplier. Think of the list as a smorgasbord. Not all of the suggestions will be immediately applicable to your organization, but all are valid, feasible right now, and food for thought.

**1.** Give yourself a terminal linked to one of your computing resources and use it to generate all your own documents (chances are that it will have some usable text editor and formatter). People will start to notice the higher quality and faster turnaround that you get, and it is good experience for you.

**2.** Give your president or ceo a terminal with some programs that can translate existing data (financial, production, staffing information) on your corporate computer into graphs, pie charts, and other forms.

**3.** Attach to the above terminal a printer/plotter that your executive can use for giving output to staff and associates.

**4.** Attach to the same terminal a 35mm slide-maker to produce graphics appropriate for presentations.

**5.** Get a color plotter that can make overhead foils for your presentations and graphics for your reports.

**6.** Give your secretary a word processor for all your memos, letters, reports, etc. (Don't forget to give her enough training to use it properly.)

**7.** Put a microcomputer in your department for your professional staff to use as functional support. Get spreadsheet, business graphics, and/or word processing software for it.

**8.** Get some language tutorial books (BASIC, Pascal, C) for your professional staff. Let them program the micro to support their job functions.

**9.** Get a cheap matrix printer for your micro that will support graphics and generate charts and diagrams for your reports.

**10.** Put word processing software onto your mainframe computer. Have your existing users employ it for documentation, report writing, etc.

**11.** Put electronic mail software onto your mainframe computer. Start using portable terminals in conjunction with existing users and terminals to keep in touch with staff and management.

**12.** Put an on-line information retrieval interface onto existing databases, and give terminals to the people who most need timely access to those data. Try to replace some regular report generation with user-generated ad hoc inquiries.

**13.** Get your research/reference librarian onto your messaging system. Have staff submit requests in the form of electronic messages, and answer them in the same way.

**14.** Using an existing computer with communications capability, write a small program that can let your librarian capture the results of the on-line queries and send them to the requestors over the messaging system.

**15.** Put a user-friendly interface (probably a menu, at least initially) onto your existing mainframe utilities and applications. Give terminals access to an appropriate high-performance team.

**16.** Give your controller or financial vice president a microcomputer with a spreadsheet utility, plus easy access to someone who knows the system. Let him or her try something small first.

**17.** Use a local timesharing service and a financial modeling package to develop your next departmental budget.

**18.** Put your time sheets onto a system. Let your secretary input them every week. Make summaries available as required in graphical form.

**19.** Let your professional staff input their time sheets through their own terminals. Realize greater accuracy and timeliness.

**20.** Put a project control system on top of your time-sheet system. Post time-sheet entries onto project budgets, track milestones reached, graph expected versus actual budgets.

**21.** Link your project control system to your client billing system. (Develop appropriate authorization procedures.)

**22.** Next time you do a questionnaire study, develop the text of the questionnaire on a system that has both statistical tools and word processing. By doing the data analysis on the same system, you will find the report easier and quicker to write.

**23.** Pick a geographically distributed department (e.g., employee relations for plant sites) and put it on a public (timeshared) electronic mail network.

**24.** Put a programming language on your word processor, and have a summer intern build some appropriate applications.

**25.** Start sending documents from one office to another using the communications option of your word processors.

**26.** Get a black box that enables one kind of word processor to communicate with another (and then go back to the last point).

**27.** Send documents to your clients/customers using communicating word processors.

**28.** Set up procedures to receive documents (orders, RFPS, proposals) from your clients and customers. Relieve them of printing and distribution costs, and get the text on a system that you can use for your reply.

**29.** Have a representative of each of your major clients on the same electronic mail system that you and your staff use. Make it part of the proposal and contract with them.

## Put everybody in your company on the electronic mail system.

30. Put your traveling sales staff, sales manager, and secretaries on an electronic mail system. Give them portable terminals that fit in pockets. Have them use the terminals for phone messages, orders, inventory checks, and other information exchanges.

31. Give your sales staff portable printer terminals so they can print out orders, etc., in the field.

**32.** Take a high-powered team of creative professionals (technical writers, professionals whose main output is reports, et al) and put them on a network of advanced professional workstations.

33. Put an index to your manual filing system on a computer and let both the users and the file clerks access it. Increase availability and decrease wrong filing (especially for subject-indexed systems). This lets users access files by any criterion they choose.

34. Use a microcomputer as a remote terminal instead of a dumb one. You can use the micro for editing the information you get, batching input, analyzing data, etc.

35. Send your dp manager to an office automation conference.

36. Send your financial officer to an office automation conference.

**37.** Put a video projector in your boardroom. Use it in group meetings to project information (text, graphics) from your system.

38. Replace overhead foils with slides composed on the system. Have a forward, backward, and random access program created to simulate a slide projector.

39. Use an interactive text formatter/editor for meeting support and minutes generation. Let all the participants see the on-line development of meeting notes and ideas.

40. Put an opinion registering device into your boardroom that can project votes and levels of agreement from the meeting participants on a screen. Use this to record votes in minutes.

41. For meetings that involve geographically distant participants, develop agendas and hold preliminary discussions over electronic mail. Make the time spent together in the meeting more focused and productive.

**42.** When you are ready to replace your phone system, include data switching support in the specifications. It will be there when you need it—at little extra cost.

43. Install all new terminals using the data module add-ons that go with your digital PBX. Save cabling costs and build a more flexible installation.

44. Instead of having the call detail recording output of your PBX printed on a printer, attach the output cable to an intelli-

gent word processor or other computer. Use its listing, sorting, and merging facilities to prepare and print charge-back statements.

45. Tie the call detail recording output from your PBX into your client billing system.

**46.** Prepare your organization charts from the information in your personnel database (some reporting information may have to be added). With the addition of a simple graphics package, your charts will never be out of date.

47. Tie your organization charts into the addressing scheme of the electronic mail system. Permit addressing to staff positions (e.g., bookkeeping) and departments (e.g., sales managers).

48. Put everybody in your company on the electronic mail system, regardless of whether they have computer access. Deliver the messages to users without computer access through the mail system. Put a printer in the mail room, and users won't even have to concern themselves with the how the message gets there.

**49.** Next time one person finds it difficult to get to a meeting in another city, rent some audio teleconferencing equipment. Make sure the person leading the meeting is aware of how to conduct matters with an audio link.

50. Next time one group of people can't make it to an important meeting with another group in another major city, book the hotel teleconferencing facilities in the two cities. Use graphics as well as watching each others' faces.

51. For a series of meetings that involve geographically distant participants, lease or purchase some slow-scan video teleconferencing equipment. Using cheap and available telephone lines, the two or more groups in the meeting will still be able to see what is going on.

52. If you have an important user who is adamant about not using a keyboard, get a voice recognition device that can output the words it hears. Have him use it for the most frequent command words.

**53.** For your staff's next brainstorming session, rent some time on a computer conferencing system. Use it for the members of the meeting to raise issues and discuss ideas before the "actual" meeting.

54. Once you have demonstrated the advantages of computer conferencing, get a programmer or two to amend the electronic mail software so that it will support computer conferencing (it isn't really that big a change).

55. Start using a calendar scheduling system for meeting rooms. Take all the re-

sources needed for meetings (rooms, projectors, etc.) and create them as entities in a scheduling system. Let the facilities coordinator maintain the information, but let users who are already on the system inspect the schedules themselves.

56. Once you have people using the system (or asking their secretaries to use it for them), start putting meetings and other shared activities on the scheduling system. Let people get used to the system suggesting the next available times.

57. If there isn't one already, build a link between the scheduling system and the messaging system. When a meeting is scheduled, the messaging system automatically informs the participants.

58. Put public and private reminders into the messaging and calendar system. Notify users of holidays, personal items (such as anniversaries), and other important dates.

59. Equip the messaging system with a timer. Let users send messages at specific times, or repetitively (reminders for weekly meetings, for example).

**60.** When you replace slower forms of text preparation with faster ones (word processors), use some of the secretary's or typist's time for more careful proofreading or other extra-skill tasks. Use the changes to create more interesting jobs.

61. As more of the secretary's time is saved using the office system support, increase the scope of the job description. Let talented secretaries become paraprofessionals, regardless of the type of business.

62. If you have very little in the way of computers or terminals to build a system on, start a new way of doing things with a voice messaging system. If you can't push the vendors into hooking one into your PBX (so it acts like a telephone answering machine) either buy or timeshare one of the standalone ones.

**63.** If you're experiencing a proliferation of one brand of microcomputer, get a local network from either the vendor of the micros or a third party. Hook all the micros together, and encourage users to share files instead of copying them.

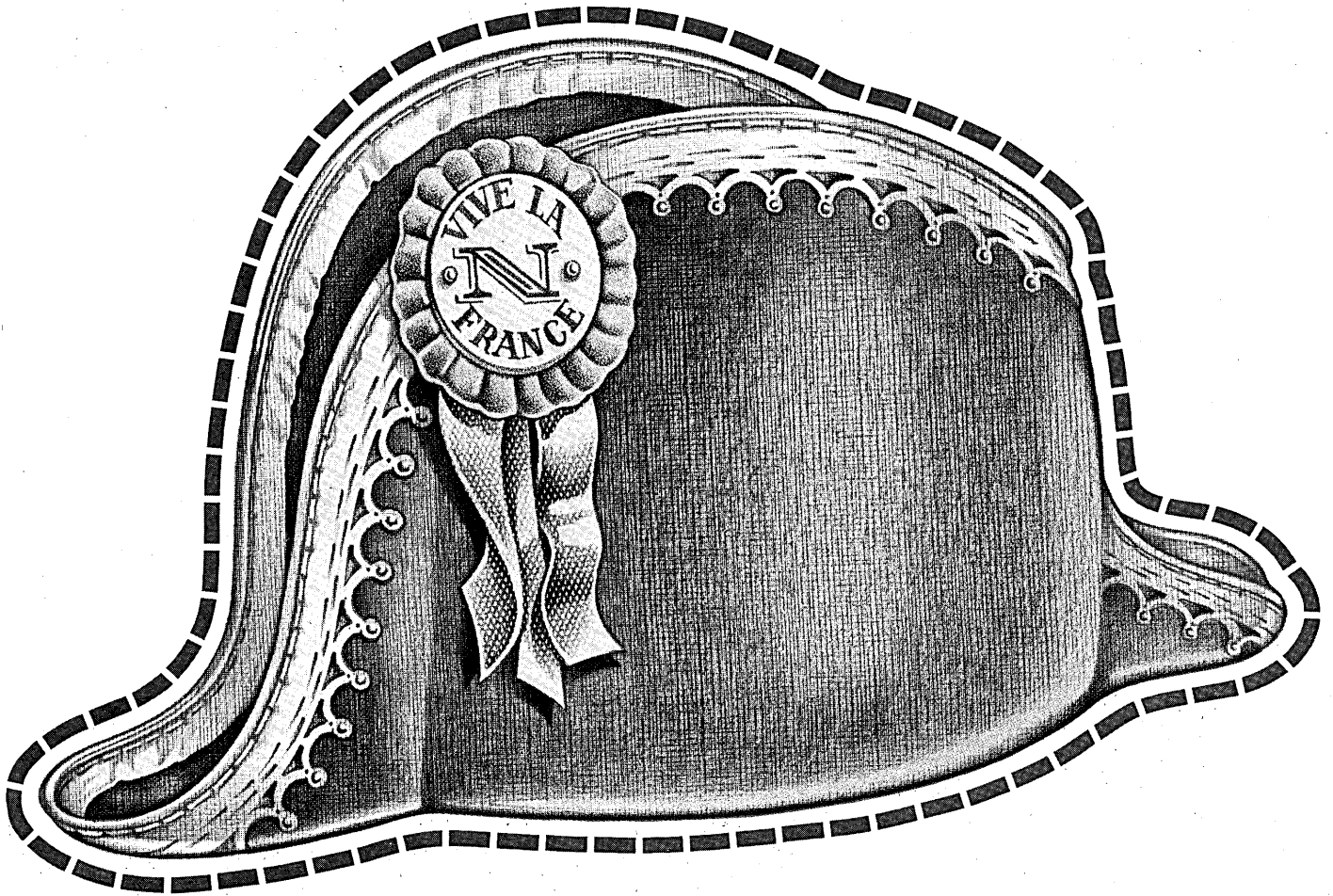
64. If a local net is not feasible, use a dial-in central computer for file and software distribution to the micros.

65. Add electronic messaging to the local network of micros.

66. Add a hard disk to the local network of micros, and encourage users to keep files on it. Cut down on floppies, and simplify software and information distribution.

**67.** Find a printer or typesetting bureau that can take the output from your word processors and give you back photo-

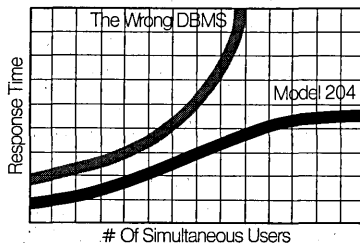
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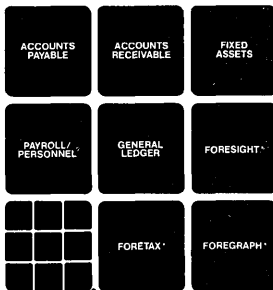
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## Set up an abstract index of all documents in your company library.

typeset hardcopy. With very little extra work, you can get much higher quality and effectiveness.

68. If you have a large volume of typewritten text that you wish to include in your office system, input it using optical character recognition at a service bureau. Chances are there is one that can handle your type styles.

69. If you have too many typewriters to replace and typists to retrain, start a document creation procedure that includes optical character recognition linked to word processors. The bulk input is through OCR, and authors have their marked-up drafts handled by word processing.

70. Once you have professionals doing their own document generation on a system, add some of the many programs that analyze spelling, readability, syntax, and grammar. Emphasize quality, not volume.

71. For word processing on any kind of system, keep previous versions and indicate all changes in every draft. You can use change bars in the margins or a special kind

of underlining. This way the author knows what was changed and what was not.

72. Add call-out programs to your on-line system that automatically connect to the public information bureaus. Give your users access to stock information, library databases, news wire services, etc.

73. Let users specify their interests to the system so it can extract appropriate items from the news wire services and put them in the messaging system automatically.

**74.** Start buying desks with variable or typing-height surfaces. Many of the people in your office will be using terminals in the next few years.

75. When moving or redesigning your offices, prepare the facilities with office systems in mind. Plan ahead for extra power outlets, task lighting, air circulation, cabling, etc.

76. Do you want to hire an expert from out of town who does not want to move? Hire that person and give him a work-at-home terminal configuration.

**77.** Store all your on-line text documents with a content search capability. You can never predict all the ways your users will want to access material for reference or review.

78. Use your list of names, addresses, and phone numbers as a dynamic contacts database. Each time a person is contacted (by phone or letter) update the database to indicate the date and nature of the contact. Use the list so you don't get out of touch with anybody.

79. Put an on-line inquiry into your contacts database and enable access by any item (such as type of business, company name) for any item: phone number, last contacted date, etc.

80. Take the phone number fetched from the phone or contacts database and link it into the phone system—have it dialed automatically.

81. Whenever a user requests a phone number from the system for a long-distance call, give the charge rate and the local time as well.

**82.** Set up an abstract index of all documents in your company or departmental library. Let users browse through it at their terminals before they request material.

83. Get terminals that support magnetically coded keys or cards. Let users put their log-in sequences and passwords on the cards so they don't have to type them in every time. They'll keep the cards as safe as their credit cards, so there will be no security problems.

84. Put a computer assisted instruction package on your system, and use it as part of the training package. Learning by example is the best way. You can also track users' progress with the training, and identify problems with the system.

85. Use dictation in conjunction with professional-use word processing. You can let the authors correct and edit their own work and spare them the high-volume input.

86. Once you have several functions/applications/utilities on your on-line office system, provide interrupt and resume features. This more closely models real use patterns, and lets your users temporarily stop one activity (editing a report) to take care of an interruption (scheduling a meeting).

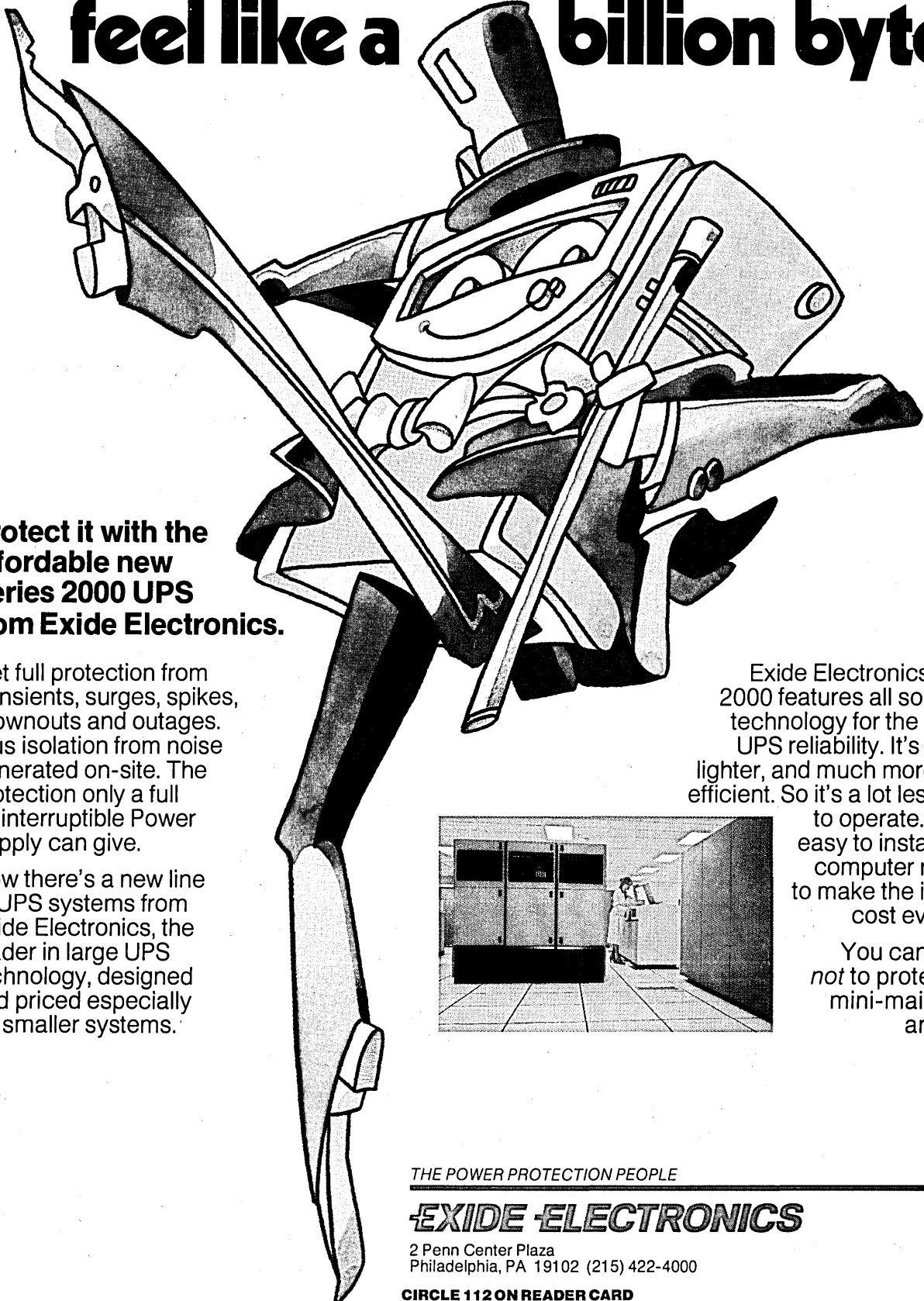
**87.** If you have both voice and text messaging, integrate them using a combination phone and terminal device (now available from several vendors). You could have one MESSAGE button that sends a voice message if the phone is being used and a text message if not.

88. Once you have messaging, use either your phone system or microphones to add voice annotation capabilities. This could work for messages and other textual docu-





# How to make your mini-mainframe feel like a billion bytes.



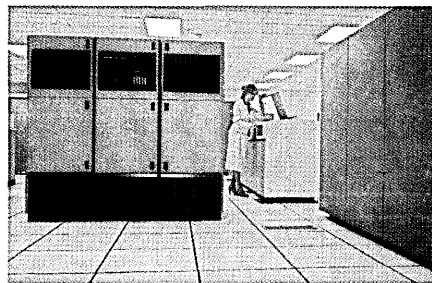
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## Put a usage monitoring facility on any system or function you implement.

ments and is already available from several vendors.

89. If you still have any regularly issued MIS-type reports coming out, use a name list on the system to selectively address the reports using the messaging system (with no ongoing operator intervention). No one gets any reports he doesn't want to see, and no one gets any paper at all (in this case, anyway).

90. Put a usage monitoring facility on any system or function that you implement. You will get valuable feedback on who is using what when, so you can upgrade, reconfigure, and retrain as needed.

**91.** If you have any dial-out links from your system to voice phones, put a voice synthesizer in as well. Use it to call people with reminders, to wake up the next shift, or alert operations staff to any urgent conditions ("Hi, this is your system calling...").

92. Put a link between the above voice synthesizer and the electronic messaging system. Let users call into the system from a regular phone and have their messages read to them.

93. Let the voice synthesizer help

with proofreading by reading back text (and numbers). Let your readers take on more interesting and valuable jobs.

94. Make your messaging system really work for you. Using the notion of "closure," let the messaging system keep tabs on an issue by making an audit trail of messages on the topic and a list of each open issue until it is "closed." This can become a database of current activities and their individual statuses.

**95.** Put in a security device (keys, special passwords, coded cards) that is viewed as being as good as a physical signature. Let people use it (as authorized, of course) to give approvals. Reduce formal paperwork.

96. Let the system manage the procedures that define how a form moves through to completion and approval. Use the messaging system to automatically route and present for "signature" all the check requests, expense authorizations, etc.

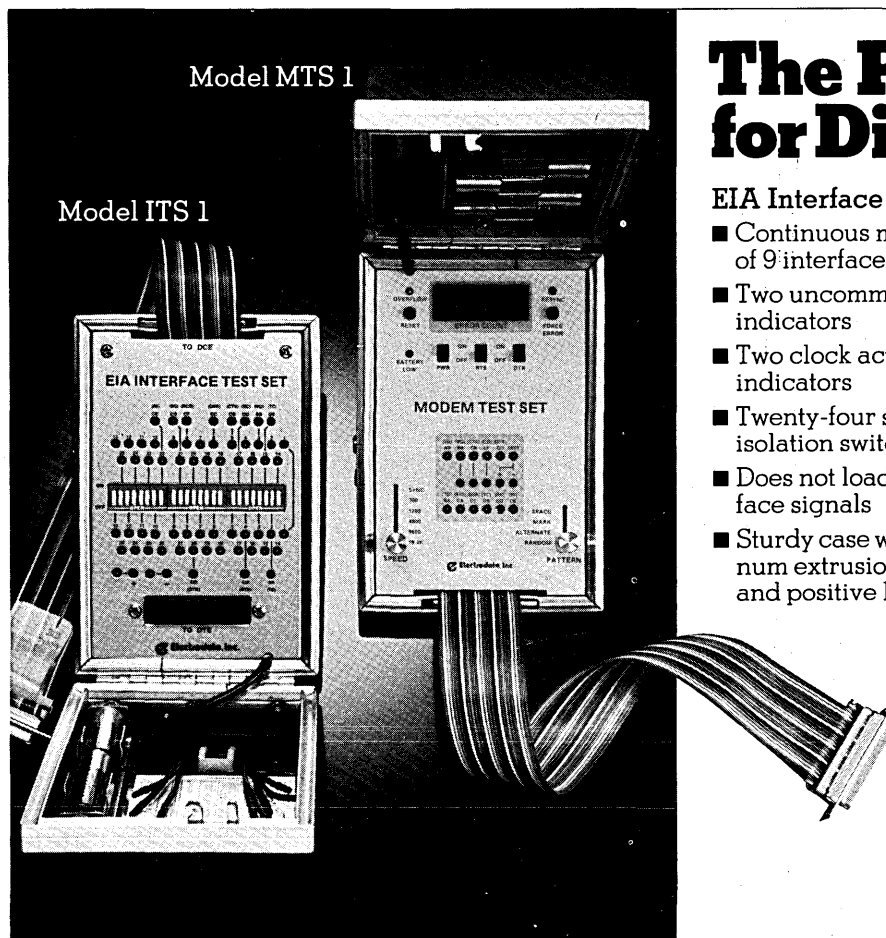
97. Put analog and status sensors online with your system. Let the users inquire about the time in Hawaii, the temperature outside, "Is Fred in his office?"

98. Let your security staff use the sensors together with the main system. Log doors opening, lights on and off; keep records that you can summarize, graph, and compare.

99. Add to your messaging system some special capabilities to support the manager/secretary working relationship. Let a secretary prepare messages for the manager to send, let the secretary see some or all of the messages sent to the manager, etc.

100. Ensure the integration of every phase of your implementation. For example, anything (graphs, charts, data from a database, parts of a report) can be sent as a message, any data (from an appendix of a report, from a financial model) can be made into a graph. \*

David Macfarlane is manager, integrated office systems for the Toronto office of Coopers & Lybrand. He is responsible for the data processing department and the design and implementation of advanced office systems. He was previously the senior office systems architect at Bell Northern Research, Toronto.



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Variance:

$$V(Y|X) = V\left(\sum_{j=1}^K \beta_j X_j + \epsilon\right) = V\left(\sum_{j=1}^K \beta_j X_j\right) + \sigma^2$$

$$\equiv \sum_{j=1}^K X_j^2 V''(\beta_j) + \sum_{i=1}^K \sum_{j=1}^K X_i X_j \text{cov}''(\beta_i, \beta_j) + \sigma^2$$



# Introducing the Most Important BREAKTHROUGH Ever in Computer Software

For the first time, decision-makers — in particular, top management — can now access and analyze information about a company's operations in time to take corrective action before it's too late. This has always been the promise of computers that until now has never been fulfilled.

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Mostly, though, it's the way that Cullinane's database software works together that has gained it such wide acceptance. The reliability of IDMS is legendary, and its unsurpassed ease of use makes it the ideal foundation for improved data control, data access, and the development and execution of future applications.

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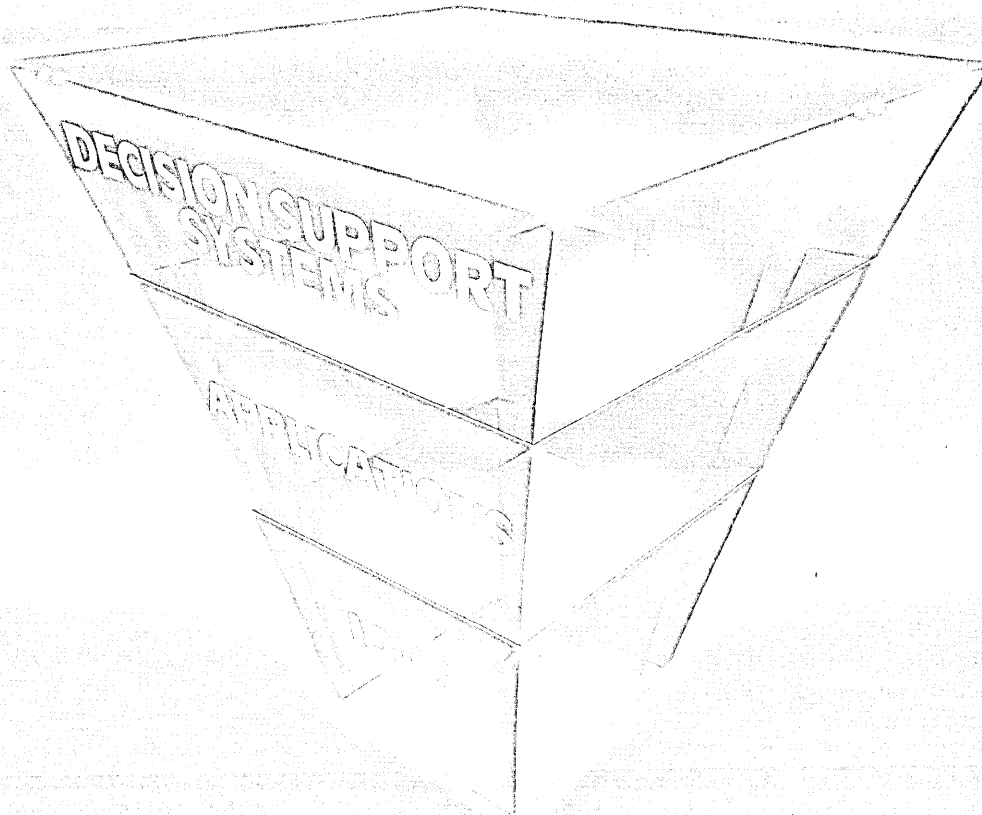
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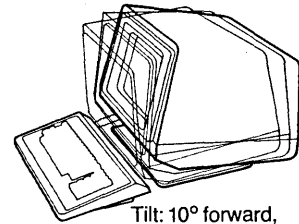
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The VISUAL 100 video display terminal is 100% compatible with the DEC VT 100 terminal from identical software right down to the layout of the keys and the sculpturing of the keyboard.

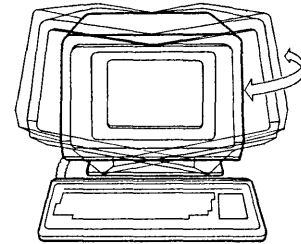
But when it comes to ergonomics, the VISUAL 100 is something else! For example, the VISUAL 100 is designed in lightweight plastic that can easily be swiveled and tilted for maximum operator comfort. A detached, low profile keyboard, and 12" or 14" non-glare screen are just a few of the other human engineering advantages of the VISUAL 100.

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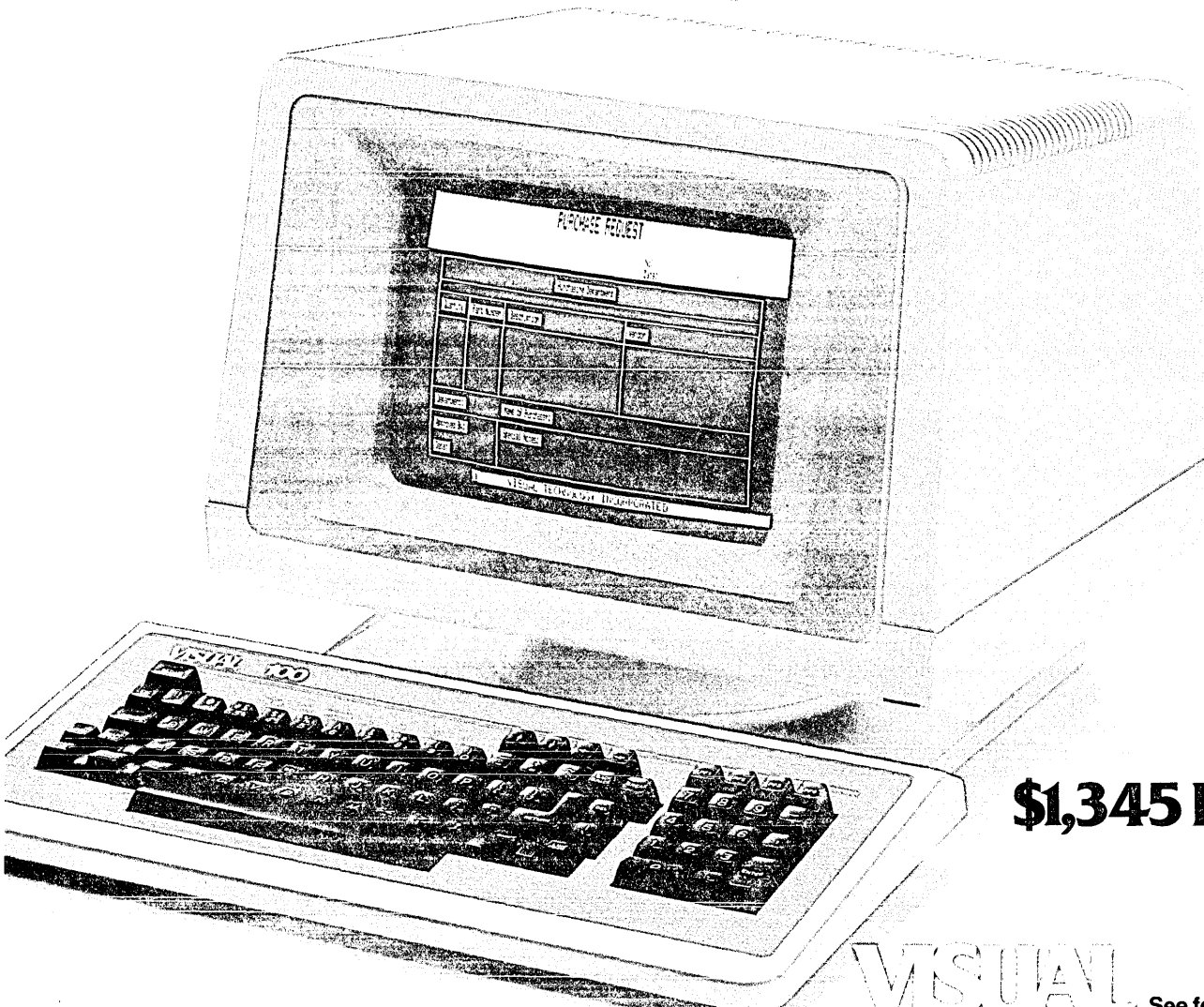


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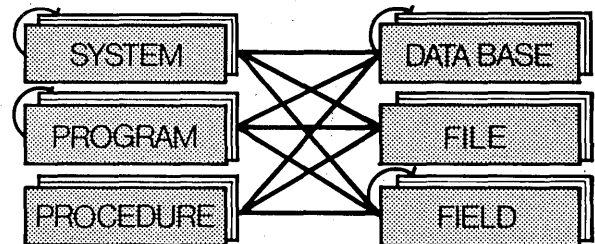
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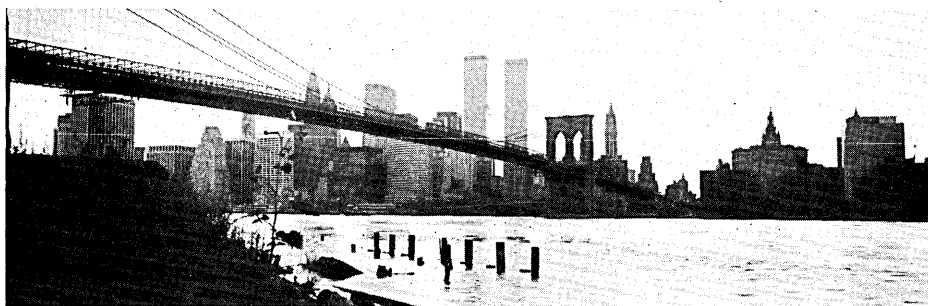
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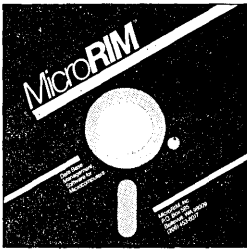
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CIRCLE 119 ON READER CARD

# **SCIENCE/SCOPE**

Delivery of the first production Joint Tactical Information Distribution System (JTIDS) terminal has been called a milestone achievement by the commander of the U.S. Air Force's Electronic Systems Division. Lt. Gen. James W. Stansberry congratulated Hughes for its efforts in delivering the first production JTIDS Class 1 terminal 31 days ahead of schedule. He said the delivery and acceptance "demonstrably establishes jam-resistant, secure digital data links as a viable medium for tactical command, control, and communications (C<sup>3</sup>) systems."

The two shortwave infrared bands on Landsat 4's thematic mapper are gathering data that sensors on previous Earth resources satellites couldn't. These bands, which are sensitive to the amount of water in plant leaves, will identify plants and assess their health. They can map snow cover without being fooled by clouds because snow appears very dark, while clouds remain bright. The infrared bands also detect a wider variety of rock and soil types. Experimental studies showed these bands can identify variations in type and abundance of clay minerals exposed at the Earth's surface. This information can be used to substantially improve the quality of geological maps. Hughes and its Santa Barbara Research Center subsidiary built the thematic mapper for NASA.

A microwave distribution network for Pennsylvania educational television is the first large-scale use of Hughes AML equipment configured for FM transmission. The two-channel, two-way system consists of 22 hops that interconnect with the network that had already been operating in a portion of the state. It is being operated by the Pennsylvania Educational Communications System, a non-profit organization whose membership includes leading independent cable companies. Hughes AML equipment, which traditionally has employed AM techniques, has been used for local distribution service in the cable-TV industry since the late 1960's. It now serves more than 20,000 video channel paths worldwide.

A series of bias-tuned Gunn oscillators that offer improved power output and tuning bandwidth characteristics has been added to the Hughes line of solid-state millimeter-wave receiver products. The oscillators are available in U band (40-60 GHz) through W band (75-90 GHz) and in several output/tuning bandwidth combinations. Bandwidths vary from 200 to 1000 MHz, power output levels vary from 5 milliwatts to 100 milliwatts. Low-noise characteristics make the units particularly suited for uses like paramp pumps and local oscillators.

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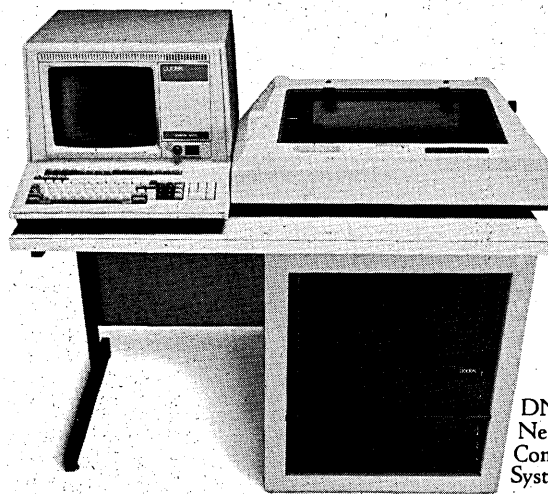
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# HARDWARE

## OFF-LINE

For anyone who needs spelling software for the British version of the English language, Proximity Devices Corp. offers a 94,048-word British lexicon. It requires 101KB of mini-floppy diskette storage and is designed for error detection applications in word processing and office automation.

The computer services industry is in strong health, according to a report by the New York consulting firm Broadview Associates. The report predicts that new products will proliferate despite a trend toward more mergers and acquisitions in the industry. Data for the first six months of 1982 show slightly more mergers and acquisitions -- but a slight decline in dollar volume -- compared to the same period last year.

Math/PROTRAN and Stat/PROTRAN, two successful packages introduced earlier this year by IMSL, Inc., are now available on the VAX-11 series using the VMS operating system and the VAX-11 FORTRAN compiler. The packages require no programming knowledge, but FORTRAN can be intermixed with PROTRAN statements if desired.

Need a microcomputer? Three new publications may help. "The Executive's Guide to Small Business Computers," published by DEC's oem group, discusses purchasing or leasing a computer. Its sister publication, "The Solutions Analysis Workbook," helps potential users select a computer. The third book, "The Businessman's Guide to The New Microcomputers and Software," published by Software Ideas, compares seven personal computers and includes a software guide.

## PORTABLE COMPUTER

The HP-75C portable computer measures 10 × 5 × 1¼ inches, weighs 26 ounces, runs on rechargeable nickel cadmium batteries, retains programs and data when turned off, and keeps real time. The computer's instruction set includes 147 BASIC commands among the 169 instructions in a 48K byte ROM-based operating system. Other software is included for engineering, math, statistics, electronic spreadsheet, and graphics applications.

The unit's cpu is a cmos version of the 8-bit custom microprocessor in HP's Series 80 personal computers. It has 16K bytes of nonvolatile RAM built in, which can be increased with the addition of the HP-82700 memory module to 24K bytes. Three software module plug-in ports accept 8K or 16K ROM modules, freeing the RAM for data. Off-line mass storage is integrated into the HP-75C. A hand-pulled magnetic card reader can read and write up to 1.3K bytes per card, giving the unit mass storage in a completely portable mode.

The QWERTY keyboard can be completely redefined, and a "hidden" numeric keypad is built in to ease numerical data entry. The 32-character liquid crystal display is a movable window for a 96-character line and features character descenders.

HP-75C can be interfaced to any other HP products through the built-in HP-IL interface loop. Products from other vendors can also be interfaced through this loop. HEWLETT-PACKARD CO., Palo Alto, Calif.

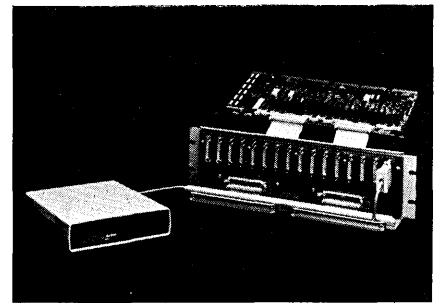
**FOR DATA CIRCLE 301 ON READER CARD**

## DEC INTERFACE

The Series 11 Bus Driver is an integrated asynchronous terminal interface for the DEC PDP-11 and VAX-11 computers. The interface, which requires no changes to DEC-supplied hardware or software, offers simultaneous support for local and remote terminals through the same multiplexor and connections for up to 32 terminals using a single Unibus slot.

The Bus Driver consists of three functional units. The bus interface module

occupies a Unibus slot and connects to the connector panel of the Bus Driver. The connector panel contains 16 RS232 connectors, all of which can be hooked into terminals. The remote concentrator controller can plug



into one of the RS232 connectors and connect up to 16 remote terminals.

The Bus Driver is compatible with Micom's standard Micro800/2 data concentrators, allowing remote users to take advantage of dial-up capability, automatic terminal speed recognition, channel priority assignment, speed conversion, and other functions. The Series 11 Bus Driver starts at \$5,950 and can run to \$6,950, depending on the Micro800/2 model used and whether built-in, matched LSI modems are used. MICOM SYSTEMS, INC., Chatsworth, Calif.

**FOR DATA CIRCLE 302 ON READER CARD**

## CHINESE COMPUTER

A Taiwan-based firm is offering what it says is the first microcomputer with the capability of processing Chinese data. The Microprofessor II Chinese (MPF-II-C) by Multitech Industrial Corp. is compact (9.84 × 7.65 × 2.46 inches) and inexpensive (\$600), but using the Chinese Character Controller's 64K RAM it can access 22,000 Chinese characters. (Only 4,800 characters are commonly used in Chinese.) The Apple II compatible MPF-II-C can also process Roman characters.

The R6502 microprocessor operates at 1.023MHz, using 16K ROM for a six-color monitor and a BASIC interpreter. Any color television can be hooked in through a proprietary interface to allow display in three

## HARDWARE

modes. The text mode displays upper case ASCII characters in a 5 × 7 dot matrix font and a 24 line, 40 column format. The high resolution graphics mode offers 280 × 192 pixels, while the low resolution mode divides the display into 40 × 40 blocks. The three modes can be used simultaneously if desired.

Interfaces to peripherals are available, allowing 1,000 bps transmission to cassette tapes, 40 characters per line, 50 lines per minute printer output, remote control, and sound/speech capabilities using the G18910 sound generator and the

TMS5220 speech synthesizer. Soon to come is a floppy disk drive. The MPF-II-C also has an expansion socket for users to add their own software modules. MULTITECH INDUSTRIAL CORP., Taipei, Taiwan.

**FOR DATA CIRCLE 303 ON READER CARD**

### ARRAY PROCESSOR

The ST-100 array processor utilizes multiprocessor architecture and advanced VLSI technology to achieve 100 megaflops. It can attach to general purpose minicomputers and mainframes for high-speed arithmetic operations in computationally intense

scientific and engineering problems. The multiprocessor architecture allows for staging of operations, high-speed arithmetic, and simultaneous input and output of data. The master control processor and three independent processors also queue multiple jobs and overlapped data transfers without interfering with the arithmetic processing.

The 64K RAMs can hold 8 million 32-bit words of main memory. With address space to one gigaword, the main memory will be offered at 32 million 32-bit words when 256K RAMs become available.

The ST-100 is supported by development, production, and maintenance software. Applications library modules are provided for basic vector and matrix operations.

The basic configuration, with 512K words of 32-bit main memory and a 48K word data cache, costs \$250,000, including operating and development software. Deliveries are scheduled for the first quarter of 1983. STAR TECHNOLOGIES, INC., Portland, Ore.

**FOR DATA CIRCLE 304 ON READER CARD**

## HARDWARE SPOTLIGHT

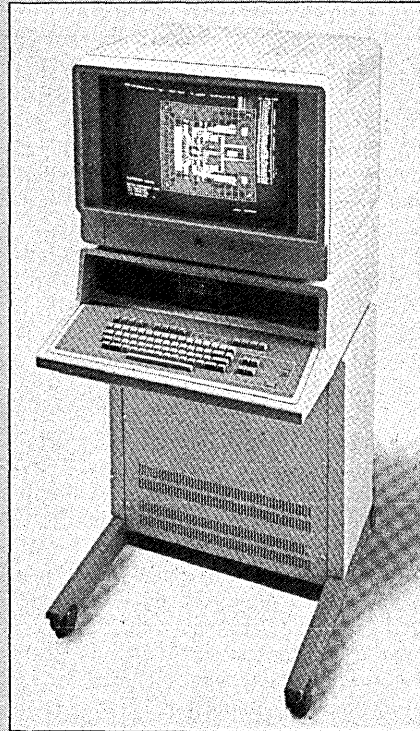
### GRAPHICS TERMINAL

The 4113 computer display terminal adds color raster graphics features to the capabilities of the 4110 series while maintaining compatibility with older models. Three bit planes are standard, providing the capability of displaying eight out of 4,096 colors simultaneously, and an optional fourth bit plane is available to expand the displayable capacity to 16 colors. The bit planes also provide the capability for text and graphic overlays.

The display is 19-inch, 640 × 480 pixel delta gun, shadow mask color raster with a 60 Hz noninterlaced refresh rate. It comes standard with 32K RAM and 88K ROM, and is expandable incrementally to a total of 800K RAM. One or two optional, integral flexible disk drives can be specified to add a total of 494K bytes per diskette of off-line mass storage per disk drive. Communications through a standard RS232 interface operate at up to 9,600 bits per second.

The terminal offers "local picture segments," graphic primitives that describe a portion or segment of a picture. These primitives are retained in memory and can be redrawn and manipulated at any time. Eight user-programmable function keys are provided for local operations. Local segments may also be rotated, scaled, or translated by command from the host cpu. Zoom and pan capabilities are available locally or via the host. The addressable display of 4,096 × 4,096 pixels allows high resolution even with high magnification.

Several options are available on the 4113. Special keyboards provide the firmware for specific language requirements, including those for APL, Swedish, and Danish-Norwegian character sets. A three-port RS232 peripheral interface permits the terminal to be used with a plotter, printer, or other device without that device being placed between the terminal and the host cpu. An external video output peripheral converts the 60Hz noninterlaced RGB video to 30Hz interlaced RGB to allow the 4113 to be synchronized with an external source or to be connected to some hardcopy units or external monitors.



An 11 × 11 inch or 30 × 40 inch tablet and pen are optional equipment. Both include controller, tablet, and interface to allow digitizing of graphs, drawing with pen-point, one-button, or four-button cursor. The tablets are compatible with all 4110 series terminals.

Tektronix now offers a local programmability package for its 4110 series terminals. It consists of a disk-based operating system, a FORTRAN-86 compiler, utility programs, a library of low-level interface routines, and an Intel 8087 numeric coprocessor. The package allows users to locally write, edit, compile, link, debug, and run programs; access the graphic and alphanumeric features of 4110 series firmware; and control all peripherals connected to the terminal. The local programmability package is priced between \$2,000 and \$4,000, depending on options and configuration requirements. TEKTRONIX, INC., Beaverton, Ore.

**FOR DATA CIRCLE 300 ON READER CARD**

### EDITING PORTABLE TERMINAL

Designed to cut costs by reducing transmission time, this new portable printing terminal can prepare edited messages off-line for later on-line transmission. The Execuport 4120 BSR can edit and store up to 43,000 characters for later transmission at 120 cps. Its maker says that the \$3,995 terminal will produce up to 16-to-1 savings in timesharing costs.

The BSR offers six commands not available on the standard 4120 to provide access to the editor and to transmit or receive files. It has a 16-element columnar printhead and fully formed descenders to allow printing below the line with no decrease in throughput. The BSR comes with a 9 × 11 character font for 10 characters per inch, and a 5 × 7 font for 16¼ cpi (136 characters per line on 8½-in. paper). Host computer software allows two 24 × 80 format pages to be printed side by side on the same width paper.

A choice of three built-in modems—two for originate only, one for both originate and receive—permits communication at either 300 or 1200 baud. Through an RS232 port, the terminal can communicate up to 9600 baud. The terminal comes in an integral case, weighs 19 pounds, and measures 18 × 16 × 6 inches for carrying ease. COMPUTER TRANSCIVER SYSTEMS, INC., Paramus, N.J.

**FOR DATA CIRCLE 306 ON READER CARD**

### SOLID MODELING

Traditionally, a solid image is generated by a host computer. It is not seen on a display system until the host has transmitted it, pixel by pixel, and the display system has painted it, scan line by scan line. The process can take several minutes. The Solidview

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## HARDWARE

system is a raster display system that performs many solids modeling functions locally rather than at the host, which the vendor says cuts image generation time from minutes to seconds. The system processes three-dimensional primitives such as polygons, lines, and points, as well as two-dimensional data. It pierces and contours, and features both constant and smooth shading techniques. Hidden surface removal, visible surface shading, and pixel drawing functions are performed locally by Solidview.

The image generation time is cut because full geometric representations, not individual pixels, pass from the host to the display system, providing users with immediate feedback and releasing the host for other tasks. The picture is constructed as a whole and is manipulated as a whole, locally, so each change does not require repainting the entire screen in scan line order, the vendor says. This interactive ability broadens the solids modeling market by reducing the cost and time involved, the vendor says.

The Solidview system offers 640 × 512 pixel resolution, and costs \$29,000, including monitor. An expanded version incorporating pan/zoom and more interactive features would be \$37,000, including monitor. LEXIDATA CORPORATION, Billerica, Mass.

**FOR DATA CIRCLE 305 ON READER CARD**

### SUPERMICROS

The System 8000 family consists of four 16-bit Z8000 supermicros running the ZEUS operating system (an enhancement of Unix). The computers share an identical cpu board and peripheral controllers, and high-speed local area network communication among the units is possible via the Z-Net option.

Models 10 and 11 are 8 × 28 × 18 inches, freestanding units that accommodate up to eight users. The Model 10 comes with 256K bytes parity memory, expandable to 1M bytes, one 5¼-inch Winchester drive with 18M bytes capacity, expandable to 36M bytes, and a 1M byte floppy disk drive for backup. All boards plug into the Z-Bus Backplane Interconnect, a 32-bit bus that allows for upgrading to a 32-bit microprocessor. The cpu board supports eight serial I/O ports and a parallel I/O port. The Model 11 is identical except that it adds a 17M byte cartridge drive for backup and an intelligent tape cartridge controller board.

The Model 21 offers a 10-slot card cage with expansion to 20 slots. It accommodates eight users standard but can be expanded to 24. The 1M error correcting memory can be quadrupled, and the 8-inch Winchester drive can be expanded to 128M bytes from 32M. The Model 31 substitutes an 80M byte SMD-compatible Winchester drive for the Model 21's 32 MB drive. Using up to four such drives, the unit can deliver up to 320M bytes of storage.

The Model 10 starts at \$13,950, and the Model 31 goes to \$37,950, with 35% discounts to oems. ZILOG, Campbell, Calif.

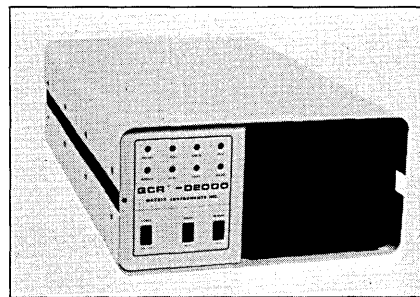
**FOR DATA CIRCLE 309 ON READER CARD**

### SLIDE RECORDER

The QCR-D2000 color slide recorder accepts digital picture information directly from a mainframe to produce slides with 2048 × 1336 pixel resolution, regardless of the resolution of the user's crt terminal. Data are transmitted through the IEEE-488 digital interface (except for IBM users).

The QCR-D2000 creates images by scanning the slide film with an intensity-modulated raster produced by imaging a moving spot of light onto the film. The spot is created with a monochrome crt and colors are produced by filters. The slide film is rigidly fixed in the film plane by a film transport, which also advances the film after the image is completed.

For raster scan images, the QCR-D2000 uses run-length encoding for data



compression. When the area to be scanned contains a large amount of constant color (as in a chart), this scheme allows each raster line to be described as a series of segments, each with a given intensity. Run-length encoding may achieve a data compression of 90 to 1 compared to standard raster transmission.

The QCR-D2000 is packaged with look-up tables to match hardcopy colors to the video monitor's colors. It costs \$24,900, including software license, but the IEEE-488 or bisynchronous interface must be supplied by the user. MATRIX INSTRUMENTS, INC., Northvale, N.J.

**FOR DATA CIRCLE 307 ON READER CARD**

### GRAPHICS PERIPHERALS

Chromatics is offering several new peripherals to its CGC 7900 color graphics computer system. The remote fixed disk (model 7941 or 7942) contains a 10 megabyte or 40 megabyte Winchester drive with the same features and specifications as the CGC 7900 internal fixed disk drive options. It extends the high-speed mass storage of the 7900 to a possible 80 megabytes. Each remote disk drive comes with a terminator kit so that the remote drive can be removed from the system while allowing the remaining remote or internal drives to function properly. The drives have an average access time of 50 milliseconds for the 10 megabyte and 65

milliseconds for the 40 megabyte version. The 10 megabyte costs \$5,995 and the 40 megabyte costs \$10,995.

The 7924 ROM expander card is a 7900 digital circuit board intended to expand the computer's capability from 64K bytes to 512K bytes of ROM. Each card contains space for two independently relocatable 64K byte banks, and up to four expander cards can be configured into one system. The card also has the ability to accept 2K × 8 static RAM instead of ROM. The expander cards cost \$1,295 each.

The 7938 nine-track tape interface supports 800 and 1600 bpi tape and block transfer sizes up to 32K bytes. It interfaces the 7900 to any tape drive using the standard PERTEC interface. CHROMATICS, Tucker, Ga.

**FOR DATA CIRCLE 308 ON READER CARD**

### MICROWAVE TRANSMISSION

The MiniLink microwave system transmits voice and data through up to 96 PCM channels at 6.3 million bps. Designed for transmission up to 14 miles, the duplex radio also handles video transmission and FDM usage of up to 120 channels. The system includes an 18GHz radio and T-carrier interface.

The FCC-approved system is intended to be used in place of leased data lines and off-premise extensions. It eliminates the need for PBX operators at satellite locations, since each pcm channel can be assigned a telephone extension, with incoming and outgoing calls going through the manned PBX.

The system is constructed of modular design. The BCB interconnect motherboard is mounted at the rear of the cage, and all other boards slide in from the front to connect with the motherboard. A basic 48-channel installation costs \$65,000, and a 96-channel installation costs \$98,000. ANACONDA-ERICSSON INFORMATION SYSTEMS, Garden Grove, Calif.

**FOR DATA CIRCLE 313 ON READER CARD**

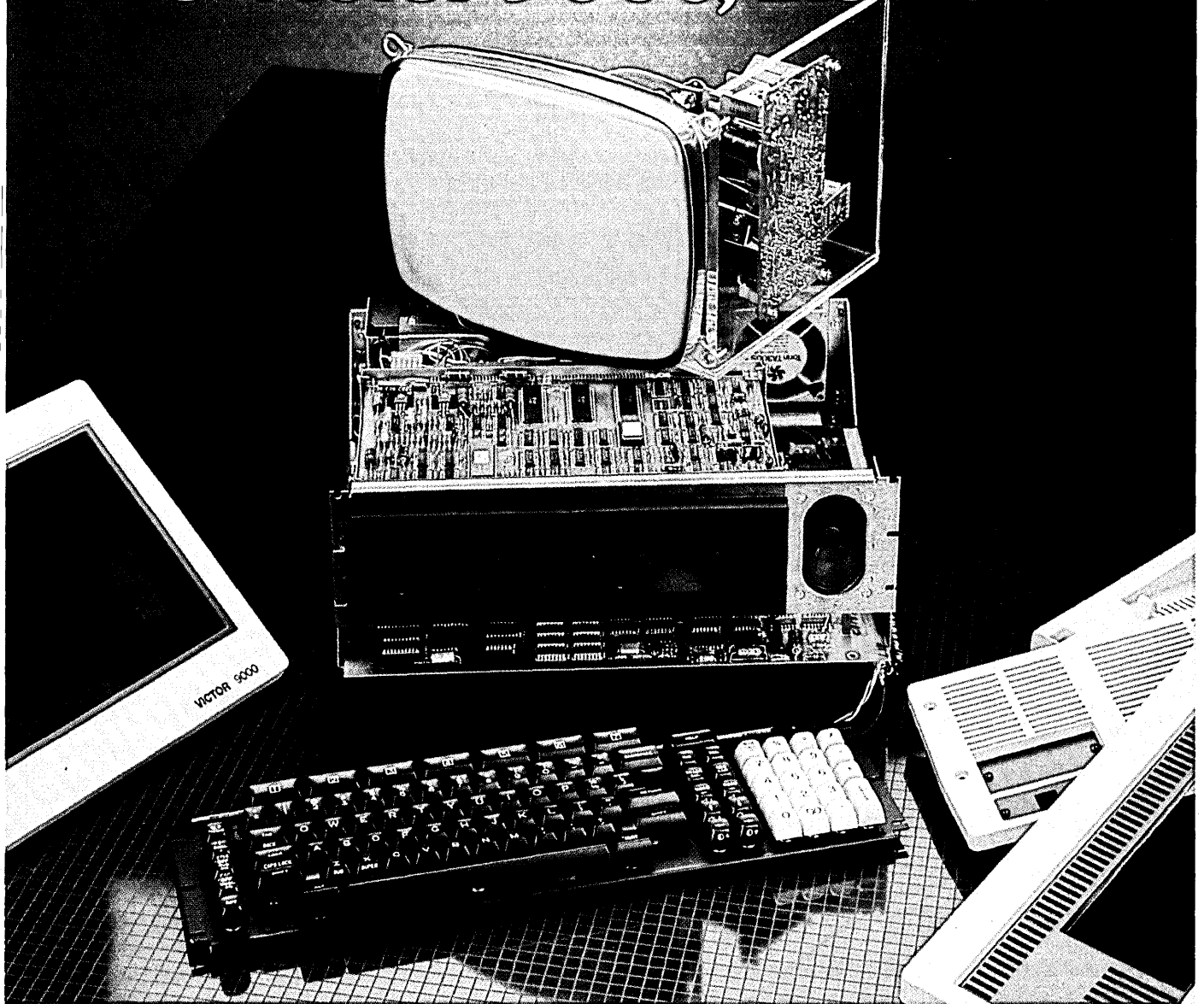
### FIBER OPTIC MULTIPLEXOR

The CMX-808 multiplexor combines fiber optic technology with MSI circuitry to achieve what the vendor says is the lowest cost-per-channel in the industry for 8 to 16 channel short-haul multiplexors. The multiplexor's circuitry provides "Auto Baud" capability, allowing any speed terminal to be connected to any port without hardware or software programming. Full code transparency permits the CMX-808 to accept any terminal device through standard RS232 interfaces. Full maximum data rates of as much as 19,200 bits per second can be accommodated simultaneously on each channel without data buffering or peak load shutdown. Data bit error rates are guaranteed by the manufacturer to be better than 10<sup>-9</sup>.

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## HARDWARE

designed for transmission of less than 1/4 miles. The vendor says it is easier to install than conventional cable, provides immunity from EMI/RFI, cannot be tapped or monitored by unauthorized parties, and provides total electrical isolation between the ends of the data link. The CMX-808 costs \$1,200 singly, with quantity discounts available. Delivery is up to four weeks ARO. CANOGA DATA SYSTEMS, Canoga Park, Calif.

**FOR DATA CIRCLE 310 ON READER CARD**

### GRAPHICS SYSTEM

This graphics computer system can work as an intelligent, programmable terminal, or as a standalone workstation, or as a node in a network of other Orcatech machines. Its dual processor architecture is intended to improve throughput and responsiveness. A bit-slice processor is dedicated to graphical operations, and an Intel 8086/87 is used to support the system software environment and to execute user applications. Each system can support and control up to four hard disk drives and four diskette units.

The system boasts a  $1,024 \times 1,024$  pixel viewable resolution and a  $64,000 \times 64,000$  virtual resolution for zoom and pan capabilities. The display file is fully paged, and backing onto disk occurs automatically in complex picture situations.

The system has its own operating system, file system, FORTRAN compiler, and application and graphics processor assemblies, and offers optionally a Unix environment with C, Pascal, and FORTRAN. It also supports the standalone Compeda Dragon drafting system. Total system cost is under \$50,000. ORCATECH, INC., Ottawa, Canada.

**FOR DATA CIRCLE 315 ON READER CARD**

### HIGH-DENSITY PROM

The 63S series of programmable read only memories offers typical access times as low as 20 nanoseconds, which the vendor claims is the fastest rate in the industry. The 1K by 4-bit 63S441 and 63S441A bipolar PROMs are rated at 45 and 35 nsecs respectively. Other members of the high-density PROM family include the 2K by 4-bit 63S841 and 63S841A (50 and 35 nsecs), and the 4K by 4-bit 63S1641 and 63S1641A (50 and 35 nsecs).

The PROMs are designed to be used as programmable logic elements, address decoders, priority encoders, spectrum analyzers, and other test and measurement instruments in which complex logic functions must be performed with few inputs.

The PROMs in the family all feature low current PNP inputs, full Schottky clamping, and three-state outputs. The titanium tungsten fuses store a logical low and are programmed to the high state. On-chip circuitry and extra fuses provide preprogramming testing.

The 4K and 8K PROMs come in 18-pin DIPs, and the 16K device comes in a 20-

pin DIP. Prices range from \$5.25 for the 63S441 to \$53.33 for the 63S164A, in quantities of 100 to 999. MONOLITHIC MEMORIES, INC., Sunnyvale, Calif.

**FOR DATA CIRCLE 311 ON READER CARD**

### RASTER DISPLAY

The RM-9460 display system offers all the features of Ramtek's RM-9440 family, but utilizes the MC68000 cpu and 64K RAM



technology for better performance in a less expensive package. Multiple memory processors allow the RM-9460 to perform independent graphics operations, such as local pan and zoom, on multiple workstations. Other features include context switching, image enhancement, entity detection, graphics functions, display list processing, decluttering, coordinate transformation, and split screen/clipping.

The RM-9640 offers  $1,280 \times 1,024$  pixels and up to 32 refresh memory planes. Vector writing speeds exceed 16K vectors per second, based on an average vector length of 50 pixels. The system can display up to 1.3 million colors simultaneously from a palette of 16 million.

The RM-9460 starts at an end-user price in the mid-\$20,000 range, with significant discounts to volume purchasers and OEMs. Current users of the Z80-based 9400 can upgrade by adding a \$7,250 MC68000 cpu card. Also offered is a Z80 version of the 9640 for users who want to retain customized software that runs on the 8-bit microprocessor. RAMTEK CORP., Santa Clara, Calif.

**FOR DATA CIRCLE 312 ON READER CARD**

### SMALL COMPUTER

The Extec 1000 is billed as the first computer on the market to include a typewriter keyboard, video display, disk memory, and a full-size printer, all in a rugged freestanding unit small enough to fit under an airline seat. It is based on the 8-bit Z80 microprocessor.

The unit's 9-inch diagonal green phosphor screen contains an 80-column, 24-line format. The keyboard controls the full ASCII character set and has a high-speed numeric entry pad, cursor control, and spe-

cial function keys. The printer has 96 ASCII characters with descenders and 64 block graphics characters, products by a  $9 \times 9$  matrix impact printer. The adjustable tractor-type pin feed accepts 4- to 10-inch paper widths and prints up to four-part forms. It contains 12 user-controllable combinations of type sizes and densities, and prints bidirectionally 80 cps.

The computer has 64K bytes working memory standard, with up to 512K bytes optional. In addition, 1 megabyte 5 1/4-inch disk storage provides up to 360 pages of typed text, and a user port is provided for external disk drives. The system comes standard with CP/M, C-BASIC, and an electronic spreadsheet. An internally powered direct/acoustic modem and communications software is available as an option. A dedicated port for a telephone modem and a second RS232 port are provided standard.

The 40-pound machine measures  $21.75 \times 16.875 \times 8.75$  inches, and costs \$4,995, with discounts of up to 20% for quantity purchases. EXTEC CORP., Carmel, Ind.

**FOR DATA CIRCLE 314 ON READER CARD**

### LARGE MAINFRAME

Univac's 1100/90 series of mainframes can be configured with from one to four processors; each processor has a 65,000 byte (16,000 word) cache memory that is assigned as two separate buffers, one for instructions and one for operands. In a four-processor configuration, the system can achieve 25 MIPS, nearly twice the rate of the IBM 3081K.

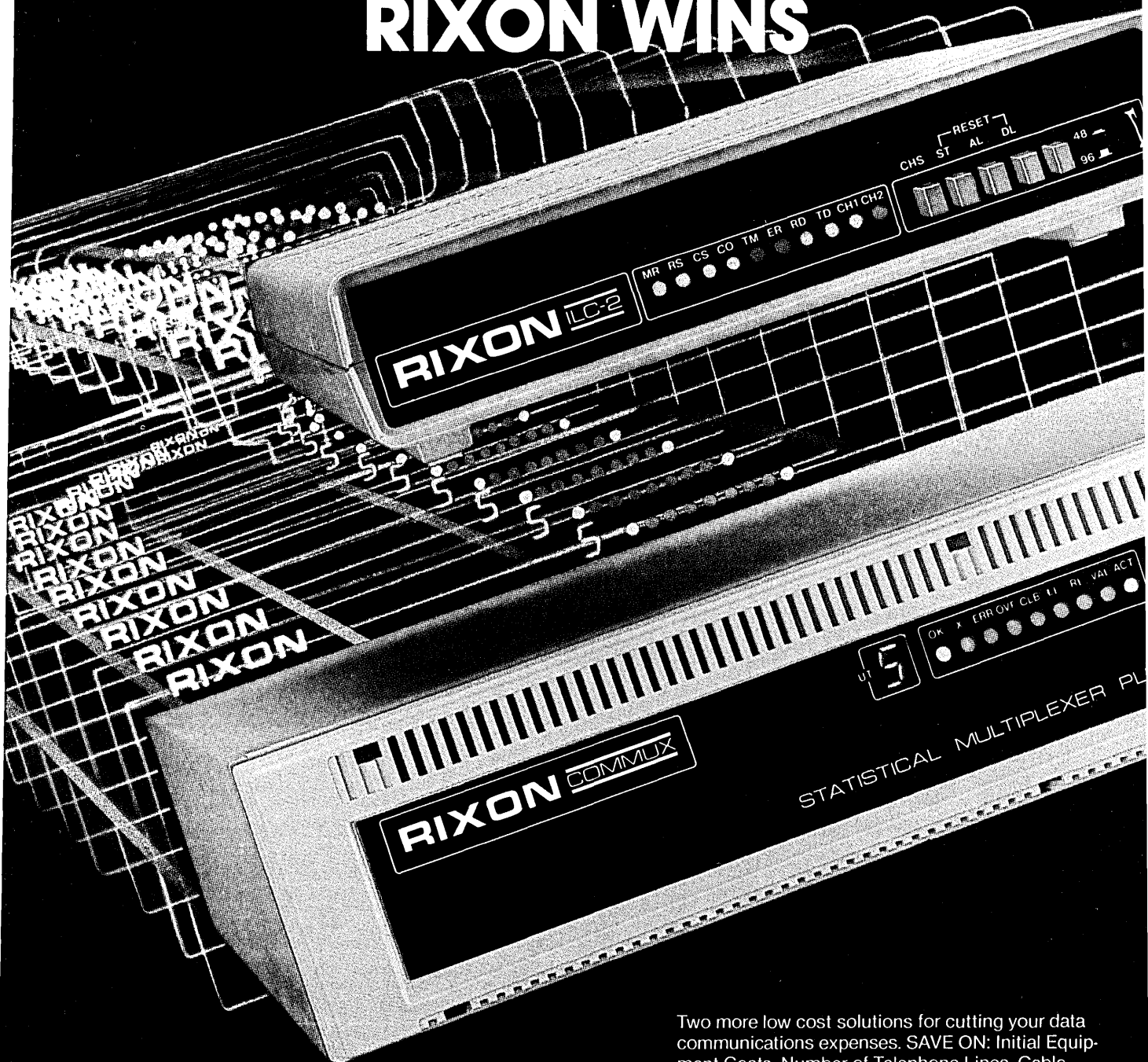
System memory is contained in up to four storage cabinets, each of which can contain 8 million, 12 million, or 16 million bytes. The maximum storage is thus 64 million bytes (16 million words). An I/O processor operates independently and can interface up to four instruction processors, four memory storage cabinets, and two system support processors, yielding an aggregate transfer rate of 37.5 MBps per IOP. Up to four IOPs can be configured into the system, accommodating up to 96 block multiplexor channels. Channel transfer rates are over 3.5 MBps, and the overall I/O system offers about 4.5 times the throughput of the fastest 1100/80 system.

Univac also introduced two extended storage peripherals. The 8480 disk subsystem's 2.25 billion bytes provides four times the storage capacity of the 8470 subsystem, and can interface four series 1100 computer channels. The 8407 diskette subsystem can house up to 20 diskettes at a time, with a double density, double-sided recording capacity of 1 million bytes.

The 1100/90 system and peripherals runs from \$4 million to \$15 million and is compatible with all previous series 1100 systems and software. SPERRY UNIVAC, Blue Bell, Pa.

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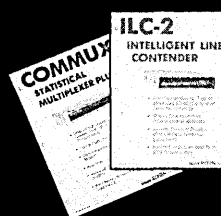
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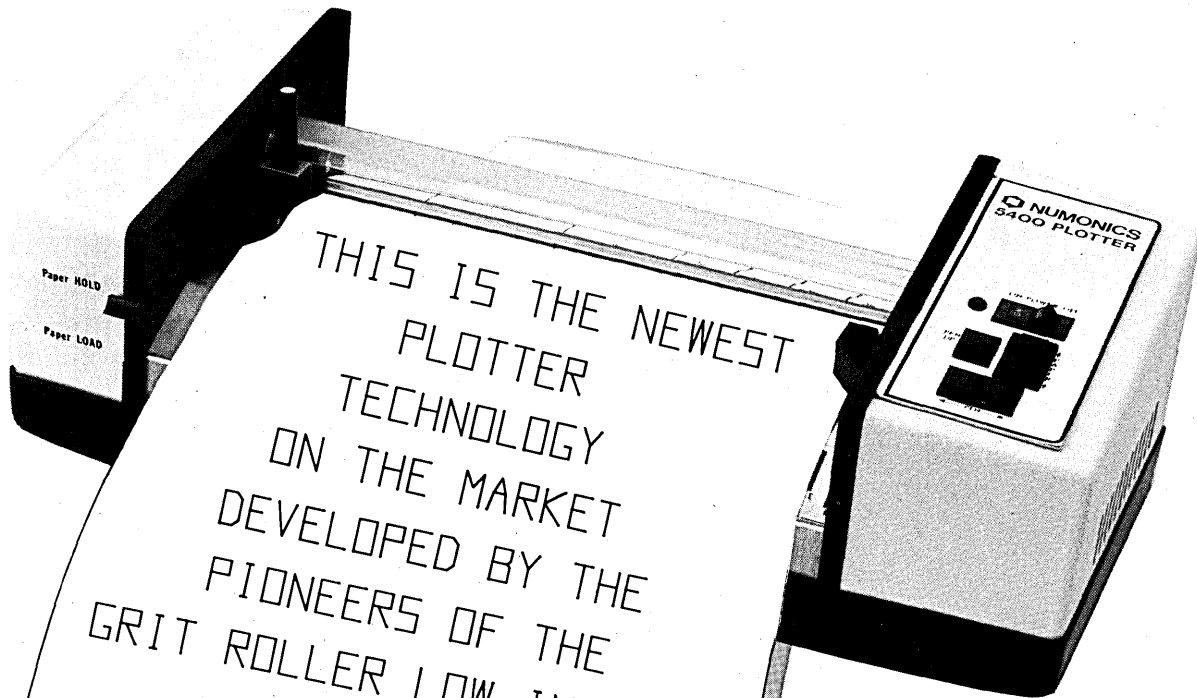
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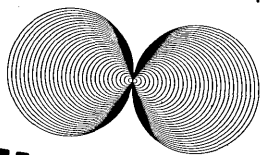
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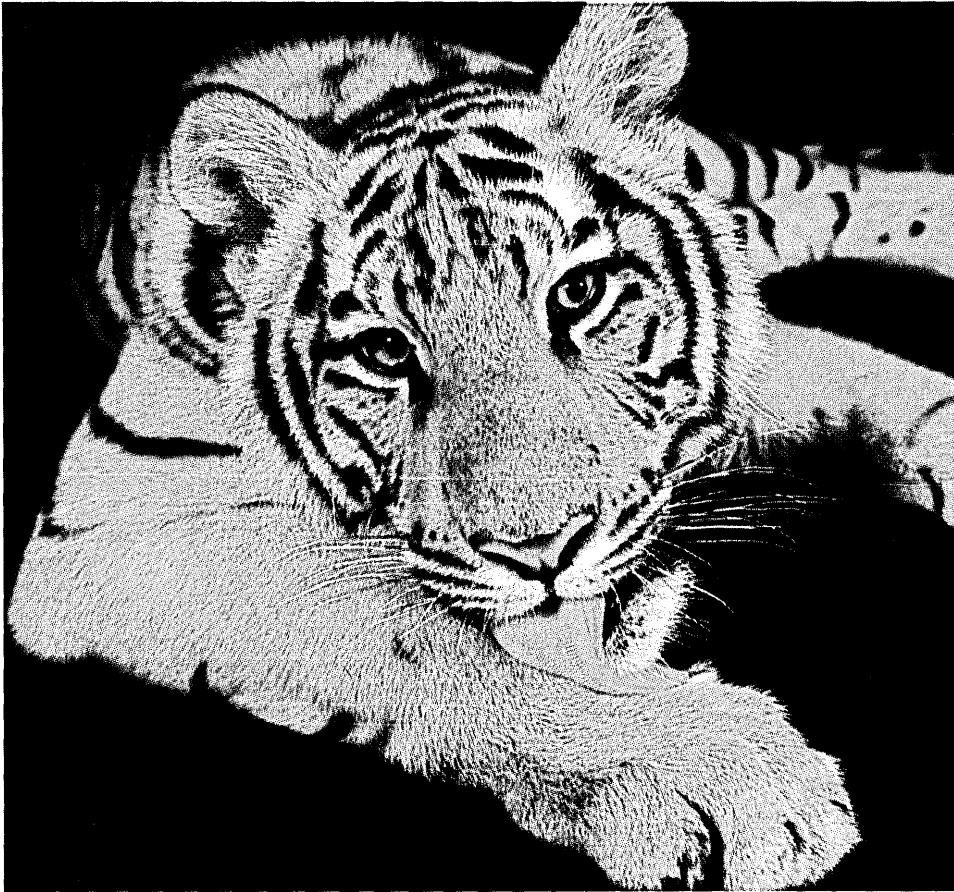


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# SOFTWARE AND SERVICES

## UPDATES

The marketing people at Apple have come up with a package bound to whet the appetite of businessmen looking for a personal computer. Until Oct. 31, they are selling the Apple III Professional solution, which includes an Apple III with 256K internal memory and built-in floppy drive, a 12-inch Monitor III, the Apple Writer III word processing program, The VisiCalc III electronic spreadsheet, and the Quick File III filing system, all for just under \$5,000. If bought separately, they would cost \$300 more. An introductory guide is included to help users unpack the system and set it up.

No room for your modems? Try the Concord Data Systems RM 07 modem rack assembly, which holds up to seven CDS dial modems of any type. The design occupies only 8 3/4 inches of vertical space and is only 19 inches wide.

GTCO has added another dimension to its 3-D digitizer tablet -- literally. A \$200 option converts stylus tilt into a fourth dimension transmitted to a graphic crt along with XYZ data. It allows for rotation of 2-D and 3-D images and pan-while-zoomed, transforming the stylus into an "unrestrained joystick/digitizer," the company says.

From the people who brought you "Tron": Digital Productions is completing work on a second movie using its "digital scene simulation" technique. The Lorimar Productions movie, titled "Starfighters," will contain about half an hour of scenes simulated so well we won't be able to tell they're not real, the company says. Meanwhile, Digital has leased a second Cray computer, the vendor's first X-MP/22.

## RELATIONAL DBMS

Reliance Plus is an integrated package including data dictionary, relational database management system, transaction controller, query language, and industry standard COBOL compiler. The transaction-oriented DBMS, designed to be used on the vendor's family of 32-bit superminicomputers, is an enhancement of the three-year-old Reliance transaction processing system.

The data dictionary provides the data description language that allows the user to define and control the use of data throughout the application environment. The dictionary has a set of query and report specifications that can be customized to suit specific needs using the RQL/32 query language. No programming knowledge is needed for RQL/32. Application programs can be written in either ANSI '74 COBOL or ANSI '77 FORTRAN, which are extended to include the package's data manipulation language statements. Help documentation is available on-line.

The DBMS provides an indexed file organization where records are referenced by either a unique primary key or multiple secondary keys. Records may be accessed sequentially, randomly, or dynamically. The transaction unit ensures the integrity of the database by rolling back affected parts whenever a program fails. If a system fails, the package rolls back all incomplete transactions.

Reliance Plus costs \$25,000, including a year of free maintenance. Current Reliance users can upgrade to Reliance Plus for \$8,000. PERKIN-ELMER CORP., Oceanport, N.J.

**FOR DATA CIRCLE 326 ON READER CARD**

## PASCAL COMPILER

Two oem system development packages this vendor is releasing for the Motorola MC68000 microprocessor include the optimizing Pascal-2 compiler. One of the packages resides on the VERSADOS operating system, while the other is on the RSX operating system of the DEC PDP-11 series.

Benchmarks for the Pascal-2 com-

pilars show that they generate code that is a third smaller and nearly twice as fast as the latest Motorola version of Pascal. The compilers support all capabilities of standard Pascal and conform closely to the ISO draft proposed Pascal standard. Except for the reset/rewrite commands, which accommodate differing file system accessing options, the language for the Pascal-2 compilers is host-independent and virtually identical for all systems.

The packages perform compile-time and run-time error checking, and have a "walkback" feature that prints the execution history of the procedures that led to any run-time error.

The Pascal-2 MC68000 package consists of a native VERSADOS compiler, an interactive source-level debugger, an execution profiler, and other utilities running on VERSADOS such as formatters and cross-referencers. The VERSADOS compiler supports 16-bit integers but is scheduled to be upgraded to 32 bits, and costs \$5,950 to oems.

The RSX cross-compiler includes the XFR utility to transfer files to and from VERSADOS and the year-old native RSX compiler. The RSX cross-compiler costs \$7,950. OR-EGON SOFTWARE, Portland, Ore.

**FOR DATA CIRCLE 327 ON READER CARD**

## FULL-SCREEN DEBUGGING

The Extended Productivity Facility/TEST (XPF/TEST) provides a structured testing environment for controlling the execution of application programs and correcting resultant errors. The environment, modeled after IBM's popular System Productivity Facility, includes menu-driven full-screen displays, split-screen capability, on-line help documentation, and Program Function Key conventions.

XPF/TEST's control entry panel loads a program for execution in the test environment. If errors occur, the intercept panel displays status word, registers, and memory contents at the time of the ABEND (abnormal end). The programmer can then simultaneously browse the source listing of

## SOFTWARE AND SERVICES

the program and modify program specifics.

XPF/TEST also includes breakpoint control panels, virtual storage management facilities, symbol creation and management panels, memory management options, and utility control from within the testing environment. The system operates on the Assembler language level on System/370 and compatible computers as a command processor under MVS/TSO. It will test programs written in Assembler as well as compiled programs written in any language.

A one-year single cpu license for XPF/TEST is \$8,000 per site, and additional cpus are \$2,000 at the same site. Subsequent annual license renewals are \$5,000 for the first cpu and \$1,250 for each additional cpu. A free 30-day trial is available. BOOLE & BABBAGE, INC., Sunnyvale, Calif.

**FOR DATA CIRCLE 328 ON READER CARD**

### HIGH-TECH RECRUITING

Connexions is an on-line recruiting service that enables personnel, technical, and general managers to list their help wanted ads both demographically and geographically, receive applicants' résumés, and prescreen respondents with custom questions. The service, intended for use by employers of

engineers, programmers, MIS professionals, and other technical employees, operates via existing terminals and personal computers.

Recruiters pay \$600 to display their ad in the electronic publication for a two-month period. The ad can be limited in its circulation to any subset of the service's subscribers, so that the employer solicits only résumés that are applicable to the particular job.

Potential readers include anyone with access to a terminal or personal computer. Job-seekers pay a nominal subscription fee to view the publication up to four hours in each two-month publication period. Users can control and restrict access to their résumé to specific prospective employers.

The number of readers viewing an employer's ad is tabulated and can be compared to the number of résumés received on-line to measure the effectiveness of the ad. The vendor says that the service is tamper-proof and that the security of all respondents is assured through proprietary software. PROFESSIONAL DATA CORP., Cambridge, Mass.

**FOR DATA CIRCLE 329 ON READER CARD**

### GRAPHICS FOR VAX

VAX-11 Decor is a device-independent graphics subroutine package based on the 1979 Core graphics standards proposal. Consisting of FORTRAN and Bliss subroutines, Decor is accessible through standard VAX calling conventions from other languages, and is optimized for the VAX/VMS environment. Decor also provides a software interface between an applications program and a variety of graphics devices, allowing the applications program to remain device-independent.

The package implements 2-D direct and buffered output, a subset of synchronous input, and raster extensions consistent with the Core proposal. Other features include viewing operations that support viewports on multiple devices, image segmentation, attributes for output primitives and segments, and a provision for a device escape sequence that allows direct access between the applications program and some specific hardware capability.

The vendor includes a guide to write device handlers for non-DEC hardware, a set of commonly used handler routines, and a sample skeleton handler with the Decor package. A single-system license fee is \$7,500, with deliveries scheduled to begin in the second quarter of 1983. DIGITAL EQUIPMENT CORP., Maynard, Mass.

**FOR DATA CIRCLE 330 ON READER CARD**

## SOFTWARE SPOTLIGHT

### MAINFRAME-MICRO LINK

Once totally in charge of selecting and managing software within his corporation, the dp manager is now faced with a bewildering array of microcomputers whose acquisition and use he has had nothing to do with. The personal computers are busy crunching numbers, building databases, and modeling business functions more or less autonomously, with each user not necessarily processing the same information as that residing in the company's mainframe shop. Yet little in the way of hardware or software has been available from vendors to make sure all of a corporation's computers are dealing from the same deck of cards, as it were.

Eyeing this scene has been Management Science America, Inc., which is marketing an interface software package that it says will tie various micros into MSA's mainframe accounting packages. The new PeachLink software is said to enable managers to download from mainframes just the information they need for local processing on a personal computer.

MSA hopes to leverage its strong standings in the mainframe software arena—some 7,500 packages installed and the recent acquisition of Peachtree Software, Inc., an Atlanta microcomputer software vendor—to become a major supplier of corporatewide software packages. To that end, it has put into a specially priced package five popular Peachtree products that will be sold as the MSA Executive Peachpak. Included are word processing, mailing list manager, business graphics, an electronic

spreadsheet, and PeachLink. The company is hoping it can remain a jump ahead of other vendors who are selling micro software into large organizations.

Each Peachpak carries the price tag of \$3,000, with a minimum order of 10 packs required. Twenty packs sell for \$57,000, 50 for \$135,000, and 100 for \$240,000. Each order includes a license to use Peachpak with but a single MSA mainframe product. Additional licenses for other mainframe packages are \$5,000 each. Also included in the minimum order is telephone support for a year through the Peachtree service center. Deliveries and earnest marketing of the Peachpak software will begin in January.

Managing the flow of information between micros and mainframe is controlled by a four-level scheme. The layers are applications data control, data mapping control, data transmission control, and line discipline control. A copy of each layer resides in both the micro and the mainframe. Separating the functions into layers should permit quick adaptation to future changes in hardware and software technology.

The first implementation of the PeachLink interface is scheduled to be the IBM Personal Computer, a machine that already runs certain Peachtree products. Next will come versions for the CP/M, CP/M-86, and MS/DOS operating systems. MSA's mainframe accounting packages run primarily on IBM machines. MANAGEMENT SCIENCE AMERICA, INC., Atlanta, Ga.

**FOR DATA CIRCLE 325 ON READER CARD**

### BANKING INFORMATION SERVICE

The InnerLine is a computerized information service that delivers banking and finance-related data and provides subscribers with ready access to daily updates on news, issues, regulations, and statistics pertinent to the financial industry. The 24-hour service is accessible via a telephone and any crt/modem combination. No knowledge of computer languages is needed; the entire service is menu-driven.

InnerLine includes daily forecasts and commentary from the publishers of *Bond Buyer*, the daily bond market reports, including reports on treasury, money markets, bond markets, and municipal markets. It also provides, for an additional fee, the vendor's index of bank performance — a statistical tool that compares banks' financial data in 60 categories — as well as financial data on about 8,600 publicly held corporations, obtained from reports filed with the Securities and Exchange Commission. In addition, the banking industry's daily journal, *American Banker*, is transmitted via InnerLine.

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November 15-19, 1982 ..... New York Area  
 December 6-10, 1982 ..... San Francisco  
 January 10-14, 1983 ..... New York Area  
 January 24-28, 1983 ..... Dallas  
 January 31-February 4, 1983 New York Area  
 March 7-11, 1983 ..... New York Area  
 April 4-8, 1983 ..... Los Angeles

### CICS/VS PERFORMANCE & TUNING

December 13-14, 1982 ..... San Francisco  
 January 17-18, 1983 ..... New York Area  
 January 31-February 1, 1983 ..... Dallas

### RECOVERY/RESTART

December 15-16, 1982 ..... San Francisco  
 January 19-20, 1983 ..... New York Area  
 February 2-3, 1983 ..... Dallas

### CICS/VS APPLICATION PROGRAMMING COMMAND LEVEL

December 6-10, 1982 ..... San Francisco  
 January 3-7, 1983 ..... New York Area  
 January 31-February 4, 1983 ..... Dallas  
 February 28-March 4, 1983 . . . New York Area  
 March 14-18, 1983 ..... Los Angeles

### CICS/VS APPLICATION PROGRAMMING MACRO LEVEL

Nov. 29-Dec. 3, 1982 ..... San Francisco  
 January 24-28, 1983 ..... Dallas  
 March 21-25, 1983 ..... Los Angeles

### CICS/VS LOGIC & DEBUGGING

November 1-4, 1982 ..... New York Area  
 December 13-16, 1982 ..... Dallas  
 January 10-13, 1983 ..... San Francisco  
 February 15-18, 1983 ..... New York Area  
 March 14-17, 1983 ..... Chicago  
 March 28-31, 1983 ..... New York Area

### CICS/VS APPLICATION DESIGN

November 8-9, 1982 ..... Chicago  
 Nov. 29-Dec. 2, 1982 ..... New York Area  
 January 3-6, 1983 ..... San Francisco  
 February 8-11, 1983 ..... New York Area  
 March 21-24, 1983 ..... New Orleans

### VSAM: ITS STRUCTURE & HOW TO USE IT

December 13-16, 1982 ..... New York Area  
 February 8-11, 1983 ..... San Francisco  
 February 22-25, 1983 ..... New York Area

### VTAM: FROM START TO FINISH

November 8-11, 1982 ..... Houston  
 December 20-23, 1982 ..... New York Area  
 January 24-27, 1983 ..... New York Area  
 February 22-25, 1983 ..... San Francisco

### IMS/DB (DL/1) APPLICATION PROGRAMMING

November 15-18, 1982 ..... Minneapolis  
 December 6-9, 1982 ..... New York Area  
 January 17-20, 1983 ..... New York Area  
 February 22-25, 1983 ..... Los Angeles

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to send private messages. Other services are scheduled to be added later this year. Inner-Line costs \$200 a year or \$20 a month, plus a 60¢ a minute usage charge. BANK ADMINISTRATION INSTITUTE, Rolling Meadows, Ill.

**FOR DATA CIRCLE 331 ON READER CARD**

### FLOPPY DUPLICATING

A division of Peripheral Marketing offers software duplication on high-quality 5¼-inch and 8-inch diskettes, either single- or double-sided, 48 tpi or 96 tpi. Duplication services are available for 15 standard formats, including IBM, Apple, TRS-80, and Atari. The company can also duplicate custom-formatted diskettes.

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Each diskette is verified twice. First, all duplicates are checked. At the end of each day, the drives used to duplicate the diskettes are taken off-line and rechecked. A second set of drives is put on-line and reverifies the duplicates. The vendor expects to go to a random reverification sample eventually, but for now every diskette is reverified.

Prices run from under \$3 for a 5¼-inch single-sided floppy to about \$5.25 for an 8-inch, double-sided diskette, in quantities of 500. Discounts are available for larger quantities. PERIPHERAL MARKETING, Mountain View, Calif.

**FOR DATA CIRCLE 332 ON READER CARD**

### PROGRAMMER'S WORKSTATION

The MTC2000 workstation is intended to help solve software programmers' problems of limited dp personnel and time resources, more user requests, and requirements of quality systems design.

The workstation—which consists of an 8086-based cpu, up to 1MB addressable memory, 102-key detached keyboard, 132-column by 34-line 15-inch crt, printer, and proprietary software—allows the analyst/programmer to automate many of the tasks associated with design, documentation, implementation, and maintenance of software systems.

The software is designed to manipulate text and graphics easily and quickly. Symbols, lines, and text can be intermixed; several common symbols can be created with one keystroke and expanded or contracted in two dimensions.

The system can produce, maintain,

and remember PERT charts, HIPO charts, logical flow charts, report layouts, screen layouts, and system or program narratives. They can be recalled with one keystroke. The system can also function as a word processor.

The MTC2000 offers host communication links via IBM 2780/3780 emulation as well as 3270 emulation compatibility. Communications are provided through two serial ports, one of which is RS232C compatible and the other of which is either RS232C or RS422 compatible. The complete system starts at \$37,700, or it can be leased on two-, three- or four-year terms starting at \$1,188 a month. Availability is 30 to 45 days ARO. MULTIPLE TECHNOLOGIES CORPORATION, Southfield, Mich.

**FOR DATA CIRCLE 333 ON READER CARD**

### ELECTRONIC MAIL

The Mail Monitor package allows users on local area networks consisting of Apple II and Corvus Concept computers to send letters or data to each other. An optional version that supports a modem allows information to be transmitted over telephone lines to remote networks.

The package contains two programs. The central control Post Office program, which runs on a dedicated Apple II, acts as the main distribution center for all mail. The Mail Box program, which runs on each user computer in the network, is run by the user to create and send letters to the "post office" for distribution to other user locations and to collect mail distributed to him by the post office.

Letters can be addressed to specific locations or for general distribution. Senders are notified when letters have been received by everyone on the address list. A printer spooler utility is provided to spool text files to a shared printer attached to the post office computer. The local area network Mail Monitor—which must run on a Corvus network system—costs \$495; with the modem support, the price is \$750. Optional \$200 diskettes allow Corvus Concept workstations to be attached and will soon be able to add the IBM Personal Computer and the Apple III to the network. SOFTWARE CONNECTIONS, INC., Santa Clara, Calif.

**FOR DATA CIRCLE 342 ON READER CARD**

### PERSONAL COMPUTER INSURANCE

Since most standard homeowners' insurance policies do not cover personal computers used for business, many users may unknowingly leave their systems unprotected. This vendor's policy, one of several it has developed in the Safeware program, covers personal computers for theft, fire, and accidental damage due to a variety of mishaps.

Unlike insurance for jewelry or other valuables, the Safeware program does not itemize individual pieces. The policy

and premiums are based on the total value of the system, and cover all hardware, media, and purchased software up to the amount stated by the owner when the policy is issued. No coverage limits are placed on specific items prior to the claim. The blanket coverage reimburses the insured for the full replacement cost of the equipment at the time of the loss.

The annual premium for a typical system consisting of a \$3,500 microcomputer, \$1,600 printer, and \$900 of software would be about \$60, with a \$50 deductible. Policies can be quoted over the phone and issued immediately. A full refund is guaranteed within 10 days of receiving the policy. COLUMBIA NATIONAL GENERAL AGENCY, Columbus, Ohio.

**FOR DATA CIRCLE 335 ON READER CARD**

### TEXT FORMATTER

The Incredible Text Printer (ITP) is designed to be a mainframe-caliber text formatter to be used on microcomputers. It works with many text editors and printers to create letters, reports, manuscripts, and offset masters. ITP begins with a menu-driven procedure to set up the printing format, and allows storage of frequently used formats.

The system is optimized for proportional width fonts of daisywheel printers, but line printers, dot matrix printers, and typewriter printers can also utilize the ITP package. The program requires the UCSD operating system, at least 60K characters of system memory exclusive of disks or tapes, two floppy disk drives or a hard disk drive, and a 24 by 80 crt display. The IBM Personal Computer and an Apple II with Apple Pascal or Apple FORTRAN and an external terminal can be used.

The ITP provides many word processing functions, such as splitting long centered lines onto two lines; table formatting; line drawing; automatic hyphenation; control of headings, subheadings, and footings; pagination; file insertion; automatic index and table of contents; underlining, boldface, and sub- and superscripts; table and figure relocation to the bottom of the page or the top of the next page; personalized form letters; and automatic section numbering.

The \$249 price tag includes free updates for six months. A demo version costs \$60 and a manual is \$30. DATAMED RESEARCH, Los Angeles, Calif.

**FOR DATA CIRCLE 336 ON READER CARD**

### DISTRIBUTED DBMS

The Domain Distributed Data Management (D3M) system is a CODASYL-compliant database management system with relational query and update capabilities. It is designed exclusively for use in the vendor's Domain network of 32-bit computers; D3M combines the individual databases from each node in the network to form a single, aggregate, logical database, without users having



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## SOFTWARE AND SERVICES

to reformat or redefine any of their databases.

The D3M system is composed of four parts: Dataview provides relational capabilities for queries and updates; Describe lets the user design a database interactively, using either forms or commands; Unite is an aggregate schema compiler that lets the user create logical combinations of multiple databases anywhere in the Domain network; and Formatter is a report-writing package for nonprogrammers.

D3M is tailored for engineering, scientific, and CAD/CAM applications. FORTRAN and Pascal are used to interface with the database and, in combination with the CODASYL format and distributed architecture, allow CAD/CAM users to use the DBMS in a real-time mode. The CODASYL format provides an overall logical plan for the structure of the database, down to the individual records and their interrelationships. Subschemas permit individual user views of the data, and may change as applications change.

D3M runs on any Apollo computational node with 1MB main memory, and one node in the network must have a Winchester disk and diskette. The license fee is \$2,500 per node, including installation, documentation, and training. APOLLO COMPUTER, INC., Chelmsford, Mass.

**FOR DATA CIRCLE 337 ON READER CARD**

## DISK EDITOR

Disk-Edit is a screen-oriented disk editor for CP/M programs that makes changes directly to programs stored on hard disk or floppies. The editor allows users to access raw files directly from disk that are not accessible with a normal editor, then edit them in either ASCII or hexadecimal notation.

Disk-Edit simultaneously displays a program in both hexadecimal and ASCII notation. The user moves the cursor to any area where changes are desired and types in the new byte values in either hex or ASCII. The changed version is saved directly back to disk. The user has cursor control and can move forward, back, up, down, next screen, next page, beginning of file, etc. The user can move back and forth between hex and ASCII displays, and can write programs back onto disk with no changes, if desired.

The \$100 program loads a 1024-byte section of the disk into an internal buffer, then displays two windows on the screen, with the hex values of each byte on the left and the ASCII values on the right. Changing a byte value in one window automatically changes the corresponding value in the other window.

The package comes with a terminal definition package and is configurable for almost all CP/M systems with or without

hard disks, including the IBM Personal Computer. SUPERSOFT INC., Champaign, Ill.

**FOR DATA CIRCLE 339 ON READER CARD**

## INTERACTIVE GRAPHICS

The Graph-S package converts vector to raster for interactive generation of geometric figures on a Comtal Vision One/20 digital image processing system. Applications include graphic arts, pie and bar charts, geometric shapes and forms, and CAD/CAM. Standard shapes possible include points, vectors, circles, rectangles, and triangles. Other polygons can be created using host programming to generate the necessary vectors.

The display has a 512 x 512 pixel resolution using four-deep 1-bit graphic planes for 16 colors. A standard one-deep 1-bit graphic plane yields a 1024 x 1024 monochrome resolution.

Geometric figures and labels can be generated either by the use of previously defined coordinate points or interactively using the system's trackball or data tablet. With these capabilities, the user can download the commands and coordinates and/or alphanumeric characters from the host processor, through the vendor's standard interface using command block transfers. Users can also download image generation interactively from the keyboard or with the track-

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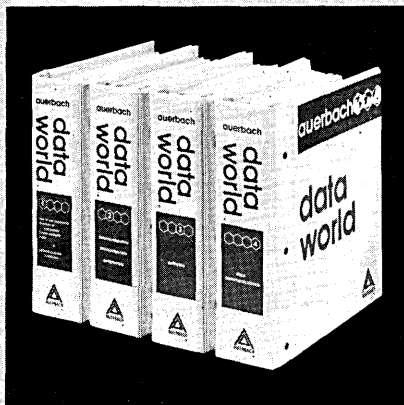
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## SOFTWARE AND SERVICES

ball or data tablet.

The Graph-S package can be added to existing LSI 11/23 cpu systems and is available immediately ARO. The package costs \$5,000 for a single-user license. COM-TAL CORP., Pasadena, Calif.

**FOR DATA CIRCLE 340 ON READER CARD**

### AS YE SOW . . .

The Farm Management System (FMS) consists of two packages written by an Illinois hog farmer to automate farming operations. Designed for on-farm use, the packages are intended to be usable by computer-naive farmers.

The financial program package is a specialized DBMS, including control of all financial data. Entry, search, monthly and year-to-date totals, cash flow statements, inventories, and enterprise analysis are all possible with the package. The hog production records package has three programs. SOWS tracks the progress of individual pigs, litters, breeding, and other similar information. ASOWS analyzes stored litter information to obtain lists of records, averages, or totals, graphs of particular information, genetic lines, and monthly trends. BREED indicates the status of each animal in a gestating herd, including the number of open, bred, and pregnant sows, as well as the conception rate of individual sows.

The packages are sold with a 64K

RAM Blackhawk microcomputer for \$7,500 or independently for \$2,500, with free updating. FARM MANAGEMENT, INC., New Lenox, Ill.

**FOR DATA CIRCLE 343 ON READER CARD**

### MEDICAL ADMINISTRATOR

Designed to automate the accounts receivable and claim form preparation tasks of the multidocor medical practice, the Automated Medical Administrator package can maintain up to 200,000 accounts for up to 10 physicians. The product is programmed through the vendor's "syslearn" technique to be user friendly in its applications.

The patient account management element allows for the entry, search, and editing of a patient base with a complete review facility for billing data, account balance data, and current account activity. The transactions management element allows the definition of procedure and fee schedules; the posting of charges, payments, credits, adjustments, and write-offs; and the preparation of activity reports by doctor. The office administration element allows the separation of charges and income by physician, the preparation of aged receivables reports, and staff efficiency reports. The billing system allows the generation of monthly statements and universal insurance claim forms.

Additional add-on modules are

available for appointment management, patient histories, claim-form specialization, and printer spooling. A single-user perpetual license costs \$1,195, with three months free maintenance. After that, maintenance is optional at \$25 a month. BOARDROOM EXECUTIVE SOFTWARE, Palm Springs, Calif.

**FOR DATA CIRCLE 341 ON READER CARD**

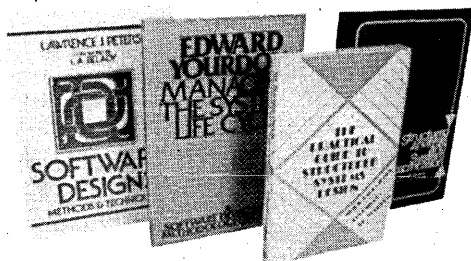
### FINANCIAL MODELING

Designed to help executives and managers in resource planning, forecasting and modeling, TelePlan is billed as the "first financial modeling software offered for a multi-user microcomputer environment." The package enables users of TeleVideo multi-station computer systems to share the same financial information simultaneously.

The packages allows several users to prepare individual plans or models and then consolidate all of them into a single document or report. Among the functions offered are cash flow planning, budget preparation, variance reporting, product pricing analysis, manufacturing planning, sales forecasting, and capital budgeting. The package also offers report generating and formatting capabilities. The \$995 package is customized for use on the TeleVideo TS-806 six-user and TS-816 16-user systems. TELEVIDEO SYSTEMS, INC., Sunnyvale, Calif.

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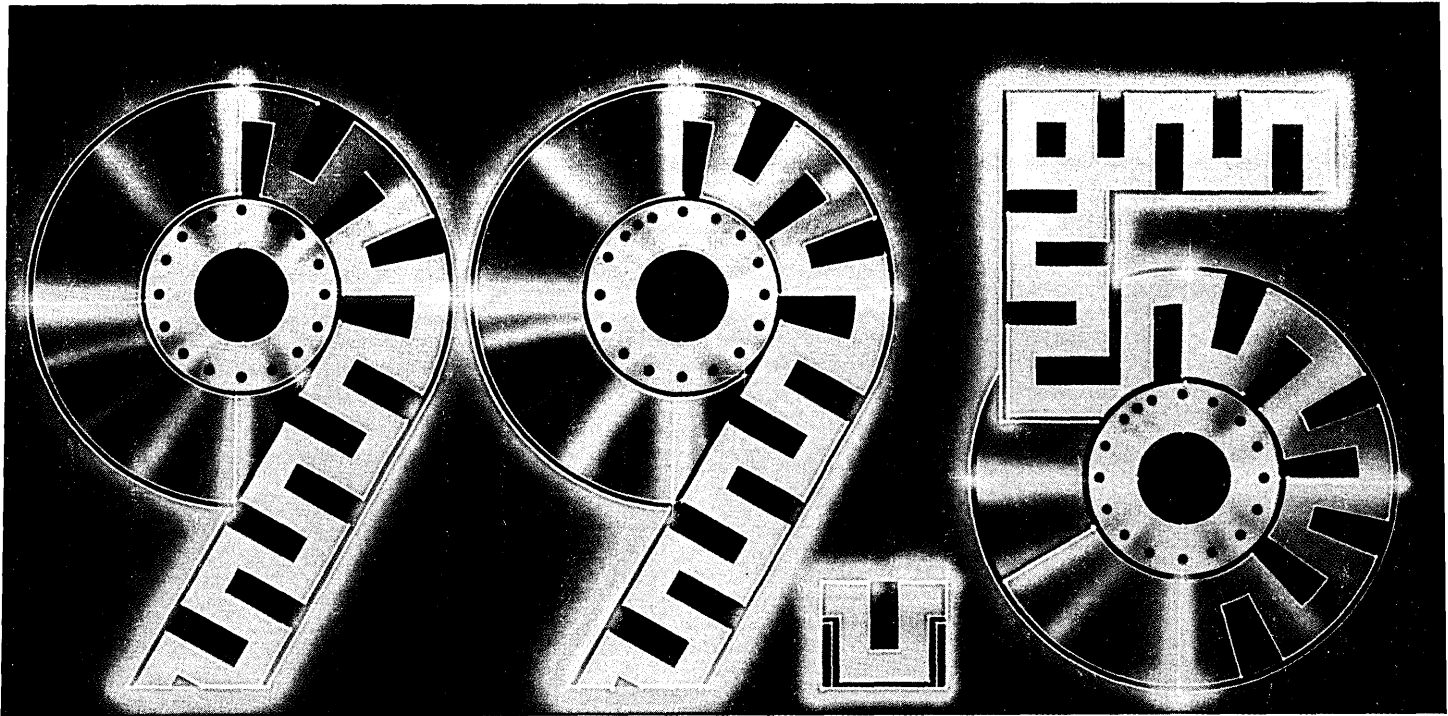
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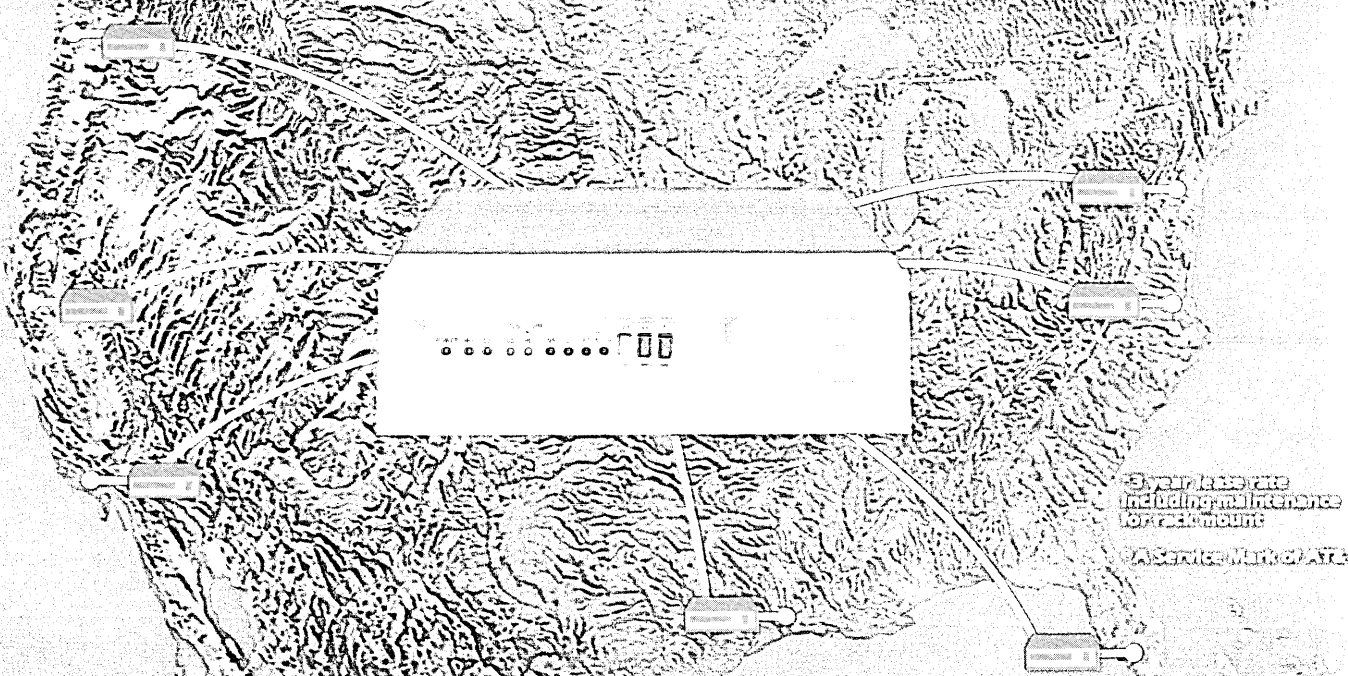
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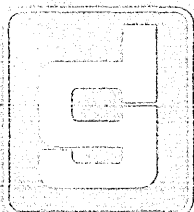
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# SOURCE DATA

## BOOKS

### **OFFICE AUTOMATION A Manager's Guide For Improved Productivity by Mark A. Lieberman, Gad J. Selig, John J. Walsh**

It isn't easy to write about office automation. One isn't quite sure whom to address or what to include and one is almost certain that the technology will have changed by the time the type is set. Office automation is a slippery subject at best; though discussed at length by vendors, users, and observers, many will tell you that they don't really know what it is. The newness and lack of definition in the area provide the strongest motivation for a book like this and, simultaneously, its biggest obstacle. The authors have chosen to attack this obstacle and they have overcome it—and it, in turn, has overcome them. This reviewer calls it a draw.

The book is intended, according to its preface, as a "general reference guide" so that "technical and nontechnical readers can readily understand the opportunities for office automation." The preface also says that the book "provides the information necessary to make the relevant and conscious choices." The list of intended readers is very long, including, it seems, practically anyone who has ever occupied or even visited an office. Fortunately things get much more specific as we pass the front matter and turn to the contents.

The book begins with a brief discussion of what office automation is all about. We learn that all levels of an organization are affected by the introduction of technology into the office (clerks, secretaries, administrators, professionals, and executives) and something about the variety of motivations for introducing office technology (cost increases, productivity drop-off, information demands, staffing problems) as well as something about the problems that we immediately encounter (incompatible equipment, high cost, difficult justification, slow user acceptance). There are some

charts that picture the dimensions of an organization and show all the factors that must be integrated in the office automation setting. The introductory section concludes with a good summary of the Paul Strassman stages-of-growth outline applied to office automation.

With generalities behind them, the authors move briskly into chapters on how to develop an office automation plan, how to put together the plan's financial foundation, how to organize an office technology staff, and how to coordinate and control the office automation activity of a large organization. There is a practical list of things to do to learn more about the general topic of office automation (read the literature, go to training courses, join professional organizations). This list is complete with specific sources and organizations. While we are learning the basics the authors give us a brief tutorial on planning as a structured activity and they relate it to the stages-of-growth outline to indicate how progressively more complex systems can be introduced as an organization matures in its use of office automation. Since any plan in a large company must be firmly based on financial analysis, the book describes how to gather and present the kinds of cost data that form the basis for project justifications. Again there is practical advice about where to look for the data, how to classify them, and how to present them.

Next, the authors devote quite a bit of attention to organizational detail. They advocate the integration of office automation functions with communications and data processing activities, suggesting specifically the Information Resource Manager model. Within this kind of organizational context they go on to recommend a functional organization for the office systems group, consisting of systems analysts, communications specialists, human factors specialists, facilities specialists, and user specialists. It is suggested that these specialists form and reform project teams to address specific objectives.

This section of the book finishes up

with a discussion of how office systems groups can relate to the management process in large organizations. There is a very specific list of suggested office systems policies, procedures, guidelines, and standards. There is also a list of "coordination strategies" that introduces ideas on how to communicate and coordinate with all parts of a large company. This list includes items like management and technical review councils, periodic progress reports and on-site reviews, internal consulting, prototyping, newsletters, and technology caravans.

Up to this point the book seems to be directed to a novice manager of office systems who has to learn his job from scratch. It seems unlikely that a middle manager would be asked to do a job for which he was totally unqualified in a field where he was totally inexperienced. Yes, it seems unlikely, but in office technology, it really happens, or at least it has happened in the past. Office automation as a discipline is sufficiently new and sufficiently obscure that experienced office automation managers didn't exist and very few people could even guess what skills would be required. It appears that this book, at least at some level, was intended to pass on the lore and lessons learned from managers who picked up their experience "the hard way" to aspiring colleagues who could have it easier if they attend well to its contents.

If the beginning of the book is addressed to a novice office automation department manager, then the middle is addressed to a novice office automation project manager. This middle part begins with a chapter called "How to Analyze Needs and Requirements." Again we get lists. Lists of the steps on a data collection effort, lists of considerations in choosing the scope of data gathering, lists of the activities about which data can be collected, lists of places that typical large corporations already collect data, and lists of topics that can be included in questionnaires. At the end of all the lists we are given too few examples of the kind of information that can be derived from the data collection activities. The "needs and

## SOURCE DATA

requirements" chapter concludes with a list of the steps in a typical office systems development methodology. The inclusion of the development methodology at the end of the presentation of needs analysis seems to be simply an organizational blunder.

The authors move beyond the chapter on data collection called "How To Analyze Needs" to a chapter on how to analyze needs called "What Are the Requirements?" They suggest that business systems all have seven fundamental components (creation, capture, keyboarding, distribution, expansion, storage and retrieval, and disposal) and that the various employee levels in an organization have different requirements to do these component activities. They give us a list of some technologies and equipment types that address the fundamental component activities and then for a finance department, marketing department, and a human resources department they present a good description of how the various technologies can be arranged to make each department's most important component activities work better. This seems to be intended to help a novice system designer learn how to think through the process from requirements analysis to conceptual design. The examples are good, although very brief, and the approach is probably as good as any to teaching what is essentially a creative process.

The middle portion of the book finishes up with a 16-page chapter on project management called "How To Implement." It tells us that schedules are required, PERT and CP/M are good things for big projects, users should be involved, vendors should be selected with care, systems should be thoroughly tested, contracts should be used when buying things, facilities planning should not be ignored, training is required, documentation is important, and we should plan to determine when the project is done whether or not it was done well. None of this good advice is either more or less pertinent to office automation than to any other kind of systems project. People who know how to manage projects will learn nothing new. People who don't know how to manage projects will probably not be harmed.

The remainder of the main body of the book is a section called "Focus on the Future." This section begins with a chapter that describes the equipment and technologies that are currently associated with the rubric "office automation." We are introduced to descriptions and pictures of word processors, printers, displays, light pens, touch screens, optical character readers, various electronic/electromechanical/optical storage devices, some communication techniques and technologies, micrographics, photocomposition, teleconferencing of various kinds, computers and software in a general way, and the briefest mention of artificial intelligence. All of this is probably interesting information to someone who is

totally innocent of the technology of office systems, but that person might be properly confused about the nearly 200 pages of material that precede this most basic information.

The last chapter of the book asks "Where Do We Go From Here?" and answers that the pressures we have seen pushing office automation so far will increase. There will be more technology, more projects, more change, and more opportunity for people who have figured out the intricacies of technology in the office. Yup!

Following the main body of the book are 100 useful pages of appendix material. We are given: sample job descriptions for office systems staff; a complete version of the matrix that shows how the various levels of the organization carry out the seven component activities and how much potential exists for benefit from which technologies at each level; real examples of activity questionnaires for data collection from principals, secretaries, and clericals; a sample request for proposal and vendor questionnaire; and some sample logs for keeping track of mail, copier, and mail-related costs and volumes. Then comes a glossary and index.

I mentioned earlier that office automation is not an easy topic: the audience is ill-defined, technology is rapidly changing, techniques and approaches are just beginning to evolve, and so forth. In general, the practice of office automation is only dimly understood. The same is distinctly not so, however, of the practice of book publication. I see very little reason for the careless editing and presentation of this book. The book is burdened with many typographical errors. It suffers from amateurish graphics, sodden layout, and gives an overall impression of having been rushed to press. Of course, it may have been, but at \$27.95 per copy one usually expects both more quantity and quality of presentation. This book has been produced at a level of quality that would barely support half its price. It remains to be seen if the material is sufficiently appealing to overcome its lackluster presentation.

The material of this book most definitely does have an appeal. We can cavil about the organization and the choices of emphasis, but there is no doubt that a large group will be interested in at least parts of what this book offers. New managers of office systems and the executives to whom they report really should know the things that the authors have to say about organization and process. New systems analysts and beginner project managers really should know what the authors know about data collection, analysis, design, and project management. The checklists, guidelines, and format examples really will make it easier for people who have office automation jobs to get their work done effectively. We suspect that the audience likely to benefit the

most from this book is professionals working in the one of the large number of middle-sized companies just now getting started with office automation as a corporate concern. The managers and staff in office automation groups in the large companies are mostly beyond this material. The small company would just be frustrated by the very structured approach, which is clearly a product of the authors' experience in large corporations.

Writing about office automation isn't easy. The authors have attacked the obstacles of this topic with an impressive arsenal of personal skills and experience and they won a draw. They have not achieved the intended purpose of helping their intended readers "readily understand the opportunities for office automation." And it is doubtful that this book "provides the information necessary to make the relevant and conscious choices." The book is certainly not what its subtitle suggests, "a manager's guide for improved productivity." What the authors have achieved, however, is the worthy goal of putting together information that will be helpful to people who are trying to make sense out of the confusion of office automation as it exists today. Writing in the field of office automation is still scarce; writing by people who have actually done the work and fought the problems is even scarcer. Lieberman, Selig, and Walsh should be encouraged to continue sharing their lore and lessons. After all, a draw isn't such a bad way to start in a tough match. John Wiley & Sons, New York (1982, 331 pp., \$27.95).

—Bruce W. Hasenyager

### **THE BRAINS OF MEN AND MACHINES** by Ernest W. Kent

### **THE UNIVERSE WITHIN** by Morton Hunt

Bit by bit (pun intended) irreverent men are chipping away at the magical edifice of the brain, from the top down, as Hunt does, and from the bottom up, as Kent does. But all of the chipping stops at the core, the holy of holies . . . the consciousness.

The authors of these two books approach the problem of the consciousness resolutely, in Kent's case completely without the psycho-philosophical jargon that this kind of book sometimes lapses into, and in Hunt's case with the obtuse sincerity of the practiced evangelist. Both authors take some pretty good shots at the consciousness, but both miss their target.

Kent is the consummate engineering pragmatist-cum-physiologist. Some background: he is a professor of physiological psychology and psychopharmacology at the University of Illinois and, although lacking discrete credentials thereto, he obviously knows his way around logic diagrams and flowcharts. Kent's avowed in-

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tent in his book is to redefine biological circuitry in terms of electronic/logical circuitry and thus give logical designers an intellectual bridge from gates to neurons to robots and artificial intelligence. He is certainly successful at the levels of transfer terminology and circuit equivalence. Nothing is more reassuring and comforting to an engineer than to see an "axon hillock" cut down in size to a "Schmitt trigger," or to see a neuron laid out in neat blocks of one-shots, resistors, and diodes. He even reduces the problem of boundary (edge) detection in the visual system to an exercise in AC coupling.

This whole bit/byte/AND/OR/ROM/PROM approach to neural network analysis is intriguing. It has just the right ring of resonant familiarity. It also has the effect of turning the implacable density of biochemistry into the more transparent simplicity of wires, gates, flip-flops, and delay lines. But is it right? Can a complex quasi-analog/quasi-digital biological data processing network be confined to the binary cage of logic circuits? A "no" answer is practically moot in this case because Kent pulls off an intellectual trompe l'oeil that hangs together quite well up to the barrier of the consciousness. The only nonlogical luxury Kent allows himself is the concept of an ALMOST gate, which is sort of an AND gate that fires when some (variable) percentage of its in-

puts are excitatory (enabling). This is about as far as "analog" intrudes onto "digital" in Kent's book. A reasonable extrapolation of ALMOST gates is "fuzzy" logic, which Kent admits to late in the book but does not explore too deeply.

Kent's analytical approach to the neural system is best summed up by two phrases right out of his book: selective convergence and transformation. Another way to describe these ideas is differentiation and integration. The sensory inputs, or transduction interfaces if you prefer, are extremely wideband channels filled with redundant, static, and extraneous information. The input data stream can be thought of as a highly complex, constantly changing, real-time equation that describes real-world events (within the limits of the transducer). In digital terms, it is a million-bit word window on the world. The tricky part is that this superequation is actually a composite of many "feature intensive" components. In the case of vision, for example, there are brightness, color, motion, relative distance—each of which needs to be extracted from the superequation for different kinds of signal conditioning and processing in the neural system. Kent defines these portions of the biological hardware as "feature extractors." In a discrete form, "feature extractor" becomes "Fourier transform" in the visual network. A perception

of the internal visual process as streams of compressed Fourier-transformed data representations is compelling and permits Kent to suggest that the brain can then use techniques such as convolutional integration (by multiplying Fourier transforms) for some fancy data massaging later on in the neural pathway. Simple differentiation seems to explain the system's apparent sensitivity to change and insensitivity to no change.

The pattern that unfolds is a fascinating picture of data being compressed, synthesized, differentiated, and transformed, only to be further combined in a towering sequence of successive refinements. Useless information, or environmental "clutter," is sloughed off along the way, so that the brain need deal only with deeply coded abstractions of the transducers' original data.

Kent's stab at explanations of consciousness, volition, memory, hemispheric specialization, and other higher functions begins with a chapter on goal-defining systems. Here, the neat AND gate/OR gate sense of order starts to fall away. From this point on, most of Kent's theory is the usual conjecture-supported-by-observation analysis that practically every other writer on the brain does with more or less equal facility.

Hunt's book is a rather well-written popularization of essentially the same sub-

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ject addressed by Kent except that instead of working from the inside out, as Kent does, Hunt works from the outside in toward the common paradox of the consciousness.

Hunt's academic qualifications are not given. This is his 11th book. Selected titles from his other 10 books are: *The Natural History of Love*, *The World of the Formerly Married*, and *Sexual Behavior in the 1970's*—not exactly a reassuring background for a writer dealing with the insights of cognitive psychologists into the workings of the human mind. Yet, oddly enough, Hunt's obvious people orientation combines with a good native intelligence to yield an always entertaining and occasionally informative book. Hunt lapses a bit too frequently into the "golly! gee whiz!" style of popular science writing, and his approach to computers is so tentative that it's difficult to see why he bothers. But once all these negatives are understood and gotten out of the way, one can appreciate Hunt as an accurate reporter on other men's ideas.

Hunt's book is a series of puzzles—real, honest-to-goodness puzzles such as mazes and cryptarithmic—each of which is selected to illustrate some quality of the human mental machine. Hunt then explains the mechanisms in the language of cognitive science, carefully introducing terms such as "protocol analysis" and concepts

such as "problem space" with examples and anecdotes. Nothing truly definitive comes out of all this, at least not in the same sense as Kent's unarguable logic diagrams, but some good deductive inferences are developed. For example, in a section entitled "Let There Be Order," Hunt puts together a strong case for a kind of new intellectual determinism. The argument is that humans create an internal world that excellently mimics the external world. The argument further states that the internal world will be created even if it is not taught directly by parents, peers, society, etc. This is not the old deist determinism, which was implacable, inviolable—and external. It is, rather, a partial admission that every human brain is basically the same kind of machine (like the IBM System/370 with different model numbers) and will always generate similar programs to solve similar problems. This is like looking at Kent's circuitry through the other end of the telescope. Hunt casually distributes many similarly challenging ideas throughout his book. I say casually because Hunt merely presents the ideas; he seldom develops them.

The most intriguing part of the book is the chapter on creativity entitled "Something New Under the Sun." Hunt focuses on the qualities of abstract association that seem to lie at the foundation of every creative act. More specifically, he locates the

thin line between abstract association without internal consistency, which we call madness, and abstract association with internal consistency, which we call creativity. Hunt neatly plays off a madman's scribbles against an excerpt from Doctorow's *Ragtime* to make his point.

And here is where both books reach an impasse: neither author can do much with the operating-system-like consciousness that makes the human mechanism work. Kent's approach is to drive upward toward the consciousness through the minutiae of circuits and utility programs. This technique bogs down in sheer complexity somewhere around the eighth or ninth synaptic level and dissipates into conjecture. Hunt's approach is to deal strictly with the effects of the operating system and then to try to deduce its underlying structure from the nature of the effects—sometimes called intelligent guesswork. Hunt's singular foray into parallel computer structures could have been omitted without loss. His book does not dissipate into conjecture about the consciousness because his approach is all conjecture to begin with.

A final editorial comment about the respective styles of the two books: Kent's book is poorly written and poorly edited. Occasionally, a certain style sparkles through his writing, but most of the book is dead dull because of his (curable) habit of

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writing tortuous relative-clause sentence stacks that collapse under their own weight. The book is also loaded with typos, and one dearly wishes that someone at McGraw-Hill would learn the difference between affect and effect.

Hunt, on the other hand, has a glib, highly transportable style that accepts any kind of data, from sex therapy to computers, with equal facility. Hunt is a professional writer; Kent is a professional scientist. The difference shows. *The Brains of Men and Machines*, McGraw-Hill, New York (1981, 272 pp., \$18.95). *The Universe Within*, Simon and Schuster, New York (1982, 350 pp., \$17.95).

—Vincent Rauzino

## SEMINARS

### COMPUTERS AND ART

Computer Graphics for the Artist and Designer is sponsored by the National SIGGRAPH Organization, the Los Angeles Chapter of the IEEE Computer Society, and the Alumni Association of the Art Center College of Design. The festival will be held in Pasadena, Calif., at the Art Center College of Design Oct. 30 and 31. Topics include the use of computers from advertising and business graphics to fine art, animation, and special effects. The registration fee is \$25 for SIGGRAPH, IEEE, and Art Cen-

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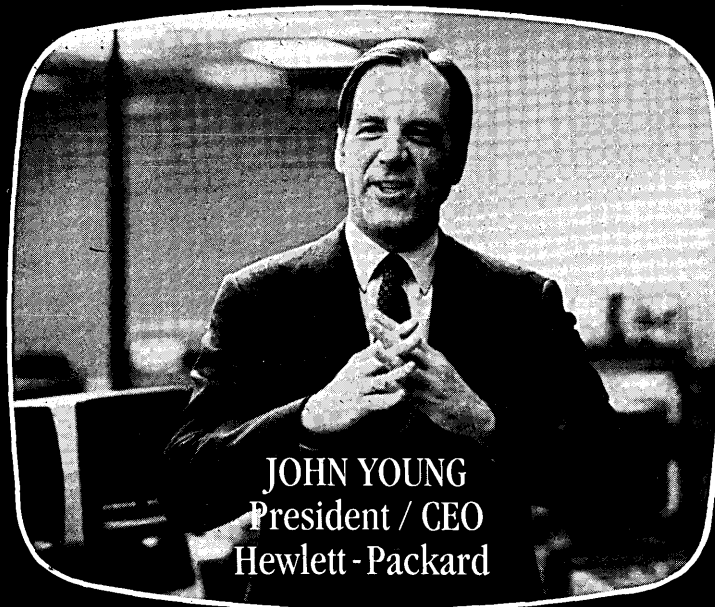
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City Nov. 11 and 12. For more information, contact Women in Data-Processing, Inc., 310 Madison Ave., Suite 2008, New York, NY 10017, (212) 661-7790.

### HIGHER COMPUTER EDUCATION

"Bringing the Information Age to the Campus" is the theme of this year's Sixth Western Educational Computing Conference, presented by the California Educational Computing Consortium. The event will take place in San Diego Nov. 18 and 19, and will cover such topics as student involvement in database design, mixing Ap-

ples and "oranges" in the micro lab, and using business to teach business graphics. Contact CECC, Center for Information and Communication Studies, California State University, Chico, CA 95929.

## VENDOR LITERATURE

### BAR CODE INTRO

This 24-page booklet is an introduction to bar code technology, covering features, operation, and use of both contact and noncontact bar code readers. Case histories demonstrating bar code applications are given. ACCU-SORT SYSTEMS, INC., Telford, Pa.

**FOR DATA CIRCLE 350 ON READER CARD**

### WAREHOUSE CONTROL

The vendor's glossy, four-color brochure describes use of minicomputers, microprocessors, and other high-density IC devices in three different models of warehouse control systems, from material handling machinery to semiautomatic storage and retrieval. ANN ARBOR COMPUTER, Div., Jervis B. Webb Co., Ann Arbor, Mich.

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### PIRACY NO MORE

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**FOR DATA CIRCLE 352 ON READER CARD**

### PACX

A 12-page brochure, "The Proven Data Communications Management System: PACX," is available from the vendor. Included are applications information, specifications, functional and operational diagrams, plus a description of the PACX IV family of software-based switching systems. GANDALF DATA, INC., Wheeling, Ill.

**FOR DATA CIRCLE 353 ON READER CARD**

### CPUs

Superminis are described in the vendor's eight-page brochure. Three sections explain architecture, memory, and I/O. HARRIS CORP., Ft. Lauderdale, Fla.

**FOR DATA CIRCLE 354 ON READER CARD**

### WANNA SWITCH?

"The latest in electronic matrix switch technology" is described by the vendor in its six-page foldout brochure on Auto-switch. The product's features are listed and diagrams are included. BYTEX CORP., Framingham, Mass.

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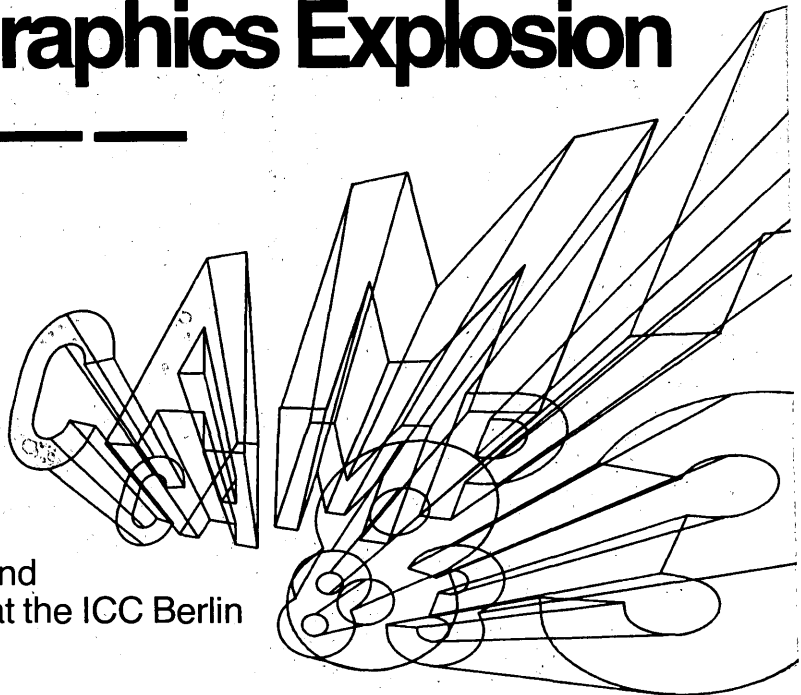
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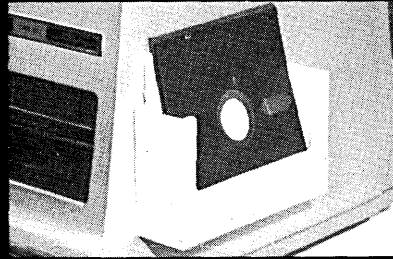
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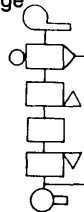
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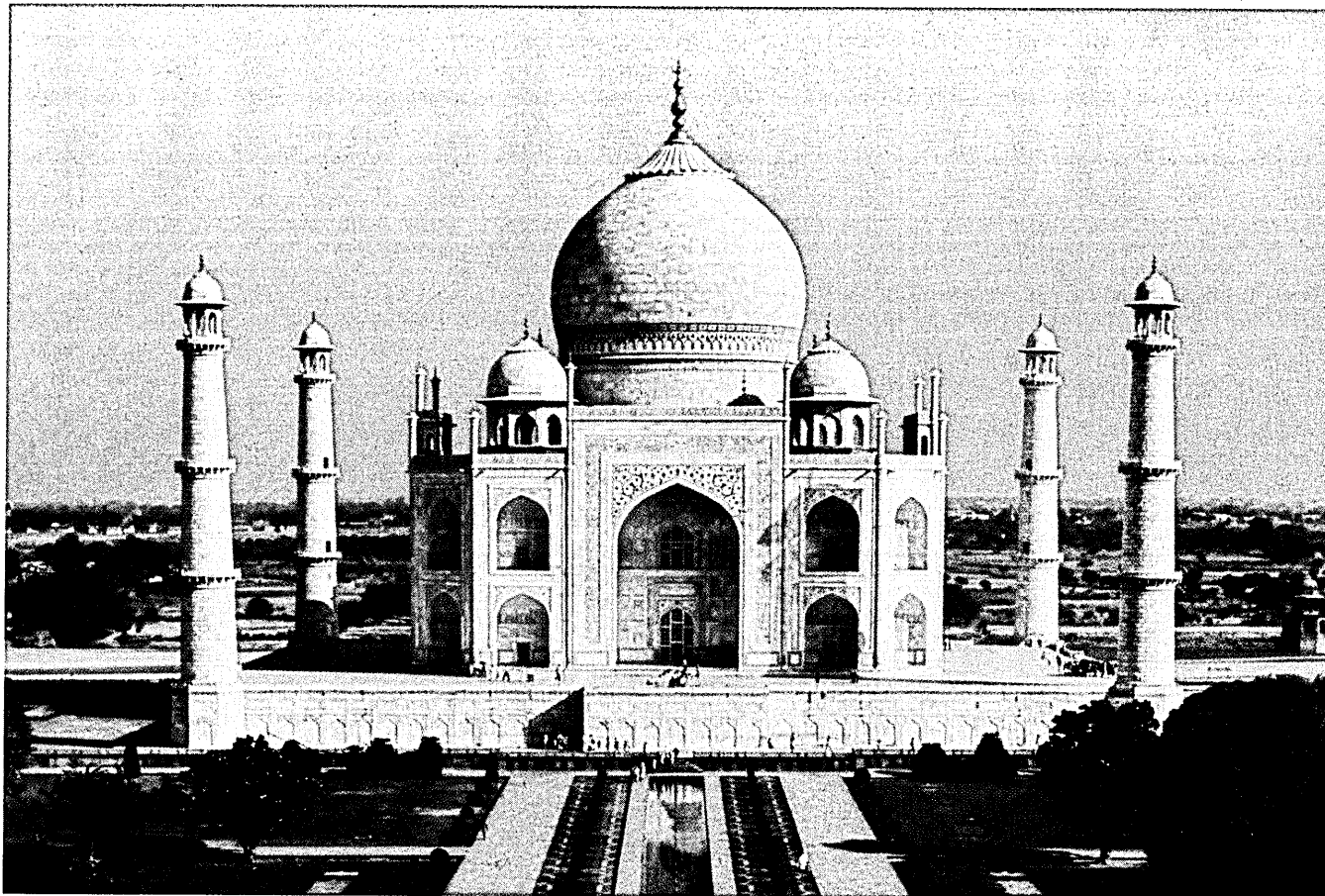
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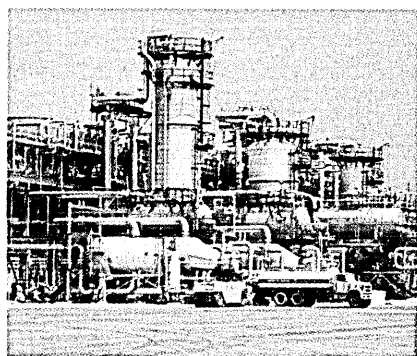


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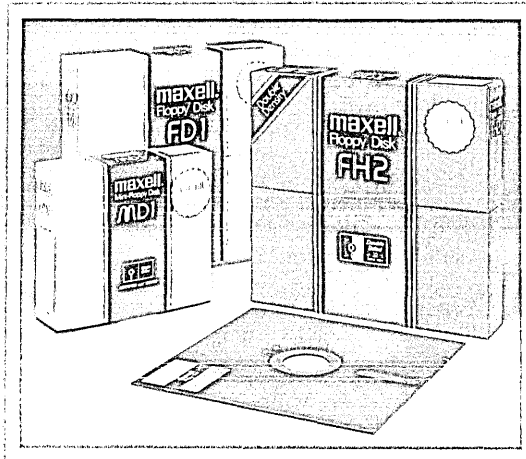
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# READERS' FORUM

## THE INFORMATION CENTER

The backlog of work in data processing has risen tremendously in the last few years. Not only has new development work been delayed but changes to existing systems take longer to schedule. To cope with this backlog, dp departments have increased staff and begun using programmer productivity tools. End users, frustrated with the apparent lack of response to their needs, have turned to outside timesharing services or have installed dedicated minicomputers within their work area.

While the use of an outside timesharing service or a mini-computer solves the user's immediate needs, either one can cause serious problems in the future. Duplicate data exist on different computers and must be maintained on each computer. As a user's information needs grow, it may be almost impossible to combine the data from different computers.

The Information Center concept is an attempt to satisfy the end user's dp needs with services and facilities provided by a company's own dp department. The end user has access to data on the company's computers while a group of user-friendly products allow him or her to manipulate these data.

The Information Center concept has a number of advantages. Computer resources remain under one organization within a company, thus allowing better utilization of equipment and personnel. Duplicate data do not have to be maintained on several computers. Future integration of data from different applications into a data management system will be easier. A pool of experienced Information Center specialists, centrally located, can support a large number of users in different user departments. The demand on the rest of the dp staff is minimal.

The Information Center concept appears to provide two additional advantages to IBM. The large dp shop manager, IBM's bread and butter customer, is supported in his efforts to satisfy his user's information needs. Since many of the minicomputers being installed are non-IBM, the Information Center will promote the sale of IBM hardware and software at the expense of mini manufacturers.

The Information Center consists of a number of user-friendly products such as Query-By-Example (QBE), A Programming Language (APL), APL/Data Interface (APL/DI), A Departmental Reporting System (ADRS), Financial Planning System (FPS), Interactive Chart Utility (ICU), and PLANCODE. The end user is provided with on-line terminals to use these products and access data. The Information Center staff consists of people who are experts on the various products; they train the user and provide technical support as needed. Attack teams, composed of Information Center personnel, go out to a user area to determine the user's information needs

and then develop solutions.

Most of the data the user works with in the Information Center are copied from the company's production files or from external databases. This helps avoid conflict in using the data. The Information Center user is not locked out when production files are updated and the normal processing of the files is not affected by the Information Center. The production files are protected from unauthorized access and update. When the data are copied they can be put into a file organization that allows rapid access by various Information Center products. Often, a user needs only certain fields or certain records from a production file. With a smaller record size and/or file size, the copied file can be processed faster than the production file. Information Center data are available to the end user on a read-only basis, thereby relieving the end user of responsibility for file organization or content.

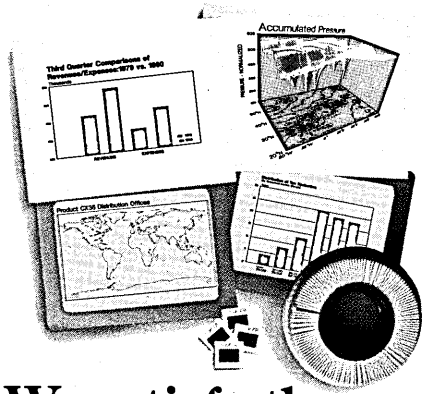
The Information Center can also provide a scratch pad facility to the end user. Special data are created by the end user and then manipulated through various products. The special data can sometimes be combined with copied data from the production files. This facility is very useful for answering "what if" questions and providing future projections. As the name scratch pad implies, the data created are temporary in nature. Any of the special data needed by a production system would be entered through normal update functions.

IBM recommends that the Information Center staff have an access coordinator. This person would be responsible for understanding the user's information needs, making sure the user understands what data are available, and assisting the user in accessing and working with the data. Within the end-user departments, an interface coordinator position should be established. This person would assist other people in the department and interface with the access coordinator and the interface coordinators from other departments.

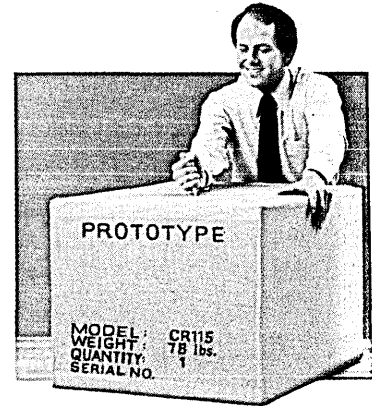
Information Center products and data can be used to satisfy the requirements for both special one-time-only information needs and regular recurring information needs. The recurring information needs are often the result of requests to the dp department that cannot be completed in the time frame needed by the end user. In most cases, using the Information Center for recurring information needs should be considered an interim solution. Careful consideration should be given to keeping the requests active in the dp backlog queue.

The Information Center concept is one of several methodologies developed to reduce the backlog of work faced by dp departments. It is superior to many of the methodologies proposed to date. Although the end user is given more capabilities, the Information Center is centrally located and is under the direction of the dp department. The central location allows for the efficient use of hardware and, more importantly, staff. It also acts as a clearing house for end users where they can share data and avoid duplication

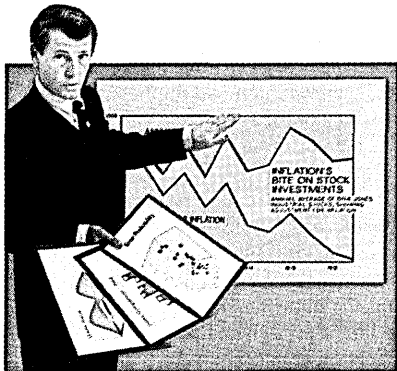
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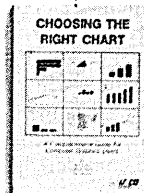
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CIRCLE 156 ON READER CARD

## READERS' FORUM

of effort. Because the Information Center is part of the dp department, its work can be coordinated with the rest of the department. The assistance of software and application specialists will also be easier to obtain when it is needed by the Information Center. More importantly, the control of computerized information will remain within one department. This will be an important advantage as it becomes necessary to combine and integrate data from previously independent applications.

Setting up an Information Center can be done in a fairly short time. The necessary Information Center products are simply installed; there are no new applications to write. Because data in the Information Center are copied from existing files, there is no need to develop procedures to create and maintain new data. While time should be spent on determining what information is needed and what products to use, once the decisions are made, they can be implemented quickly. IBM support, through numerous classes and from branch office IC specialists, helps reduce and solve the problems that normally occur when new products are installed.

With its small staff, the Information Center does not satisfy the user's dp requirements. Instead the center experts answer questions on using the products and copy data from production files into Information Center usable files. Without this approach, the center would be swamped with user requests to solve their dp needs and the user would never learn how to use the products.

As with all new concepts, there are some problems with the Information Center. The most obvious are the user-friendly products. While they are far better than such languages or tools as COBOL, JCL, or TSO, they are still oriented toward the dp-trained person. They require several days of training and experimenting before a person can use them productively. The HELP functions are not sufficient and often assume that a person has a good understanding of the product.

Secondly, the products do not mesh well. The same operation requires a different command in each product and the use of PF keys varies widely. This problem can be somewhat offset by the establishment of the interface coordinator position in each end-user department. In addition to handling the information needs of the department, this person would be trained in the various products. Because the coordinator works in the end-user department, he is available to answer questions and can solve the more complex information needs of the department. The Information Center should concentrate on training the interface coordinators and other end users who will use the products regularly. The occasional end user will not use the IC often enough to spend the time needed to learn the products or remain proficient in them. A new generation of products that is being developed should be more user friendly. The Information Center can then service other, less technical users.

The complexity of an Information Center's products means that it takes time to develop a specialist who is an expert on a product. Rather than learn several products, each specialist tends to concentrate on one product. An Information Center may not have someone who knows a little about each product. Thus, when deciding which products and file organizations will best solve an end user's requirements, each specialist attempts to meet these requirements with the product he or she is familiar with. There is no one to determine which products or combination of products will best satisfy the end user's needs. As an Information Center matures, the specialist will have time to learn more than one product. It is during the startup of an Information Center, however, that important decisions are made. An Information Center generalist, who knows something about each product, is needed. This person, along with the access coordinator, will be better able to understand and meet the end user's needs.

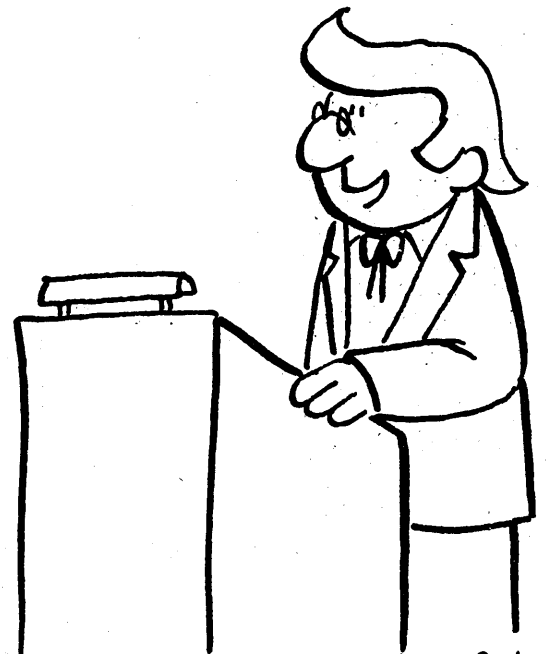
When using the scratch pad facility, end users are creating their own data. In addition, complex problems that utilize the copied production files may require the creation of new data fields. In solving these problems, several separate processing steps may be necessary. The information passed from step to step is often a combination or extraction of existing data. Thus, even when using

copied data, new data fields are sometimes created. As long as the new data fields are temporary in nature, there are few problems. Of greater concern is the creation of new data fields as part of the solution to an end user's recurring information needs. These new data fields, which exist only on Information Center files, will become important to the end user and will require backup, recovery, and maintenance procedures. The Information Center staff should make every effort to monitor the creation of new data fields. If this is not done, valuable information may be lost and any future merging of data into a data management system might be difficult.

A less obvious but more serious problem is the role of the end user. For the first time, the end user has access to basic data and powerful, though complex, tools. Most end users, however, are not aware of what data are available, and without some training in logic, they often ask the wrong questions. With the tools available, poor questions asked against the wrong data can produce erroneous answers that are then used to make important decisions.

To be successful, the Information Center must realize that there are different kinds of end users. While there are a few end users who are willing and able to formulate a problem properly, develop test data, and validate the results, most end users will only want to sit at a terminal, key in a few simple responses, and receive the results. These people use the information the computer provides to perform their regular job. Their job is not working with a computer. It will be necessary to establish a group of people who know what data are available, how to use the products, and how the user area functions. This group can produce the necessary special reports and develop the canned procedures that will reduce a complex request to a few simple responses any user can handle. If this group is part of the Information Center, it would be separate from the product specialists. If it is located within the end-user department, the group would include the interface coordinator position.

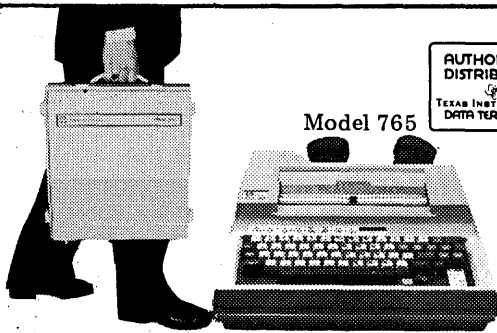
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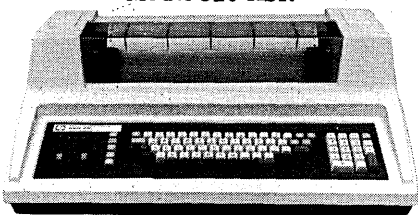
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## READERS' FORUM

# LAW AND THE PROFITS

John was a design engineer for Universal Widgets, Inc. After many years of selling a plain flat widget, the company decided to upgrade the line with a new curved widget. For aerodynamic reasons, it had to have a hole in it.

John made some lab tests, took out his calculator, and did some figuring. For optimum efficiency and durability, he concluded that the hole should be round, three-quarters of an inch in diameter, and drilled through the widget's center.

Meanwhile, the marketing department was busy interviewing prospective customers. They reported that the strongest demand was for a square hole, one inch on a side, and punched off-center.

John tried to comply. He analyzed the square hole very carefully. No good. In an effort to compromise, he tried rectangular holes, oblong holes, and several other shapes. Still no good. The size was no problem but shape and placement were crucial. If the hole were any shape but circular, or even slightly off center, the internal stresses would tear the widget apart after a few minutes of operation. He duly reported this conclusion to management.

Faced with two conflicting recommendations, management retreated to the executive offices on the top floor of the Universal Widget building. After two weeks, they descended with a decision that surprised no one but John: the holes would be square and punched off-center.

A massive advertising campaign ensued. The trade press was filled with praise for the new square-holed widgets. From the moment of its announcement, Universal knew they had a winner. By the time the first units were delivered, the company was already backlogged with orders well into the next two quarters.

Then a strange thing happened. The new widgets flew apart after a few minutes of use. Perplexed, management turned to John and asked him to design a stabilizing strut to damp out the vibrations. John sighed and picked up his calculator. After a few minutes' effort, he announced that it was impossible. An added strut would drive up the cost and weight to unacceptable levels, and would add at most a few minutes to the widget's lifetime.

Management would hear none of this talk. "That's not constructive thinking, John," said one. "I like a 'can do' man," said another. Finally, overcome by inspiring lectures on the power of positive thinking (and having grown accustomed to eating regularly) John gave in. He designed the strut.

All went well until the first of the new widgets was installed in the field. As John had predicted, it flew apart after six minutes, instead of the previous four. As cancellations poured in, the company withdrew the ill-fated widget from the market, but it was too late. The lawsuits and performance penalties ate deeply into the company's earnings. Only its long-neglected line of plain widgets kept Universal afloat.

Still, the company had to cut expenses. They considered John. "Not a team player," said one, remembering his stubborn advocacy of a hopeless cause. "And not even a very good engineer," said another. "Didn't he design that clumsy, expensive strut that didn't work?" When the inevitable layoff came, John was among the first to go. Of course, he had seen it coming and had made his plans.

Universal Gadgets had developed a reputation as an "engineer's company." John didn't know exactly what that meant (apart from the beards, long hair, and sandals) but it sounded good. He could discuss technical issues with the president that had been beyond the comprehension (and interest) of Universal Widgets' president. And he soon found out that, underneath the different jargon, the gadget business wasn't much different from the widget business. Within a year, John was just as good at designing gadgets as he had ever been at designing widgets.



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Job Control Language  
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**CIRCLE 168 ON READER CARD**  
CCP to CICS

**CIRCLE 169 ON READER CARD**

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## READERS' FORUM

But there were some differences. The hole in the new gadget, for example. Almost any shape would work, but the theoretical optimum called for a slightly eccentric oval. This meant that the frammistan had to be redesigned because you can't fit a square frammistan into an oval orifice.

They ran into a bit of flak from marketing on this one. The salesmen were virtually unanimous—customers simply had too much invested in their existing square frammistans. Nobody was going to replace these overnight. But John held his ground. No self-respecting engineer would deliberately design a suboptimal system. A square hole would increase the operating cost by 0.35%, or about 13¢ per year. Universal Gadgets was an engineer's company and John prevailed.

The new gadget was developed ahead of schedule and under budget. It worked perfectly. Everybody at Universal Gadgets sat back and waited for the money to pour in. And waited. And waited.

This time, the parting was more painful. "Our type of guy," said one. "Hate to see him go," said another. But with no money coming in, a retrenchment was clearly called for. John didn't even qualify for severance pay—his tenure at UG had been too brief. He had to settle for one hell of a farewell party.

Golden Mean Systems, Inc. was just getting started. Most of the engineers came from Universal Widgets and most of the salesmen from Universal Gadgets. Management insisted they work together as a team from the start. For the first time in his career, John did not feel the "us vs. them" atmosphere that he had come to believe was the natural order of things.

Not that all was smooth, of course. Design sessions were occasionally stormy, as people went to bat for their favorite ideas or features. But everybody got a hearing, everybody respected the other person's position, and they generally arrived at a compromise acceptable to all.

Golden Mean's new line was an immediate success. Not only were its products far ahead of anything the competition had, but they worked perfectly, and were so popular that the salesmen couldn't keep them on the shelves. This time, the money really did roll in. Everybody took a few weeks off, rejoiced over the latest quarterly results, and rolled up their sleeves for the happy task of designing the next generation of even more advanced, more capable, and more profitable Golden systems.

Then disaster struck. Universal Widgets and Universal Gadgets, their product lines in disarray and their best people gone, were desperate for new sources of revenue. Unable to develop viable products of their own, they hit upon the idea of suing Golden Mean for patent infringement, trade-secret piracy, and anything else they could think of. Although the suits were without legal or technical merit, the defense effort presented a formidable drain on the resources of the fledgling company. Reluctantly, they decided to abandon their plans for further product development, which meant they had no further use for John.

Fortunately, John was prepared. He had been quietly attending night school for several years, in anticipation of just such a contingency.

He passed his bar exams last week. Tomorrow, he begins his new position at Snap, Crackle, and Pop at twice his former salary. Because of his unique experience, he is an indispensable man on the team handling the case of—you guessed it—Golden Mean vs. Universal & Universal (U<sup>2</sup> to the insiders). With luck, he should be able to make it last until he reaches retirement age in 30 years.

Moral (with apologies to Ben Franklin): he who honors not his own prophets deserves neither honor nor profits.

—George Hannauer  
East Windsor, New Jersey

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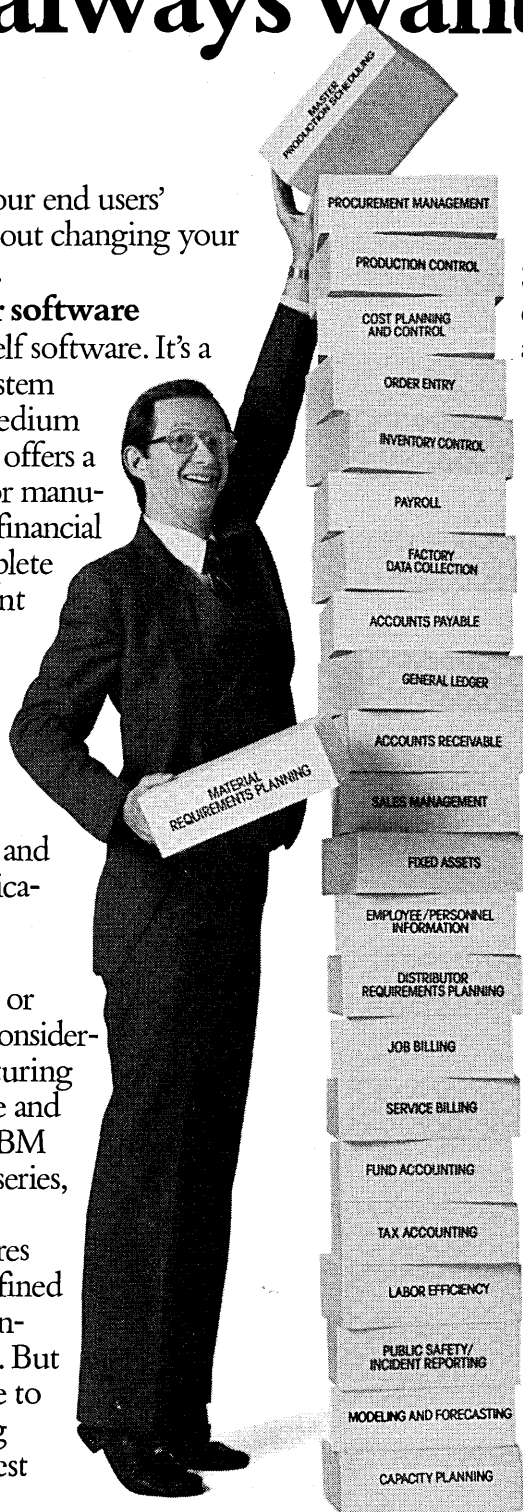
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