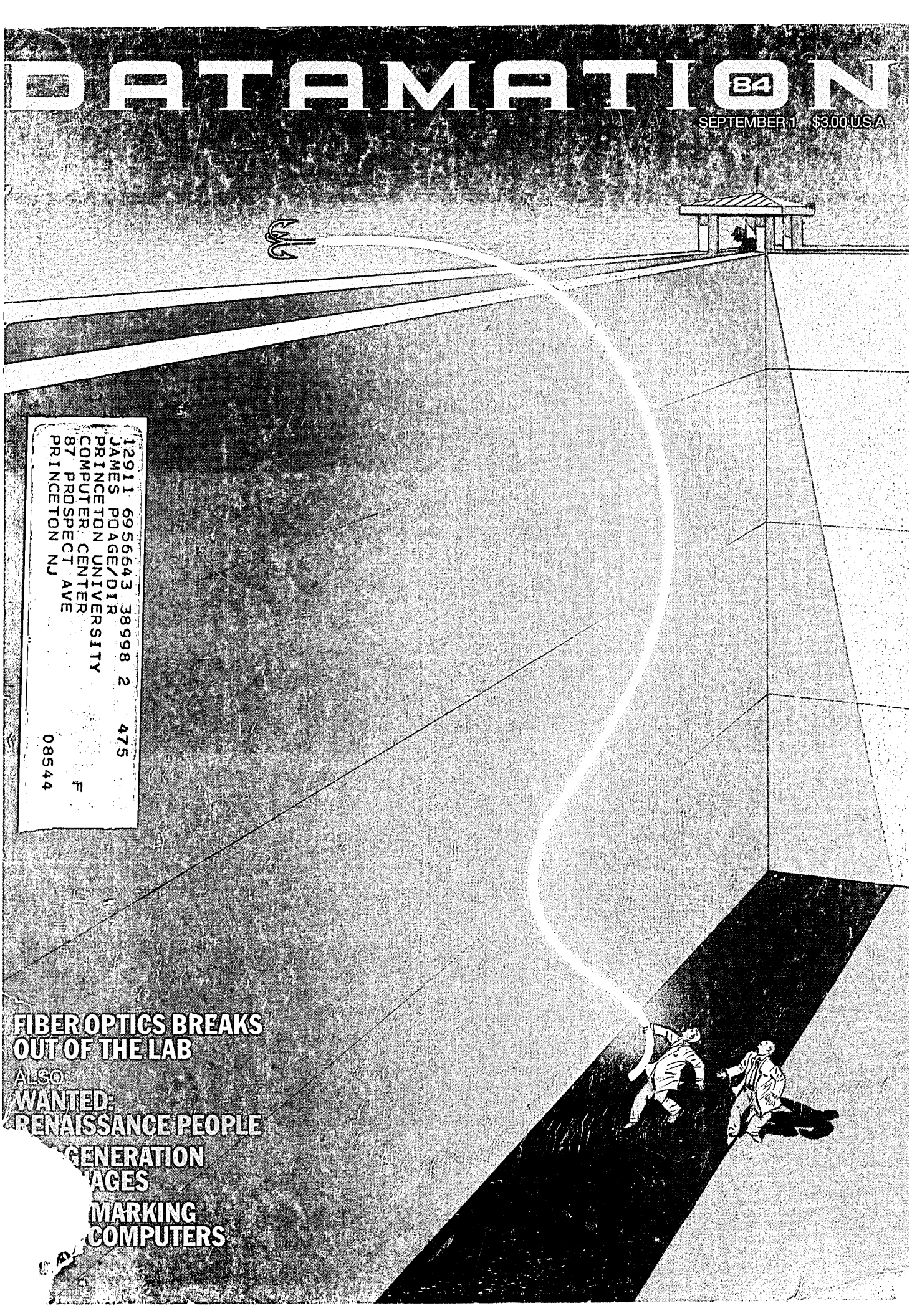
DATAMATION 84

SEPTEMBER 1 $3.00 U.S.A.



FIBER OPTICS BREAKS OUT OF THE LAB

ALSO:

WANTED: RENAISSANCE PEOPLE

GENERATION AGES

MARKING COMPUTERS

Beautiful Streamer

Kennedy proudly announces Model 9600, the first member of a new family of advanced low cost formatted tape drives. A few of its many features include; Autoload; 800/1600 CPI dual density; streaming capability of 100 ips; a capstan motor which provides an amazing 45 ips true start/stop mode; PC boards which may be moved or replaced in any order on a common bus for upgrading to higher performance levels or different interfaces — the list, fortunately, goes on and on. Write or call today.

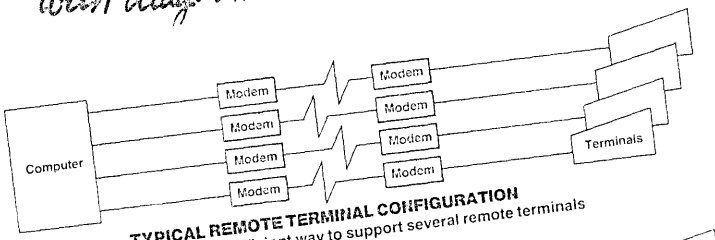
KENNEDY
An Allegheny International Company
1600 Shamrock Ave., Monrovia, CA 91016
(818) 357-8831 • ITT TELEX 472-0116 KENNEDY

KENNEDY • QUALITY • COUNT ON

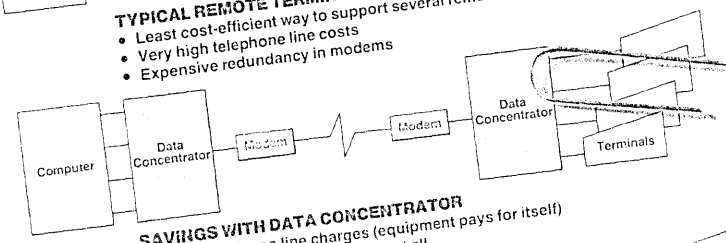
CIRCLE 25 ON READER CARD

Don't buy a bunch of modems—even from us if what you really need is a Micro8000 Concentrator Modem!

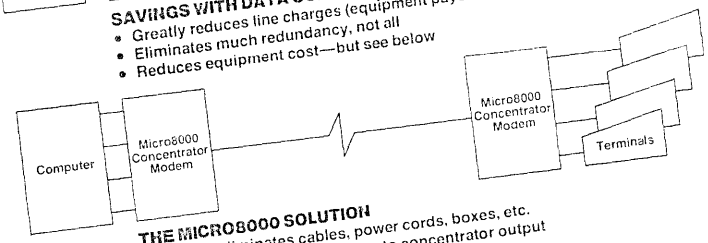
Roger:
It's been a knockout ad series, no doubt about it, but our sales people tell me the attached can best be explained with diagrams.



TYPICAL REMOTE TERMINAL CONFIGURATION
- Least cost-efficient way to support several remote terminals
- Very high telephone line costs
- Expensive redundancy in modems



SAVINGS WITH DATA CONCENTRATOR
- Greatly reduces line charges (equipment pays for itself)
- Eliminates much redundancy, not all
- Reduces equipment cost—but see below



THE MICRO8000 SOLUTION
- Clean—eliminates cables, power cords, boxes, etc.
- Perfectly matches LSI modem to concentrator output
- Minimizes all costs—lines and equipment

Isn't there some way we can get this info across without botching up the ads?

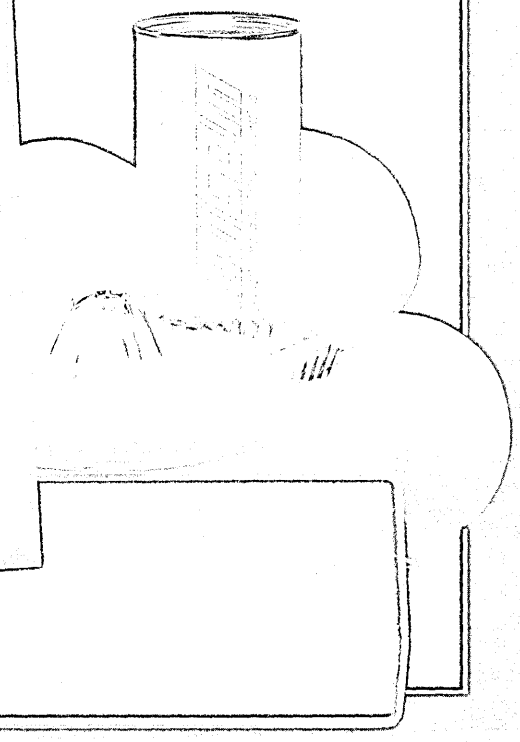
chris

e's a more cost-efficient way to support multiple remote terminals on your minicomputer—DEC, ata General, HP or any other—a way that gives ou the best of all possible worlds.

16 terminals to share a single phone line. *It will pay for itself even supporting only a single CRT and a printer.* What's more, it requires absolutely no changes to existing hardware and software, nd typical prices are only $1650 for a 2-channel t, $2000 for a 4-channel version. (Even single-hannel versions are available to provide error-ree communications for lone terminals.)

dition, the Micro8000 is available both in point-point models and in multidrop models for the pport of terminal populations which are widely scattered. (Don't let anyone tell you that you not multidrop mini terminals!) Care to concen-e on savings? *Send today for a free brochure oing the Micro8000 and its applications.*

Concentrate. It's cheaper!



MICOM Micro8000 Concentrator Modem

MICOM®

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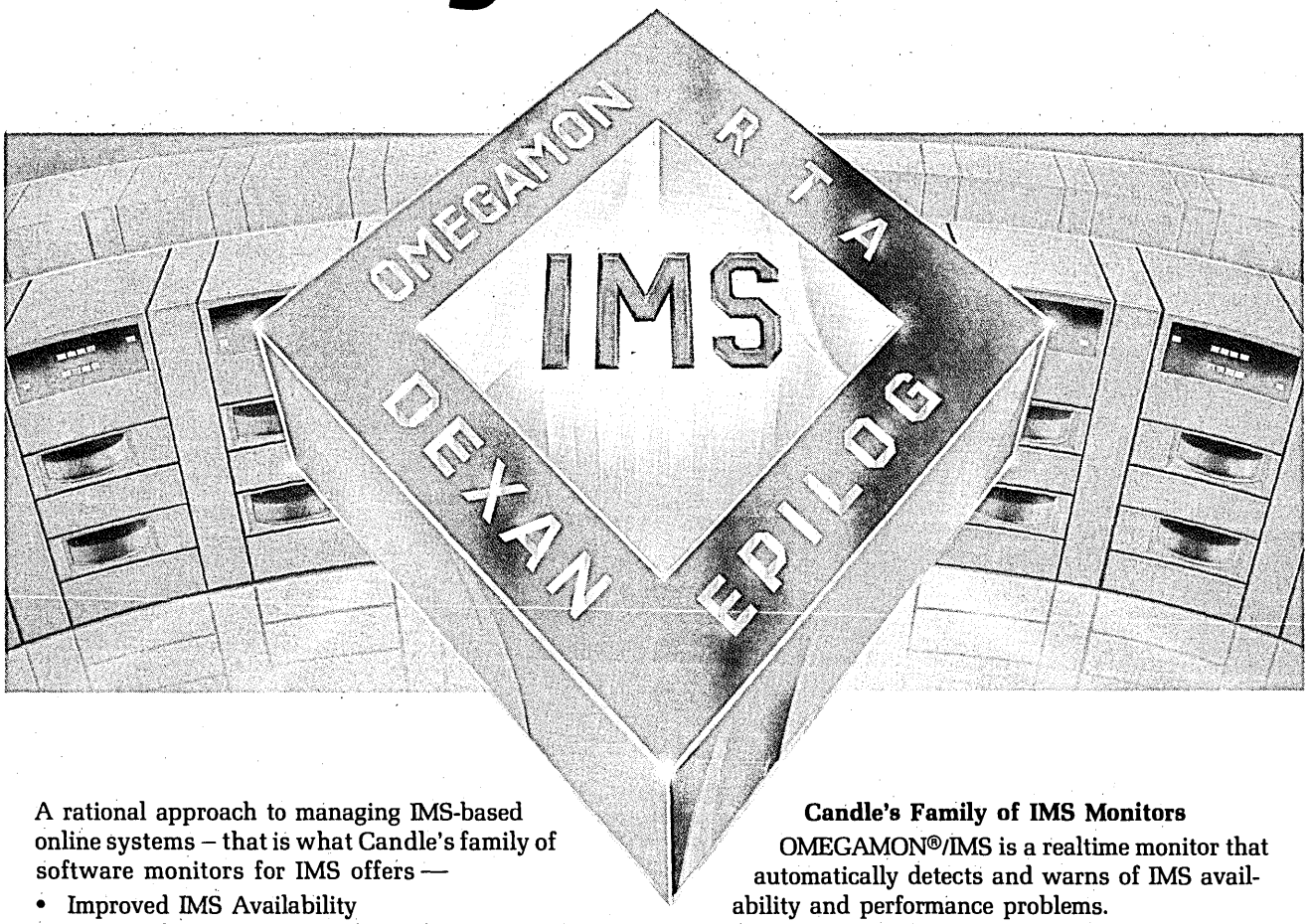
Dallas, TX ○ (214) 258-0774 ○ San Francisco ○ (415) 327-0890 ○ St. Louis, MO ○ (314) 576-7626 ○ Teaneck, NJ ○ (201) 836-4000
MICOM-Borer Ltd. ○ Bel Court ○ 15 Cradock Road ○ Reading, Berkshire RG2 0JT, England ○ (0734) 866801 ○ Telex 847135

For literature please call: (800) "MICOM U.S."

M4002

CIRCLE 29 ON READER CARD

Controlling IMS Performance.



A rational approach to managing IMS-based online systems – that is what Candle's family of software monitors for IMS offers —

- Improved IMS Availability
- Improved Response Time for Online IMS Terminals
- Improved Service Levels to End Users of IMS Systems

Exception Analysis

This is the first line of defense against IMS emergencies: IMS pool fragmentation, Program Isolation Lockouts, and dozens of other urgent problems. Because of Candle's unique architecture, the IMS product family is virtually immune to the problems that the Exception Analysis detects, so that they *continue* to work when they are needed most – during severe hardware or software problems.

Response Time Analysis

Once severe threats are averted, the next concern is user service levels. Are service level agreements being met – *right now*? Is response time getting better or worse? Are certain workloads (transactions, logical terminals, scheduling classes) having problems?

Degradation Analysis

Typically, 80% of the time to solve IMS performance problems is spent in diagnosis, while 20% is spent in correction. Degradation Analysis eliminates most of the 80% by breaking down the response time for the workload of interest according to the resources that account for the response time. It shows how much of the response time each resource accounts for. Degradation Analysis will identify and quantify your IMS bottlenecks, thus prioritizing your tuning efforts.

Candle's Family of IMS Monitors

OMEGAMON®/IMS is a realtime monitor that automatically detects and warns of IMS availability and performance problems.

EPILOG®/IMS is an Installation Performance Management system designed to manage the capacity needs and workload demands of a data center using IMS. It monitors critical data about hardware, MVS, IMS, and application software.

DEXAN®/IMS provides a realtime analysis of the performance of your IMS applications by identifying the causes of degraded response time and quantifying their impact.

RTA™/IMS monitors IMS performance from the end user's point of view, thereby allowing operational and system staff to determine how well IMS is serving the end users.

OMEGAMON/IMS, DEXAN/IMS, EPILOG/IMS and RTA/IMS working *together* — a comprehensive set of tools for you to manage your IMS network AND provide the best possible level of service to your users.

For more information, contact your Candle representative.

!Candle®

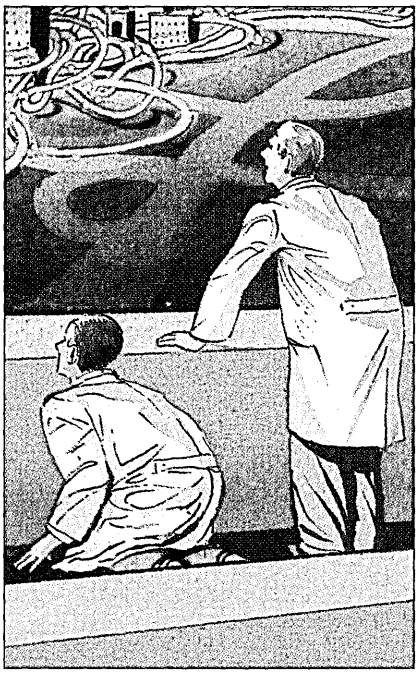
10880 Wilshire Boulevard, Suite 2404
Los Angeles, California 90024
(213) 207-1400

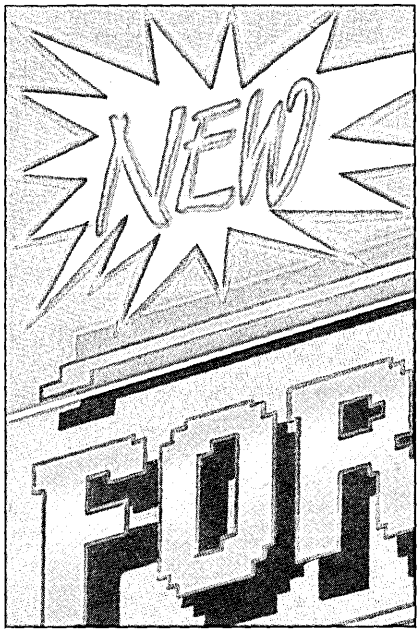
CIRCLE 30 ON READER CARD

DATAMATION

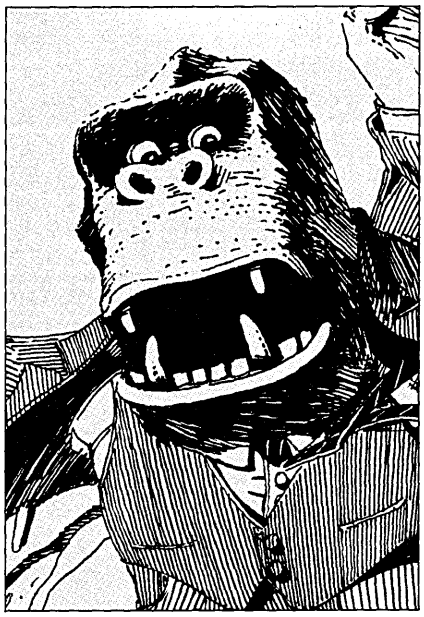
SEPTEMBER 1 1984/$3.00 U.S.A.
VOLUME 30 NUMBER 14
This issue, 183,838 copies

FEATURES





NEWS IN PERSPECTIVE



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INTERNATIONAL 180-1

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BY ANDREA BARUFFI

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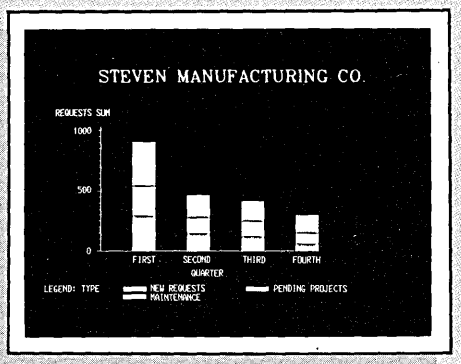

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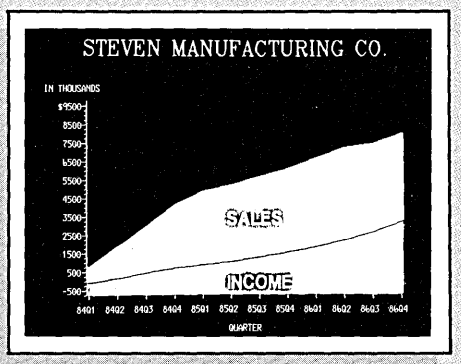

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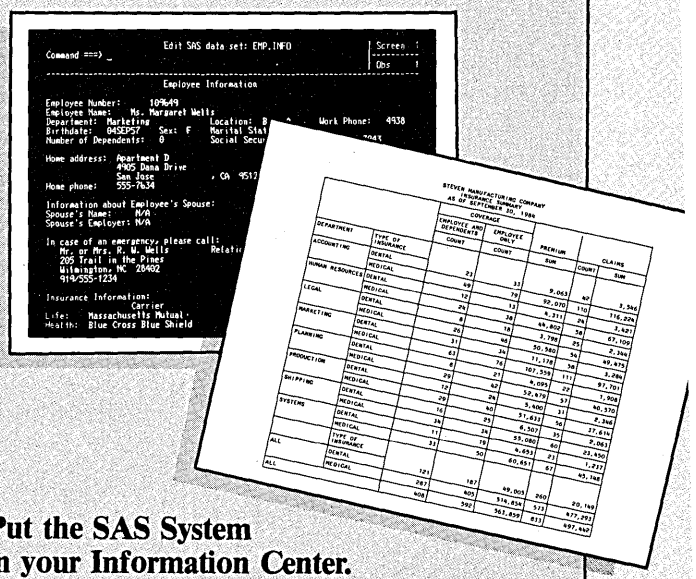

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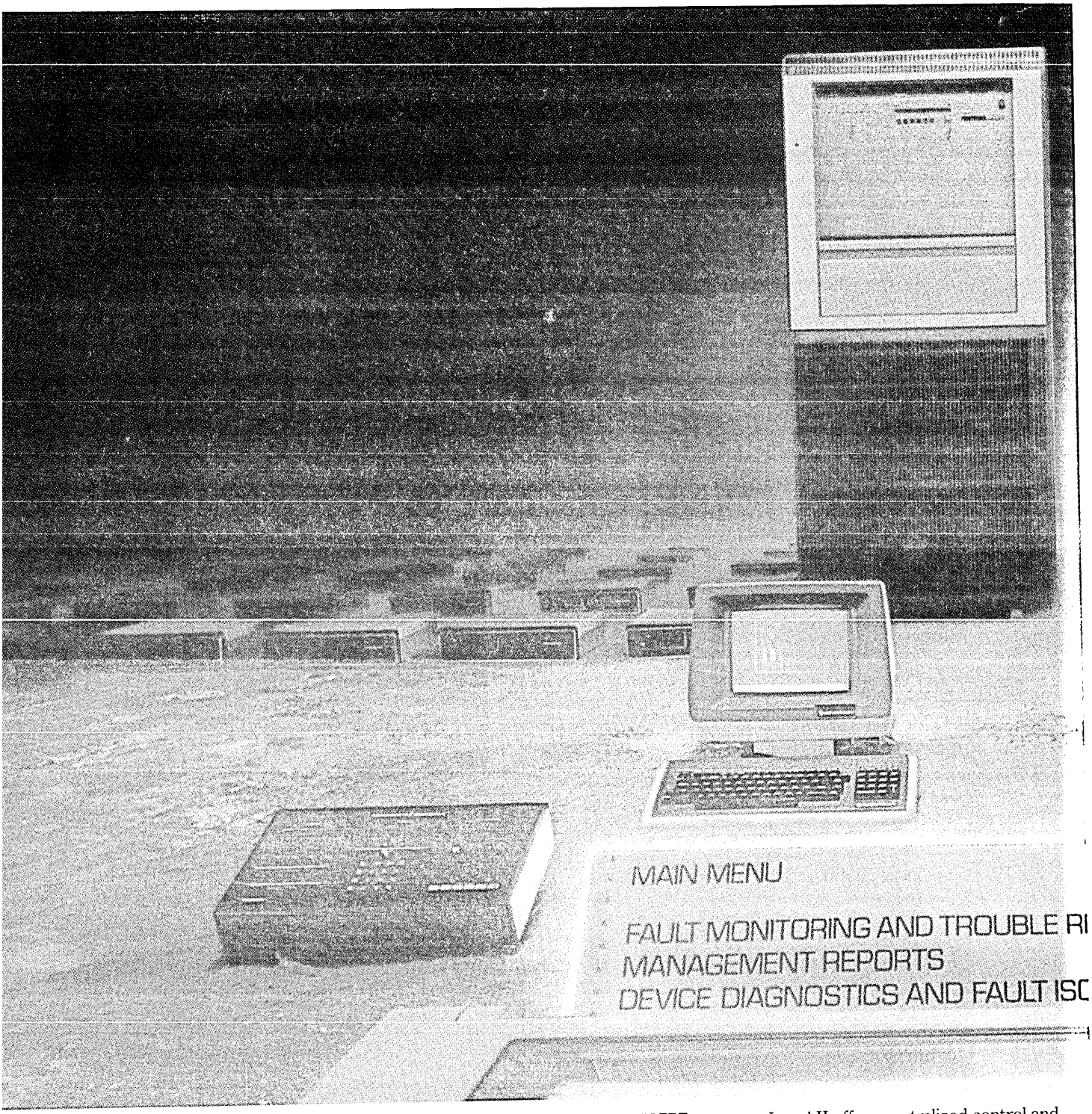


Modem malfunctions, facility faults and streaming terminals can disrupt your data communications. You can't afford that kind of trouble.

AT&T Information Systems can help.

Our DATAPHONE® II Service combines synchronous analog data transmission at speeds of 2400 to 9600 bps with a network management system on four upgradeable levels.

And upgrading your system is easy.

As your needs grow, you can enhance your system by adding new equipment to monitor and control what you already have.

And DATAPHONE II Service is compatible with any synchronous data processing system, regardless of host, terminal or line protocol. So, it can keep an eye on the data processing equipment you currently use.

WE'RE ALWAYS ON THE ALERT

DATAPHONE II Service provides continuous real-time monitoring and testing while your network is in operation.

Signals are monitored on a low-end frequency band to guarantee the integrity of your data. Malfunctions are detected automatically, isolated and repaired. This cuts outages significantly.

Monitoring is independent of your host computer. It won't disrupt computer functions and waste costly processing time.

RELIABLE MANAGEMENT ON EVERY LEVEL

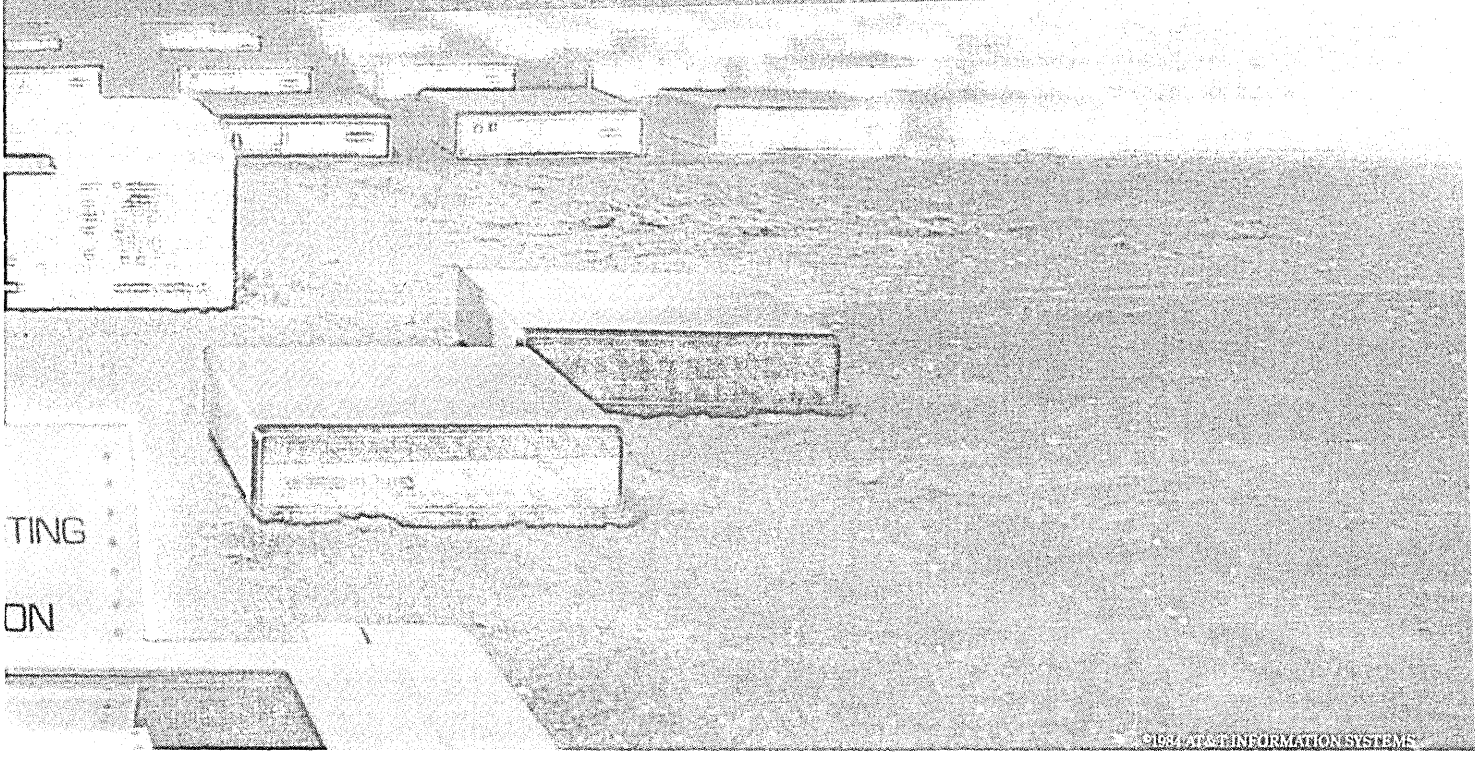
Level I data sets are the foundation of DATAPHONE II Service. Extensive tests and commands can be conducted from their front panel.

Level II offers centralized control and management. A Diagnostic Console increases test, command and monitoring capabilities. Up to 256 control modems can be managed through this desk-top console.

Level III adds a Network Controller for enhanced monitoring and control. A CRT, using English commands, provides faster, easier access to diagnostic information. A printer generates hard-copy test reports. You can analyze reports thoroughly, make adjustments and avoid future faults.

Level IV manages more modems and performs more functions than any system on the market. A UNIX* based operating system runs the System Controller. It manages up to eight control channels and up to 2048 control modems, with four-tier addressing and real-time monitoring.

AT&T DATAPHONE II SERVICE. WE KEEP AN EYE OUT FOR TROUBLE.



The System Controller provides fault and status reports of all eight channels. The color CRT and printer provide clear, graphic and tabular management reports.

User-customized English-language names and commands eliminate the need to memorize codes. System access is easy and trouble reports are quickly understood. Even the non-technical user will be able to interpret trouble tickets, follow trends and analyze the causes of downtime.

A unique benefit available with our DATAPHONE II Service is remote monitoring at a nearby AT&T Data Maintenance and Operational Control Center.

All major faults are automatically reported to the nearest DATA MOCC—and often corrected there, too. Malfunctioning devices can be located and disconnected from this remote center within minutes.

OVER 100 YEARS OF COMMUNICATING BETTER

For over a century, AT&T products and systems have set the standards for performance and reliability. Today, 4,000 designers formerly at Bell Laboratories are working full time to develop and design new business products at Information Systems Laboratories. And, as always, we back our products with the most experienced sales and service force in the industry.

To learn how our DATAPHONE II Service can guard your profits and productivity, call 1-800-247-1212, Ext. 195.

WHEN YOU'VE GOT TO BE RIGHT.

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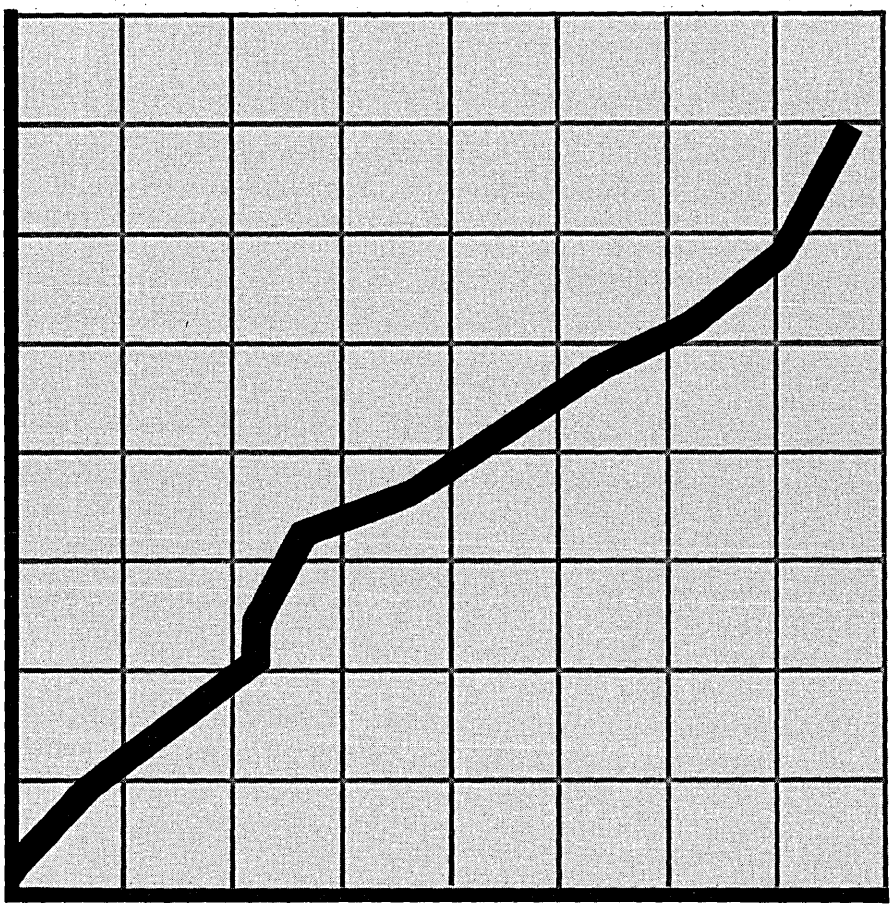
CIRCLE 32 ON READER CARD



This is a picture of a company headed for disaster.

This picture is just too simple to show you what's lying in the weeds. You know your total profits, but can you get them by product? Can performance be analyzed by distribution channel? By geography? How are things really going? Why?

If your company uses an IBM computer, Comshare Decision Support Software can help fill in those blanks and more.

Management needs relevant, timely data with depth and resolution to make informed, effective decisions. Now you can easily gather information and extract pertinent data from other sites and sources in your company. You can perform analyses, model alternative scenarios and format reports and charts to show results. If you can define the question you want to ask, System W can provide answers.

We think along your lines. Comshare has been in the business of solving business information problems for 18 years. So System W has innovations like Model-by-Example™ and WINDOW™ that make it very easy for managers to ask the hard questions.

System W is, quite simply, now the best decision support system for companies that use IBM mainframes and PCs. Seventy-seven installations in 13 months attest to that.

If you'd like the big picture on us and how System W can work for you, call Chris Kelly at Comshare toll-free: 1-800-922-SYSW (in Michigan call: 313-994-4800). Or simply mail your business card to: Comshare, P.O. Box 1588, Ann Arbor, Michigan 48106.

SYSTEM W DECISION SUPPORT SOFTWARE

COMSHARE

For decision makers who need to know their options now.

CIRCLE 33 ON READER CARD

LOOK AHEAD

IS IBM WAITING FOR TI?	IBM's local network troubles are said to stem from continuing problems at Texas Instruments in developing a single chip set to handle both token passing rings and buses. IBM wants TI to support both methods, but TI is said to have bit off more than it can currently chew. Motorola apparently declined to bid on the chips, perhaps seeing them as too rough to build on time.
WALL ST. DOWN ON WANG?	Despite strong growth in its stock price, Wang Labs may be falling from grace on Wall Street. Wang told analysts its order growth had slowed and its margins had narrowed due to tougher IBM competition in OA. Analysts are also worried that the Lowell, Mass., firm's line of minicomputers is aging rapidly, given the price/performance characteristics of year-old machines from Prime, Data General, and DEC. Volume shipments of the new high-end VS 300 are reportedly delayed up to four months, to early 1985. Analysts were buoyed, however, by Wang's purchase of 20% of InteCom, the Dallas PBX with which it is developing an integrated LAN, cpu, and PBX system.
ARKAY IS OK TO CA	Computer Associates International is on the verge of yet another acquisition ("CA Goes Shopping Again," Aug. 1, p. 50.) The Long Island software house is set to buy Arkay Computers Inc., Newton Center, Mass., for an undisclosed sum. CA has its eye on Focus, Arkay's DOS to MVS conversion product, since CA has 27,000 products installed on DOS machines worldwide, and is well aware that IBM expects about 200 DOS installations a year to switch to either MVS or VM. Arkay president Bob Kahn is expected to stay with CA in a consulting role, but Arkay's employees may not be so lucky.
DOING THE IBM SHUFFLE	Word is circulating in the industry that IBM may reorganize its sales organizations once again. Reports indicate that the company is considering a return to the more traditional sales district structure it abandoned three years ago. Sources say the current National Accounts Division isn't working out as well as IBM had hoped, but it's not clear when such a reshuffling might take place.
THE EUROPEANS STRIKE BACK	The long-awaited decision by members of the western export control organization, CoCom, on high-tech trade with the Eastern Bloc (see p. 59) have not completely cleared the air between the U.S. and Europe. West Germany is canvassing for support among other Western European nations to

LOOK AHEAD

	pressure the U.S. over the extraterritoriality clauses in the U.S. Export Administration Act. The Bonn government released a study of cases where U.S. controls have affected West German high-tech trade of products containing U.S. components or technology to countries outside the Eastern Bloc. West Germany is also considering legislation to limit the local effect of the U.S. policy.
BRAZIL CHASING UNIX	The South American country, notorious for trying to nurture its domestic information processing industry at the expense of foreign firms, is trying to gain exclusive rights to selling Unix within its borders. Rather than let AT&T come in and sell the operating system, Brazil's Association of Computer and Peripherals Manufacturers is negotiating to become sole marketer. AT&T, not surprisingly, isn't too thrilled.
TRILOGY'S NEXT COMPUTER?	Gene Amdahl is apparently still hoping to build a 32-MIPS mainframe at Trilogy Corp. Even after quitting the superchip effort, we hear he is planning to build the processor and price it to pay back the entire cost inside of three years. Future revenues would fund other R&D projects.
UNITING UNIX AND UNIVAC	Look for Sperry Computer Systems to introduce later this year a 32-bit supermicro-based office system that will run Unix. The machine will most likely come from Sequoia Systems, the Marlboro, Mass., startup in which Sperry has invested a couple of million dollars in seed money. Sequoia has only just begun field testing its machine and is likely to sign the Blue Bell, Pa., mainframer as a licensed manufacturer.
WHO WANTS VALUE?	Value Computing, the Cherry Hill, N.J., systems software developer, is on the selling block, after its unsuccessful introduction of the Data Center Distribution System (DCDS) last spring. No word on who might be buying or for how much, but president Vincent J. Bannon apparently won't stay with the company. Neither will marketing veep Michael G. McMenamin, insiders say, because his sales force has experienced very rapid turnover and instability. The privately held firm was counting on DCDS, which prints only specified excerpts of reports for each recipient of the report, to bolster the firm's sagging revenues.
RUMORS AND RAW RANDOM DATA	Daisy Systems Corp., the Sunnyvale, Calif., producer of computer aided engineering systems, is talking to IBM about an arrangement that would tie Daisy's CAE software to new IBM hardware.

A PRINTER FOR EVERY NEED AND EVERY SPEED.

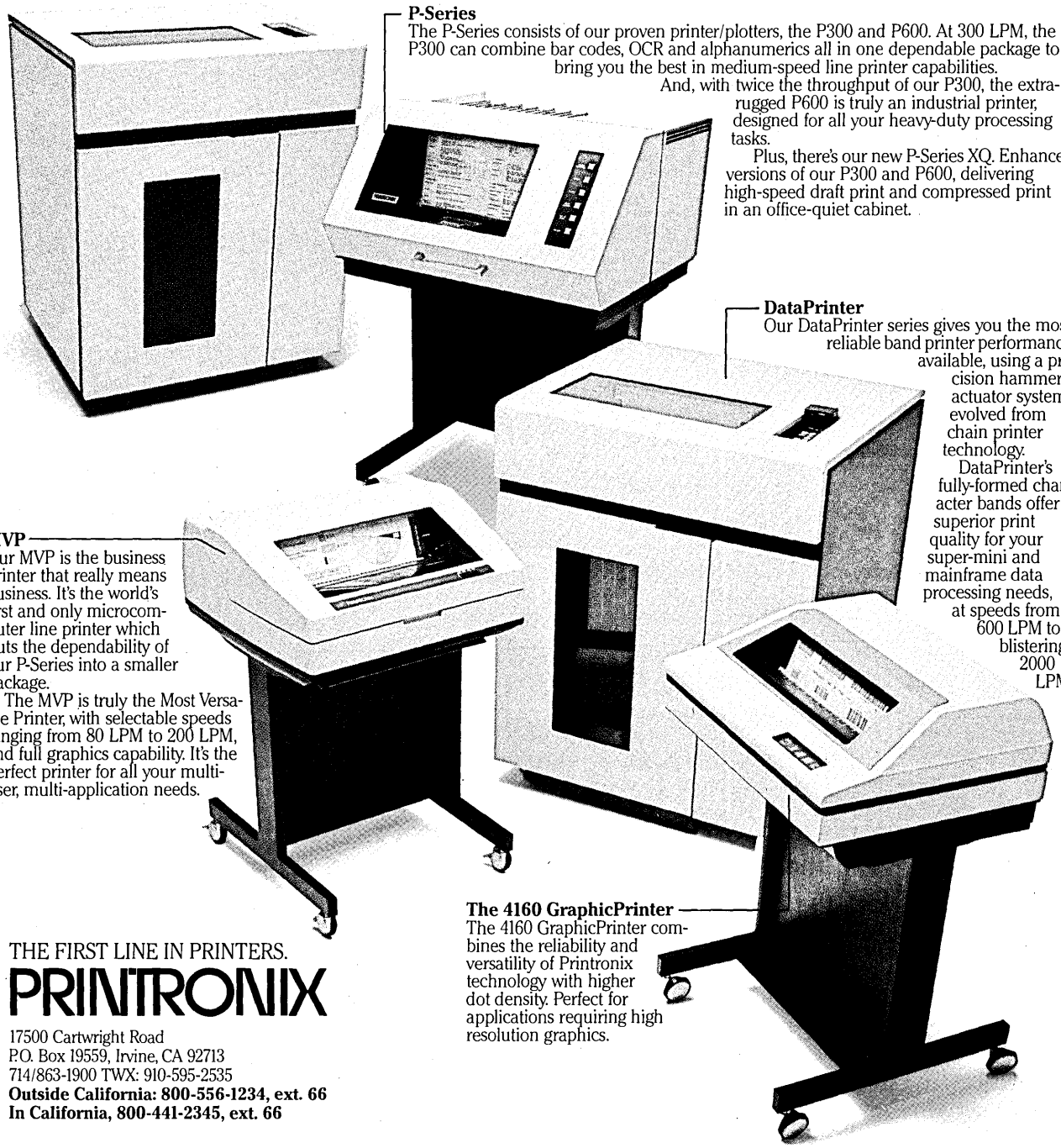
If you're looking for a dependable lineup of printers, look at Printronix. We've got it all in the family.

From Word Processing at 80 LPM, Graphics at 150 LPM, to high-volume Data Printing at 2000 LPM, Printronix printers do it all, without skipping a beat. In fact, they're the only printers built to take the pressure of continuous duty processing in the most rigorous environments.

And, in addition to industrial durability, our unique hammerbank technologies give you superior print quality and outstanding graphics capability.

For printers for every need and every speed, come to Printronix. The best printer line for your bottom line.

For more information, please write or call today.



P-Series
The P-Series consists of our proven printer/plotters, the P300 and P600. At 300 LPM, the P300 can combine bar codes, OCR and alphanumerics all in one dependable package to bring you the best in medium-speed line printer capabilities.
And, with twice the throughput of our P300, the extra-rugged P600 is truly an industrial printer, designed for all your heavy-duty processing tasks.
Plus, there's our new P-Series XQ. Enhanced versions of our P300 and P600, delivering high-speed draft print and compressed print in an office-quiet cabinet.

DataPrinter
Our DataPrinter series gives you the most reliable band printer performance available, using a precision hammer actuator system evolved from chain printer technology.
DataPrinter's fully-formed character bands offer superior print quality for your super-mini and mainframe data processing needs, at speeds from 600 LPM to a blistering 2000 LPM.

MVP
Our MVP is the business printer that really means business. It's the world's first and only microcomputer line printer which puts the dependability of our P-Series into a smaller package.
The MVP is truly the Most Versatile Printer, with selectable speeds ranging from 80 LPM to 200 LPM, and full graphics capability. It's the perfect printer for all your multi-user, multi-application needs.

The 4160 GraphicPrinter
The 4160 GraphicPrinter combines the reliability and versatility of Printronix technology with higher dot density. Perfect for applications requiring high resolution graphics.

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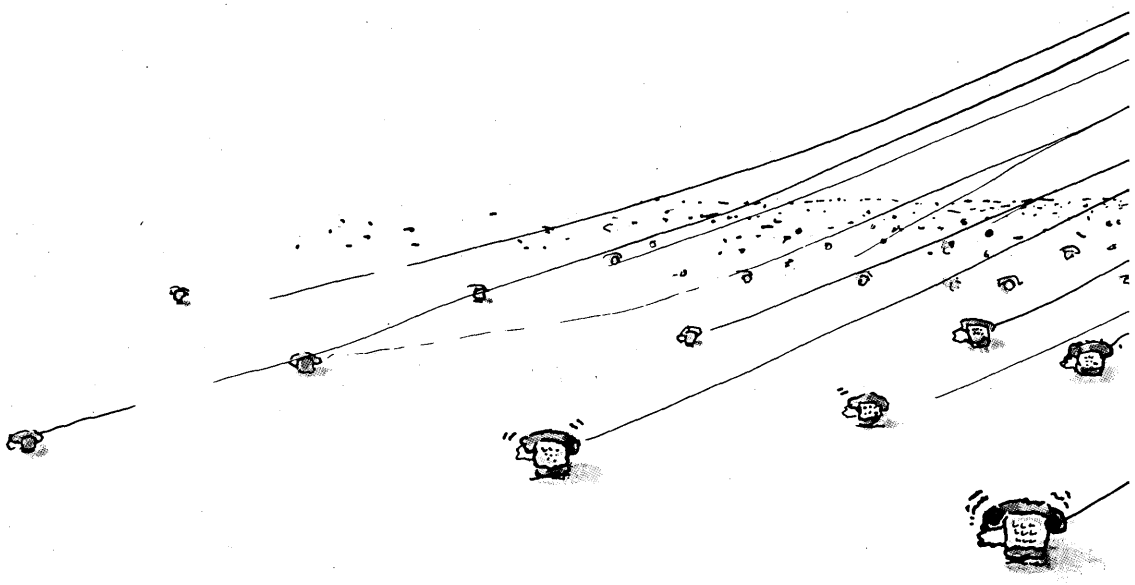
CIRCLE 34 ON READER CARD

WE HAVE TROUBLE LETTING GO.



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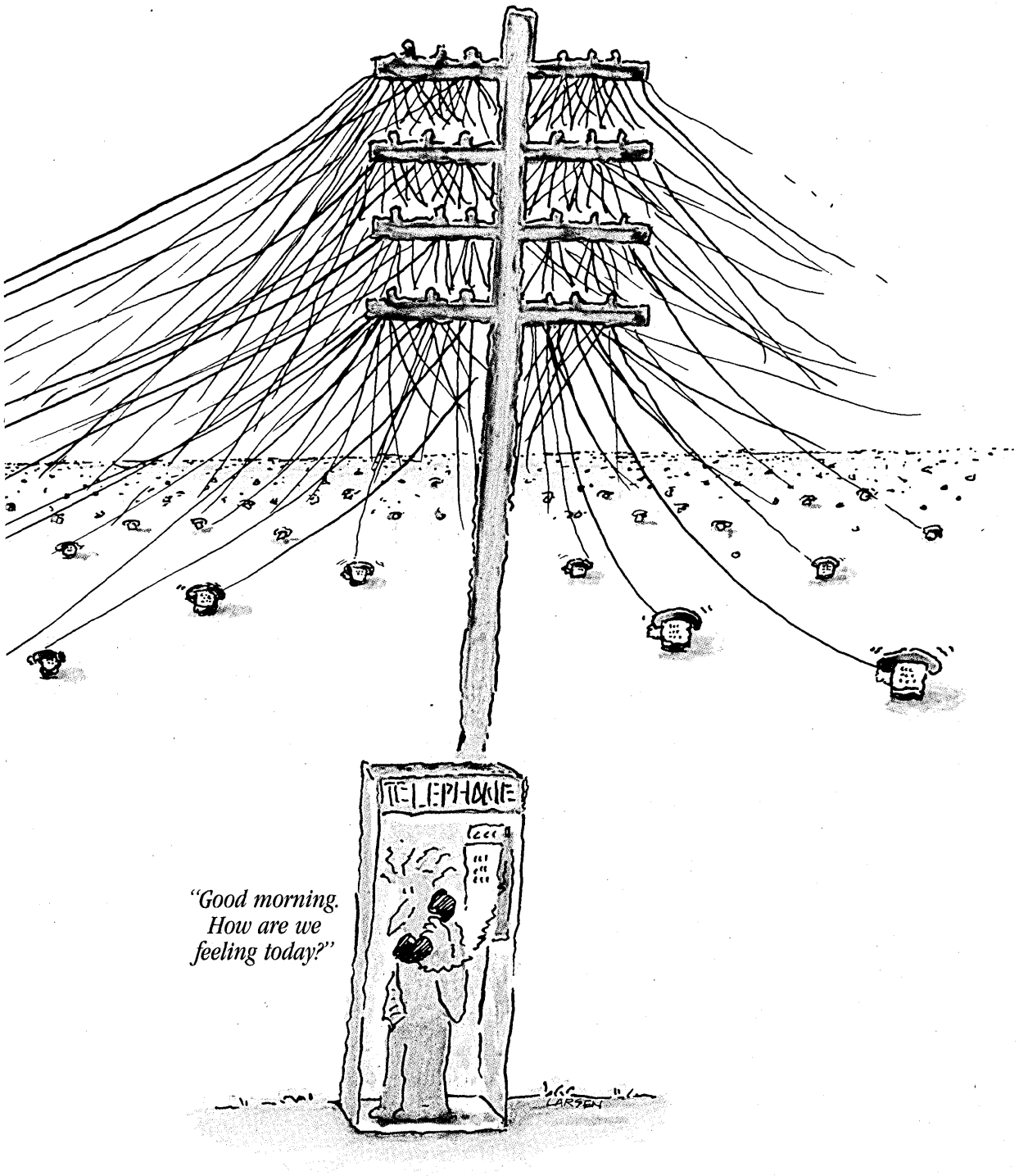

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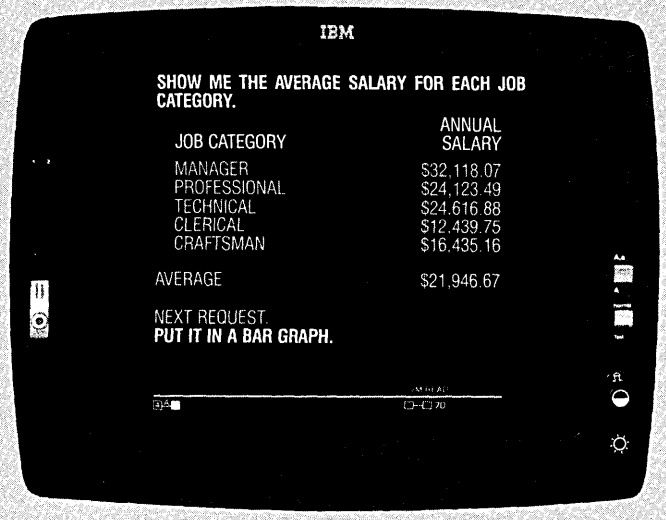

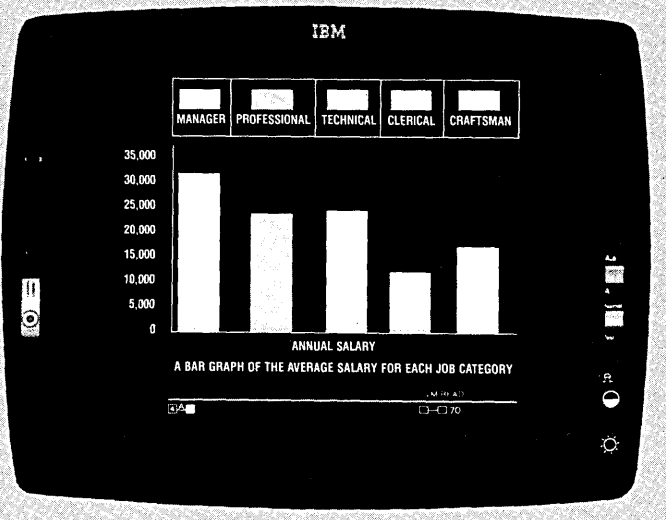

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CIRCLE 36 ON READER CARD

LETTERS

MEA CULPA

I was amazed to see the opening sentence of the May 15 Look Ahead piece on ADP (p. 13).

We're a publicly owned company with a consistently high P/E ratio that is sensitive to our growth performance. We have that high P/E ratio because we have the *longest* uninterrupted growth record of *any* listed company in the U.S. (24 years in a row).

Your comment about "sagging service bureau business" is most inaccurate and totally misleading. We have just completed our 88th straight quarter in which our earnings exceeded a 10% growth rate over the previous quarter. In fact, we're growing by over 15% per year. And we have at least a dozen unmentioned new product areas that are each very much larger and more important than the videotex test you described.

JOSH S. WETSON
President & Ceo
Automatic Data Processing Inc.
Roseland, New Jersey

UTTERLY CORRECT

A statement is either correct or incorrect (May 1, Letters, p. 16).

To be *very* incorrect is like being *very* dead. It's a shame that Karen Elder's good points are marred by bad logic.

HERBERT F. SPIRER
Professor of Information Management
The University of Connecticut
Stamford, Connecticut

ADA ALTERNATIVES

Edith Myers's well-written article, "Ada Fans Say Now's the Time" (May 15, News in Perspective, p. 38), notes the enthusiasm of Ada's proponents with testimonials such as:

- "Our programmers would fight if they were told they had to go to another language." (Ralph Crafts, vp, Intellimac.)
- "The use of Ada in a software development project can cut maintenance costs by 60% beginning immediately and, in the long run, can reduce them further." (Rodger Smith, vp, EVB Consulting Inc.)
- "Most of the better universities . . . have Ada built into their regular curriculum. . . ." (Dr. Charles McKay, High Technology Laboratory, University of Houston.)
- And finally, Dr. Jean Ichbiah, Ada's developer, simply states that Ada is "not the ideal but the best."

Before we non-Ada programmers abandon our present programming languages and rush to the Ada bandwagon, we first should note an admission by Rodger Smith: "A mistake with Ada often is to treat it as just a language. It's a methodology. We can teach a course in C in three days. It takes a minimum of 21 days to learn Ada." Therein is the clue: Ada programmers not only use this rather verbose, Pascal-like language in their coding, but they also simultaneously employ a design methodology which restricts the programmer to the "proper" use of the language. It is the application of such a design methodology to the program development/implementation which results in highly maintainable program code. Thus, I maintain that well-structured, highly maintainable code can be produced in any language, as long as the programmer works within the constraints of an effective design methodology.

Proponents of the heavily structured languages such as PL/1, Pascal, or Ada may well counter that they also achieve increased programmer productivity. They would state that the extra execution overhead resulting from the increased syntax of their languages can be ignored in favor of the increased programmer productivity and decreased maintenance effort required. Of course, if one could achieve the same programming productivity and decreased maintanence effort with the use of a lightly structured, high-performance language such as FORTRAN, then one could have both decreased execution overhead and decreased maintenance requirements.

We have developed a powerful methodology for structuring standard FORTRAN that does this very thing: permits coding directly from Warnier-Orr diagrams (or another suitable high-level design language), yields code as understandable and maintainable as that from a structured language (e.g., Ada), and works directly with standard FORTRAN (not a preprocessor).

Because the methodology, which I term functional blocks, forces a design template onto the language in use, it can in reality be used with any language! To date, however, I have employed it only with my favorite language, FORTRAN, and moreover have documented this methodology in an 84-page brochure, "Structuring FORTRAN Modules by Functional Blocks: An Overview," which we sell for $15. Because this methodology does work directly with standard FORTRAN, one of its greatest assets is in the reclaiming of old, difficult to understand FORTRAN modules, which it accomplishes in a quickly converging fashion.

RONALD C. WACKWITZ
Programming Director
The COMP-AID Company
New Braunfels, Texas

THOREAU IT OUT

This is my part of the "attempt to start a conversation" that Ben Ross Schneider Jr. invokes in "Programs as Essays" (May 15, p. 162). My part begins by observing that the Schneider article documents neither that programmers aren't the best of writers nor that they are the worst of writers. I see no justification in the article for considering a field of study, computer science, synonymous with "programmer," nor for considering the latter synonymous with "computer professional."

The writing of manuals is a job for

LETTERS

the "professional" known as a "tech writer," not for the programmer, and no evidence is given verifying that a programmer wrote the cited "manual for a prominent text editor." The proverbial "aversion to documentation" among programmers is well known. But, then, there is documentation and there is documentation. There's the documentation of the systems analyst, the documentation of the programmer (such as it is), the documentation of the dp systems librarian, the documentation of the technical writer—all having differing end users—to name a few.

One sympathizes with the user of a disorganized user manual, but the device of repeating some advice "several times" can be an aid to the memory of the novice. It appears illogical, however, to say of the advice that "some of it doesn't agree," as everything agrees with itself. If I intend to convey that various pieces of advice are inconsistent with other pieces, then I should state it.

Regarding "scientific prose," why not go the extra mile with the poet and, being telegraphic, say "Point the telescope at Vega" or "The telescope points at Vega"?

I started out as a "digital computer systems analyst" in 1961, and it was only in 1965 that I did any coding (programming). When a programmer is "wearing a systems analyst hat," then, and only then, is he in the appropriate province for "imagining," or dreaming up, VisiCalc. Relatively good code, though "unstructured," was thrown together in those days; witness today's timely arrival of social security checks, dividends, bank statements, etc., based on "old" code.

No, let's consider "Essays as Programs" rather than vice versa.

ALFONSO L. STANDIFER
Computer Specialist
Federal Equipment Data Center (KHEE)
Washington, D.C.

DIGITS RECOUNTED

In the last several issues I have been enjoying *Digits* by Roy Mengot. However, two of the strips in recent issues didn't seem to make much sense. Then I realized that the frames were out of order! You really should read these things before you print them up; after all, this is the most important part of your magazine.

DAVID M. CONLEY
Santee, California

If it's the "most important part," we'd better rerun the strips in question for those readers who weren't so astute. Sorry for the switch.—Ed.

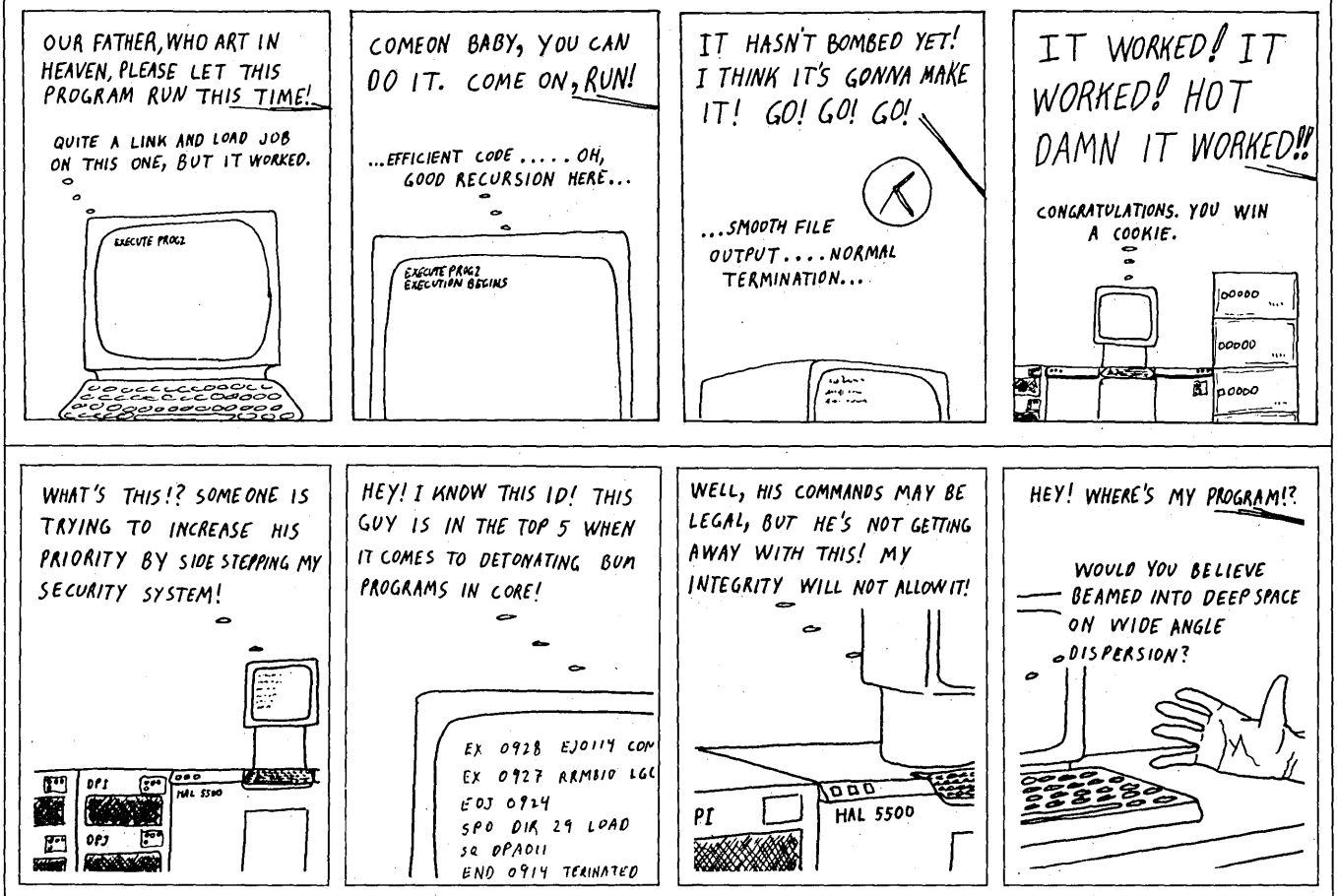
OFFICIAL DIGIT COUNTER

D.L. Gibbons (May 15, Letters, p. 23) errs in claiming that Prof. Thacher is wrong in asserting that 5^{15} is a 35-bit integer.

I assume that the exponent of 10 intended by Gibbons was 29 and not 21 as printed in DATAMATION. If so, then Gibbons is also incorrect in his claim that the product requires only 68 bits for exact precision. Neither writer mentions that floating point fractions require an extra bit to represent the sign, but do not necessarily require an explicit representation of the leading bit, which in a normalized binary number is always a 1.

Prime Computer has prepared a report to its users on the original comment in Look Ahead (October 1983, p. 14), which fully explains why certain calculations produce very tiny errors. This matter would have been even tinier than it is if Look Ahead had made it clear that the example cited does not reveal a microcode problem, and that the new quad-precision is not necessary for this example, ordinary double-precision arithmetic being sufficient to eliminate even the tiny error that arises in single-precision.

Having already this year pointed out errors in counting the length of integers in *Science* magazine and *Scientific American*, I have been thinking of apply-



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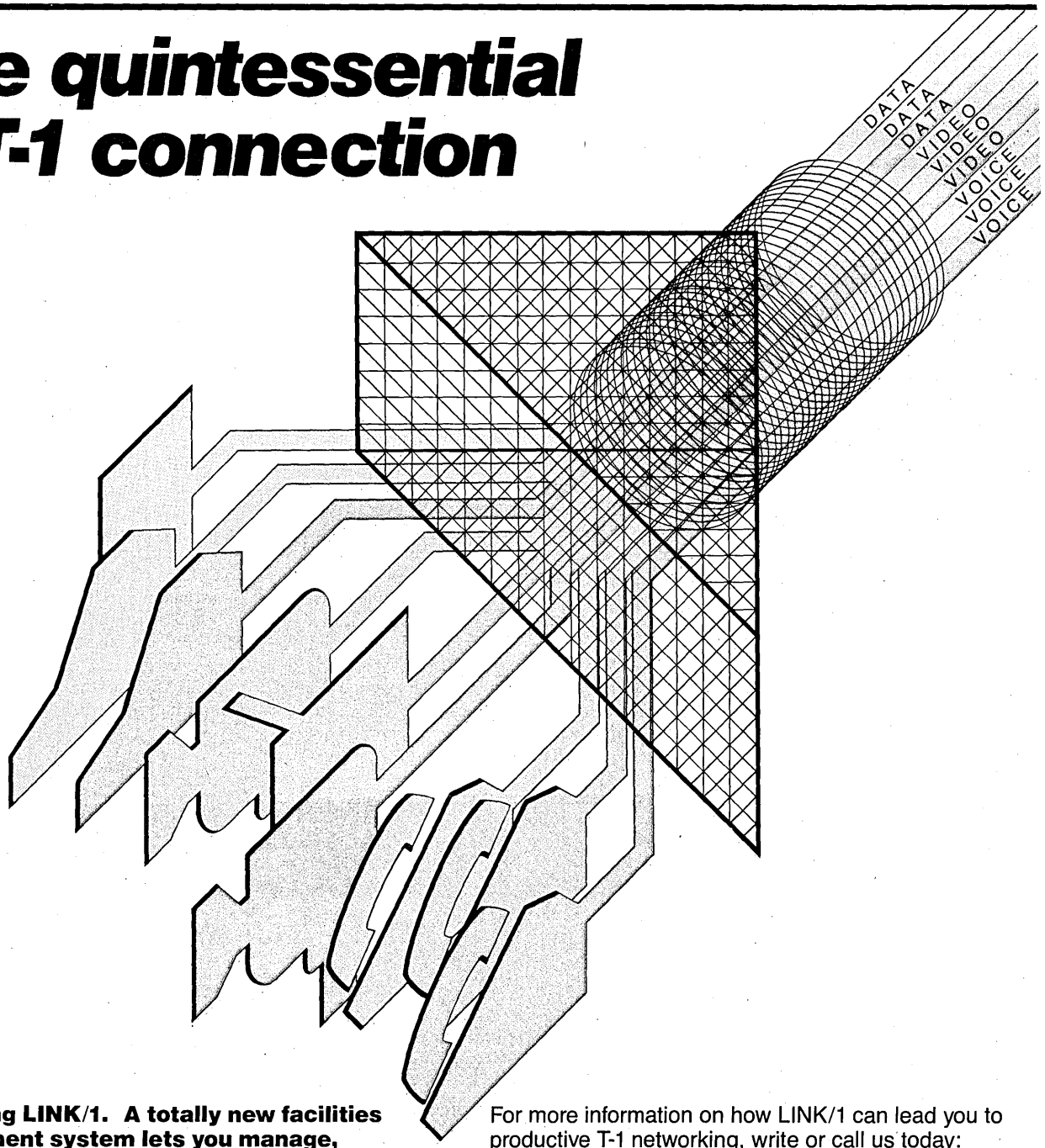

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CIRCLE 37 ON READER CARD

ing for the designation "Official Digit Counter for the 1984 Summer Olympics," or, on second thought, maybe I should apply for an appointment to H.M. the Queen.

WALTER I. NISSEN JR., CDP
Takoma Park, Maryland

DISABLED CONSUMERS' DILEMMAS

During the life of my career in data processing, I have been a loyal reader of DATAMATION. Admittedly, four years is not a long time, but I feel it is long enough to form a respectable observational base. Your publication has a strong tie to the industry, and could be considered representative of current thoughts and ideas in computing. I would like to draw your attention to a subject that has been lacking in your coverage: disability and computers.

One recent example I can give you is on p. 185 of the May 15 issue, a product announcement for a replacement keyboard for pcs, made by Key Tronic Corp.

That's all, folks. The sum total of discussion and awareness, not just in DATAMATION, but also in the industry as a whole.

I am not talking about the use of computers to substitute for human functions, such as speech or walking. Those are interesting, to be sure, but those applications concern the disabled person as recipient of the technology. I am referring to the more active use of technology, particularly as a means of employment.

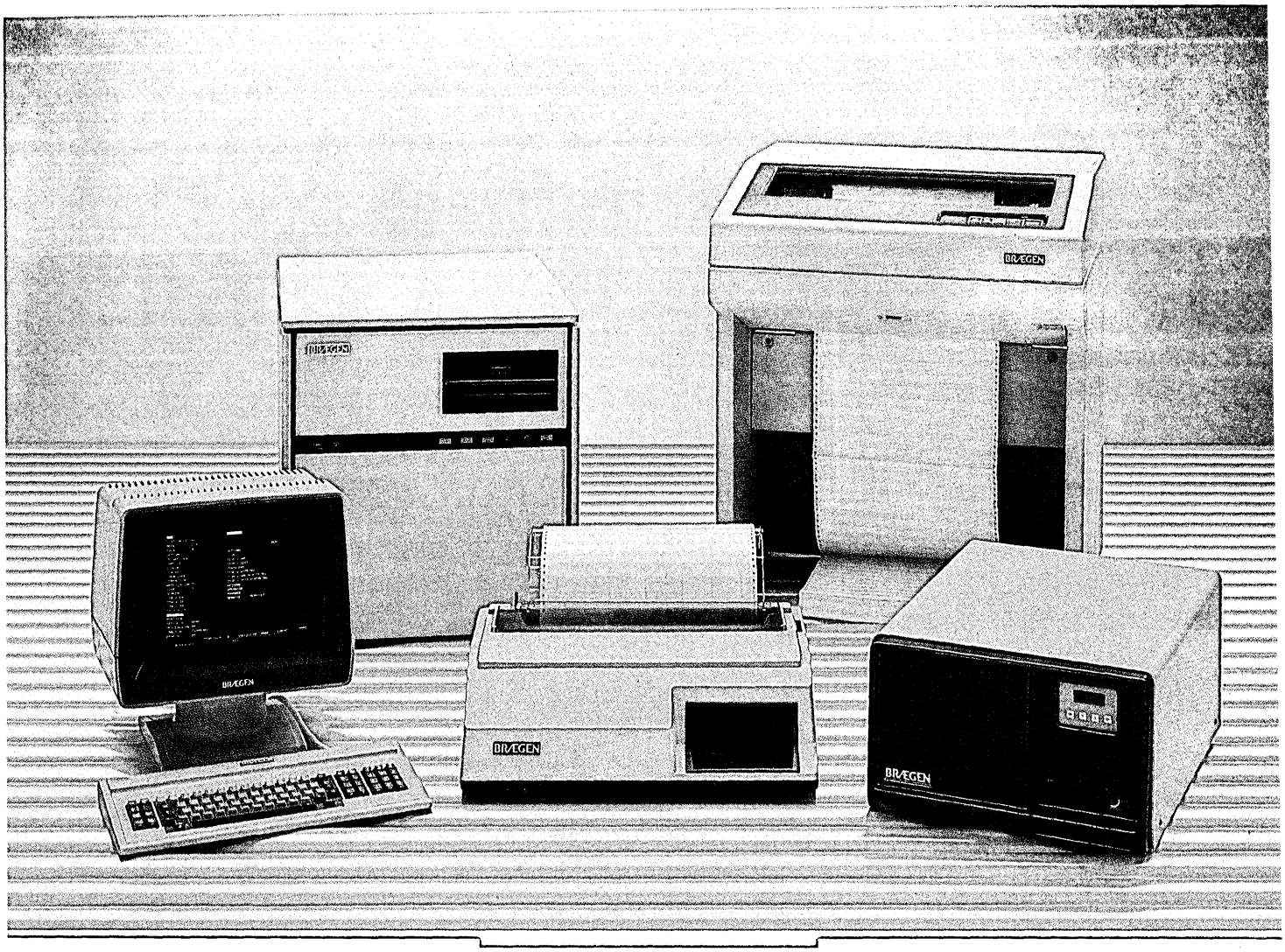
The Key Tronic people have addressed one prominent problem of the motor disabled, namely, the difficulty of pressing more than one key simultaneously. There are many more such problems, but very few manufacturers seem to be aware that they are creating and maintaining consumer goods that are not accessible to a sizable percentage of consumers. My primary concern is that product inaccessibility will lead directly to employment inaccessibility.

With the tremendous growth of micro technology, and the presence of computers in virtually every type of workplace, there is no reason disabled workers should be kept from employment. Right? Yet some of the simplest tasks, such as loading a floppy disk or turning on the power, can be difficult for someone with limited manual ability. And something as seemingly basic as a tty number for deaf customers is unavailable, although a company may have an 800 number for able-bodied customers to use.

The manufacturing companies are unprepared for disabled customers at least in part because they are not accustomed to dealing with individual customers, but rather with dp managers who buy ton-lots of equipment or software for their corporations. What happens to the disabled individual who wants to run her own business, doing accounting or word-processing or whatever, at home? Where does this person buy adapted equipment? How about training? And why must equipment be engineered for able-bodied people? Why continue to manufacture pcs that require simultaneous key depression? Does ergonomics apply only to the nondisabled? Computers aren't really user friendly; they are body friendly: so many eyes, hands, etc., required for use. And millions of disabled people are denied customerhood by those requirements.

There are efforts, such as that of Key Tronic, to remedy the situation, but you will look long and hard before you find a major producer with an organized policy toward the disabled consumer. I think it's time for a major discussion of the issue, and *not* in the rehabilitation journals, but in the mainstream of the computing industry.

NANCY R. BURNETT
Waldorf, Maryland



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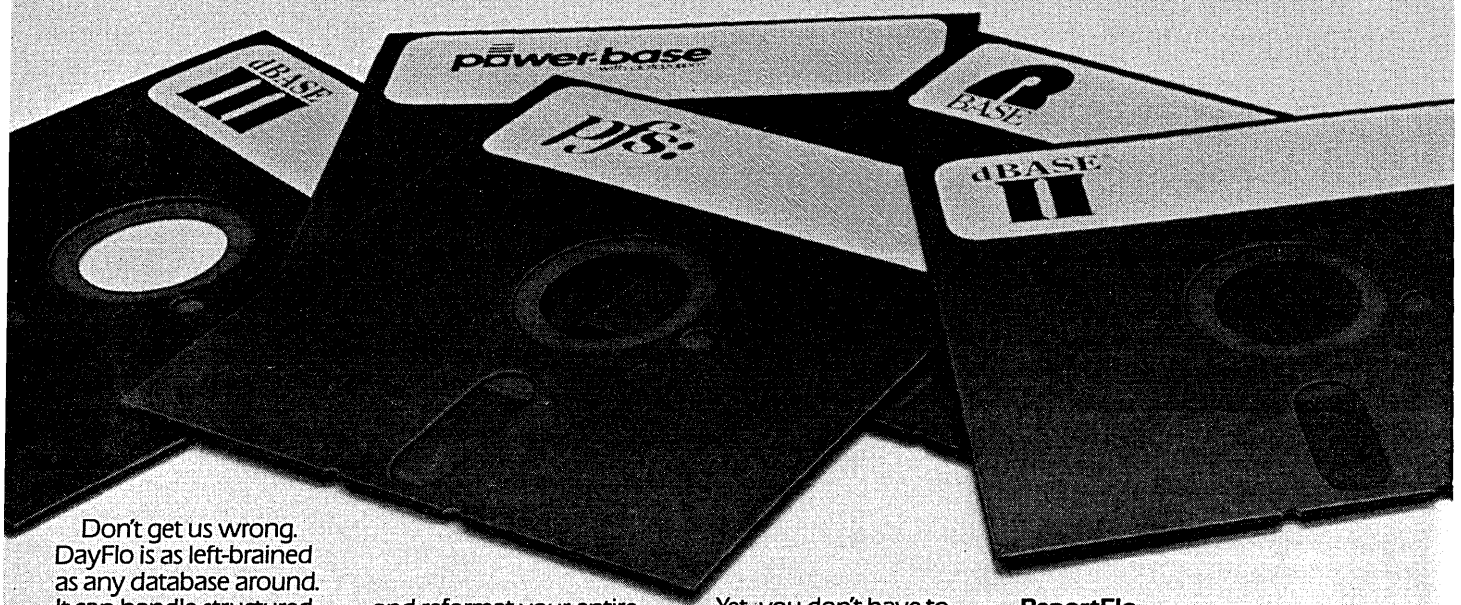
Traditionally, databases have been left-brained.



Don't get us wrong. DayFlo is as left-brained as any database around. It can handle structured information such as customer lists and personnel records. Keywords and field names are used to gain access to records.

Just like traditional databases.

However, solving traditional problems in traditional ways is just one side of DayFlo. It's also flexible enough to handle today's new challenges in exciting new ways.

And that's where strictly left-brained databases get left behind.

The First Free-Form Database.

In the real world, there's always an exception to the rule.

Which wreaks havoc on traditional databases. For example, because of fixed formats, entering a new field such as a Telex number into a single customer record is next to impossible. Unless you're prepared to reprogram and reformat your entire database.

DayFlo, on the other hand, eliminates these tedious operations.

Word-Oriented Database.

Unlike traditional databases, DayFlo has integral word processing. For instance, you can store letters and memos along with customer lists in the same database.

Now you're free to manipulate data at will. Free to enter, retrieve, edit and shuffle information whenever and wherever you please.

Every fact you need, from key client lists to spontaneously entered notes and ideas, is just a few keystrokes away.

Power, Yes. Programming, No.

DayFlo is a powerful package that runs on an IBM PC with hard disk, Compaq Plus, or compatibles.

Yet, you don't have to be a programmer to use it.

So you see, DayFlo is a much greater information management tool than any traditional database. Much more flexibility and power than pfs. Much easier to use than dBASE II.

ReportFlo.

With our ReportFlo package, you can produce presentation-quality documents, reports, letters, memos and so forth from the data stored in DayFlo. This potent report writer also performs calculations.

COMPARING DAYFLO TO TRADITIONAL DATABASES

TRADITIONAL DBMS	THE BENEFITS OF DAYFLO
• Fixed record format. All records must look alike.	• Free-Form record format. No two records need look alike. All record formats are stored in same database.
• No word processing capabilities.	• Integral word processing. Create and store letters, memos, notes, ideas, etc.
• Fixed field length.	• Variable field length. No counting character spaces.
• Adding new fields requires remapping or reformatting of database.	• Instantly add new fields to existing records without reformatting the entire database.
• One value per field.	• Multiple values per field. Information where you want it.
• Retrieves data based on pre-planned criteria only.	• Retrieves information based on content or key words.

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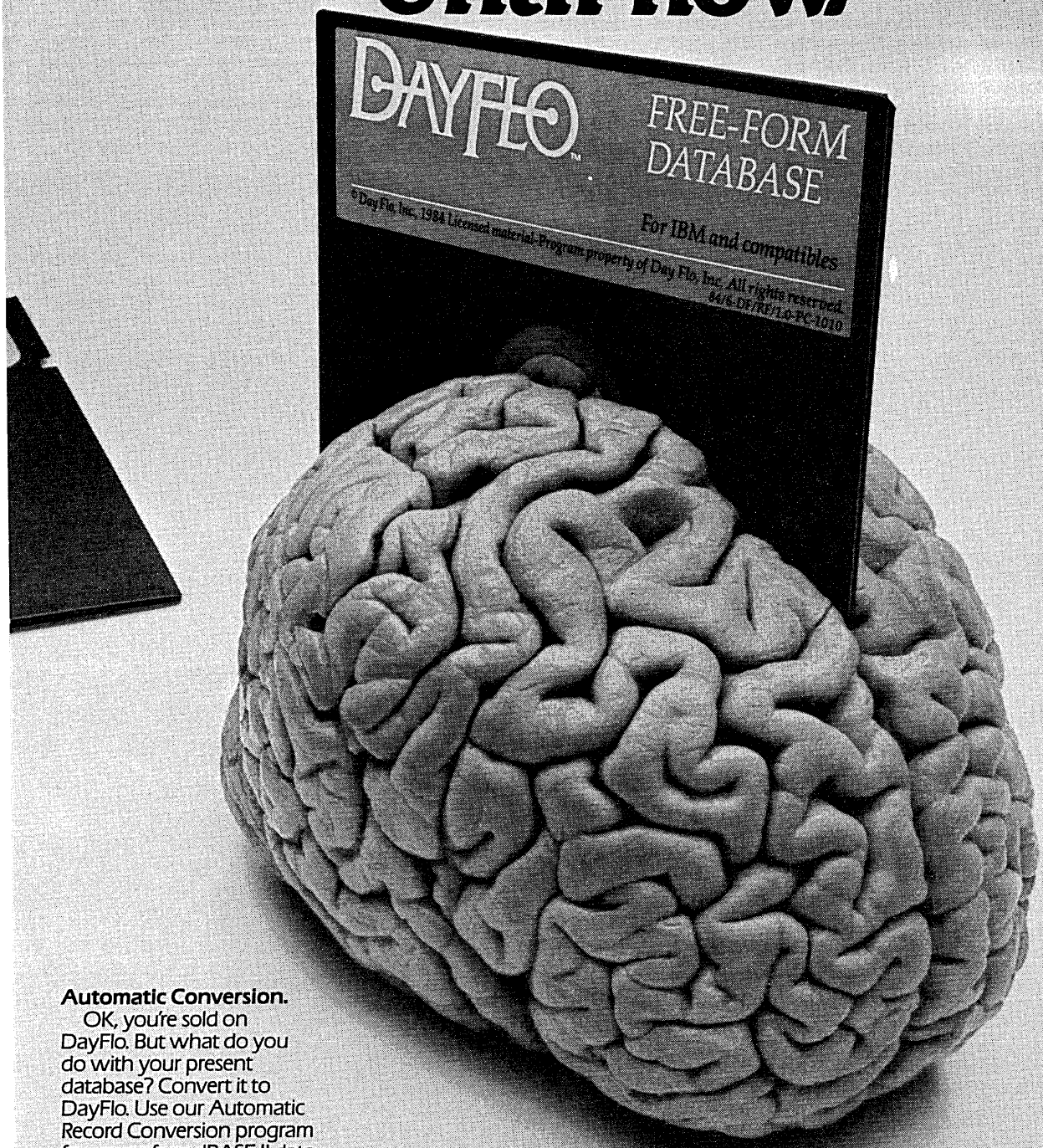

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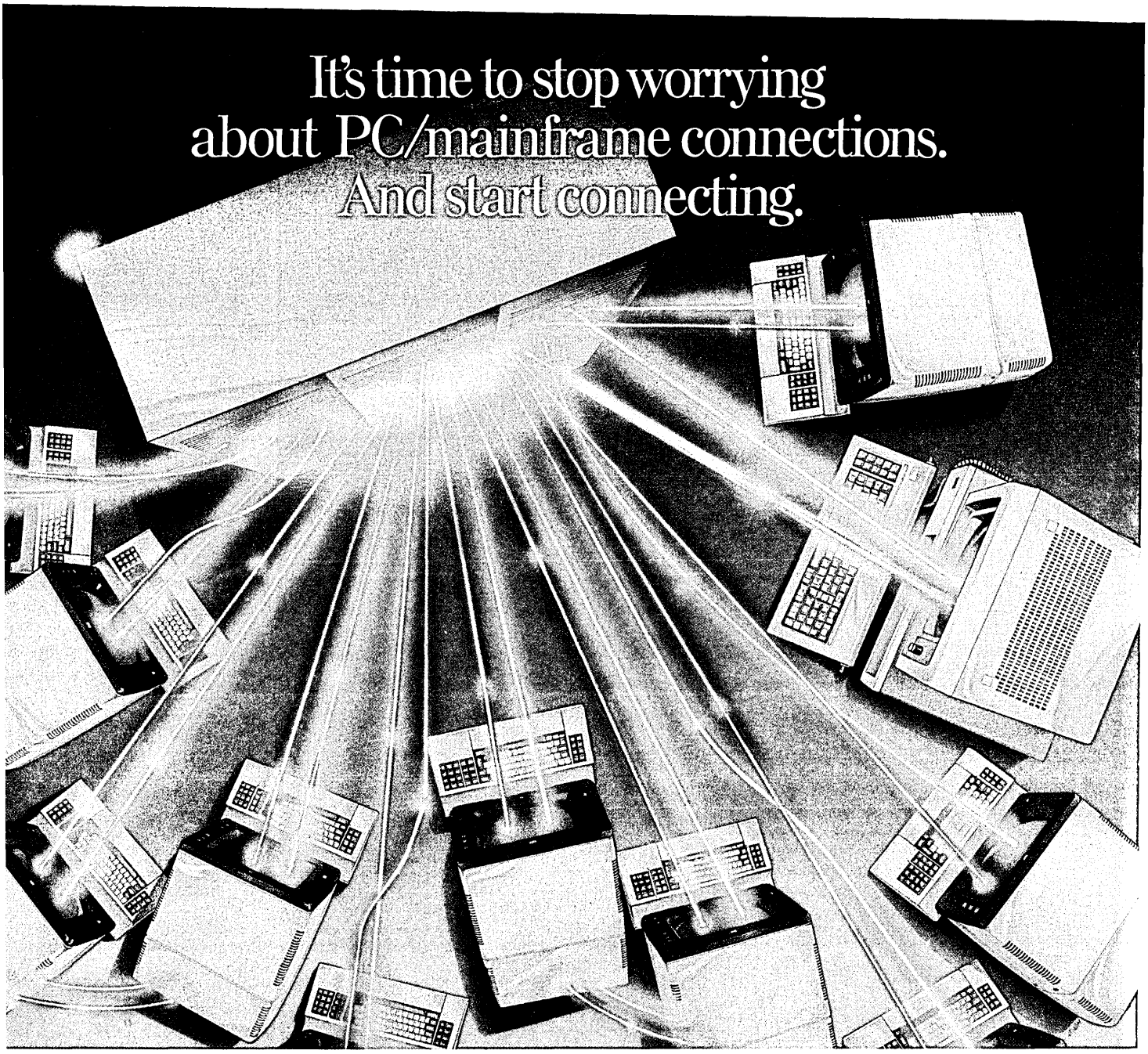

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CIRCLE 40 ON READER CARD

Rebecca S. Barna, Editor

EDITORIAL

THE AGE OF ENLIGHTENMENT

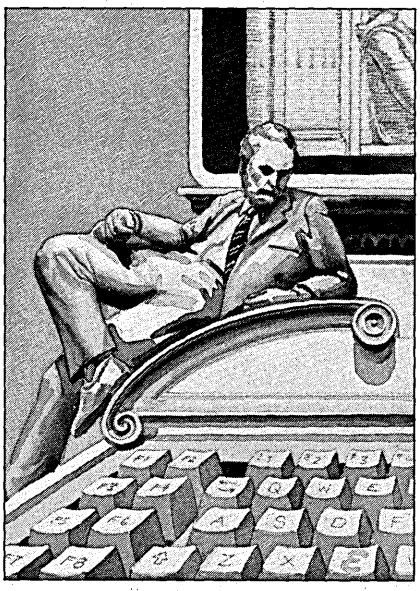

ILLUSTRATION BY DORIS ETTLINGER

Lorenzo de' Medici never saw a computer, but he had a lot in common with today's dp manager. The ruler of Florence in the mid-fifteenth century, de' Medici was a true Renaissance man: politician, banker, writer, poet, and patron of the arts.

Interestingly enough, that's just the kind of person now considered the ideal programmer, analyst, project leader, or dp manager. According to MIS executives surveyed by Andrew Friedman of the University of Bristol in England and Joan Greenbaum of LaGuardia Community College in New York, executives running the largest domestic commercial dp centers show a distinct preference for a well-rounded information processing professional over a narrowly focused computer jock.

As Friedman and Greenbaum note in "Wanted: Renaissance People," a feature article in this issue, "While a computer science degree is still a big favorite in corporate personnel departments, many managers said that, if given their own choice, they would seek out liberal arts graduates and people interested in problem solving. Two to one, managers prefer degrees in subjects other than computer science."

We increasingly hear the same refrain. Over the past few years, dp managers have bewailed the limited horizons and interests of their computer science types; they want their charges to have a broader view of the world. Many MIS execs who have taken the plunge into pursuing job applicants with noncomputer backgrounds say the newcomers to dp make far better employees. Some even go so far as to claim these dp neophytes have more loyalty to the parent organization; they certainly have less interest in writing code for code's sake.

Take the case of a West Coast dp manager for a major retail chain, who prefers to employ political science grads, artists, actors and actresses, and other liberal arts types over the die-hard dp breed. "We're in the rag business. We don't need a guy who wants to reinvent MVS. The number one question I ask job applicants is: 'Do you play a musical instrument, or do you have such an interest?' I've found that a proficiency in music has the highest correlation with excellence in programming—both require a person to be creative within a structure."

Admitting nonbelievers into the computer priesthood may strike traditional dp managers as heresy, but it appears to be part of an epochal change in the information processing function. The accessibility to computer power that is now available—thanks to the microcomputer—gives these Renaissance people the opportunity to open up the dp department, just as giving 18-year-olds the right to vote helped make Gary Hart a household name for a few months.

The arrival of a new generation of data processing people does indeed concide with that other fundamental change in dp responsibilities: the management of microcomputers and the broadening this brings to end-user computing. Friedman and Greenbaum note that the rise of microcomputers within large organizations offers the dp manager the opportunity to further involve end users in the planning and development of new mainframe applications. Given time, this new trend can help relieve the dp department of much of the handholding necessitated by the terminal and timesharing approach to end-user computing.

It also can relieve the dp department of the need to hire only those trained in computer science.

As data processing applications become more manageable by the masses, the data processing function requires more good managers—whatever their backgrounds and interests may be.

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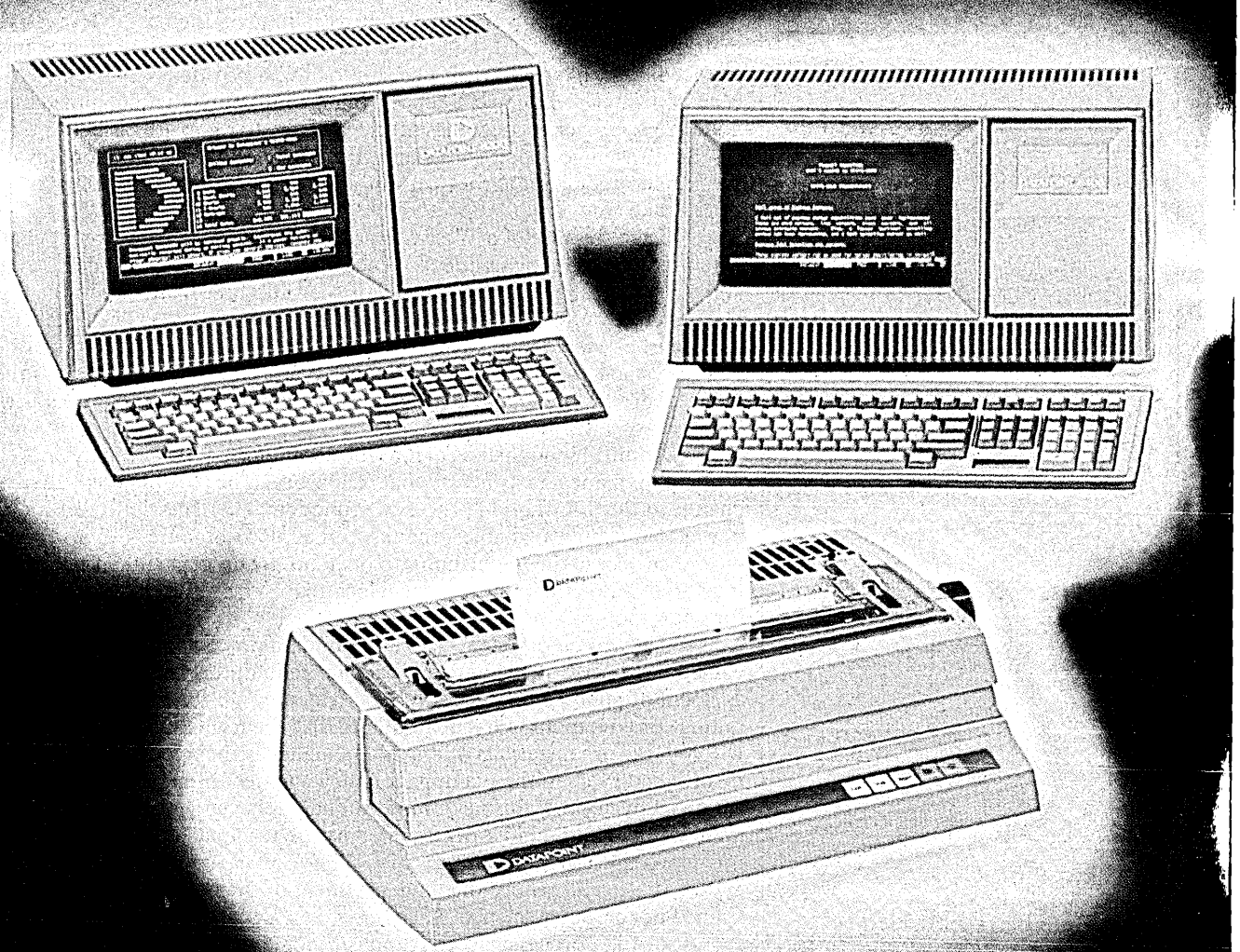

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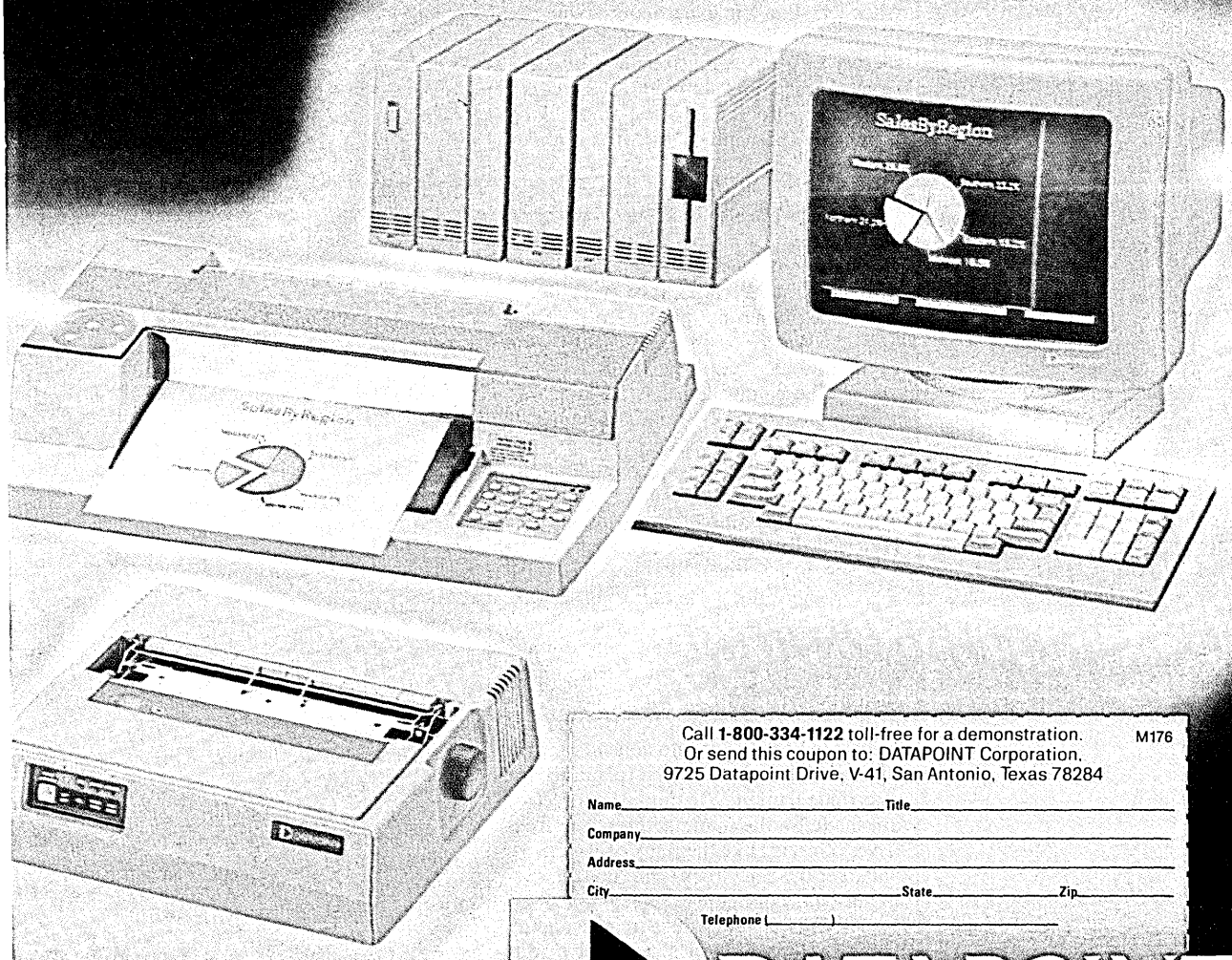

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IN FOCUS

BANKING ON PCs

Will personal computers save home banking?

Edith Myers

It's different strokes for different folks from the people who are bringing us home banking.

For the newest wave of offerings you need a personal computer that communicates. Together, more than 1 million people and small businesses have one or more pcs and a modem.

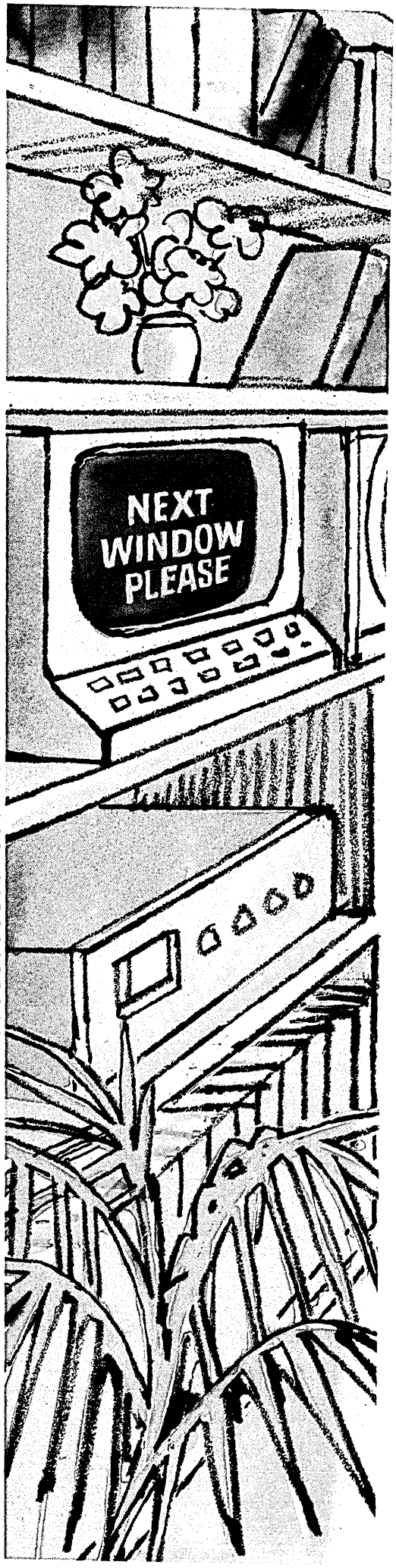
These people are ripe for the picking by such home banking institutions as Bank of America in San Francisco and Chemical Bank in New York. Nineteen financial services organizations, anxious for ways to entice customers with electronic services and simultaneously reduce back office processing costs, are flocking to join the pc bandwagon with bank-at-home offerings.

A host of software houses and service bureaus are also profiting from the pc banking trend. Among the firms who provide bank systems that link up to personal computers are Periphonics Corp., Bohemia, N.Y.; Microperipheral Corp., Redmond, Wash.; and ADP Telephone Computing Services, Seattle.

The bandwagon has its giveaway aspects. Madison National Bank of Washington, D.C., has a pc-based service, and it provides the pc—a Commodore 64 for now, but it plans to offer IBM PCs as well, beginning this month. Broker E.F. Hutton will sell or lease the hardware to access your account.

Some home banking observers, however, are skeptical of the potential in tying the cash vault to the home computer. "I don't believe what I hear about their [pcs] growth capacity," says Kenneth Thacker, president of Strategic Dimensions Ltd., a Toronto consulting firm that specializes in strategic planning for electronic banking. "I think the forecasts are made by the manufacturers." He believes offerings like the Bank of America's will "get the early rush," but not the customer who's difficult to sell to.

Camps are developing among home banking proponents who favor different types of access devices. Thacker favors videotex terminals. "The average customer doesn't want to think computer. He's more comfortable with a videotex terminal, his tv screen, and access to an




EXIT HERE

infinite number of databases."

He feels the adoption of the NAPLPS (North American Presentation Level Protocol Syntax) by the telephone company ultimately will drive down the price of videotex terminals because "manufacturers [of terminals] now have a blueprint from which to work and they'll start turning them out in quantities with resulting economies of scale.

"If you can deliver that [videotex services] for $20 to $25 a month, consumers will consider it just another add-on to their tvs," says Thacker." Yet the early returns on interest in home banking via videotex are less than encouraging.

Charlie Forbes, vice president of sales and marketing for Chemical Bank's Pronto home banking, with pc offering, quite naturally favors the pc as an access device. "The hardware is in place in the home; $600 to $900 [for a dedicated videotex terminal] is a hell of an investment for something you've never done before."

A 14-bank consortium, Home Banking Interchange, is looking at both NAPLPS videotex terminals and pcs. John Fraser, an officer of First Wisconsin National Bank, Milwaukee, one of the participants, says two tests will be conducted, one with AT&T's Sceptre terminals and a second at a later date with pcs.

The banks signed an agreement in mid-1983 with ADP to install home banking systems for them. In midsummer this year they were just about to turn on the systems, says Fraser. The Sceptre-based systems will be tested for one year with data monitored by ADP and turned over to Mathematica, Princeton, N.J., for analysis.

"The average customer doesn't want to think computer."

Fraser says the planned pc test length has not yet been set. For the Sceptre test the banks each will lend terminals to some 100 to 125 selected customers. "For the pc test we'll be talking to people who already have them," he says. Mathmatica's final report for HBI will include a comparison of the two access modes.

Howard Phillips, president of ADP Telephone Computing Services, says that the final act in the home banking scenario will see a wide mix of access devices. "We'll have everything from rotary dial phones to Touch-Tone phones to ASCII pcs to videotex terminals to bulk feed (where banks use the services of an outside provider), and out there in the Ozarks somewhere, somebody will be using a number 10 tomato can and a string."

Thacker forecasts there will be a coming together of videotex terminals

FIG. 1

BANKING AT HOME SYSTEMS

SERVICE PROVIDER	REGION	NO. OF USERS	PROTOCOL
ADP Telephone Computing Services/Home Banking Interchange	nationwide	2,000	NAPLPS
Anacomp/Videoserv	nationwide	NM*	Prestel
Bank of America/ HomeBanking	California	8,000	ASCII
Chase Manhattan Bank/ Consumer Home Banking	New York	200	ASCII
Chemical Bank/Pronto	New York	11,000	ASCII
Citibank/HomeBase	New York	about 1,000	ASCII
Continental National Bank/ Home Banking System	Miami	200	ASCII
Empire of America, Macrotel/TransTouch	Buffalo	NM*	NAPLPS
Farmers State Bank and Trust, BankWork/Farmers Home Banking	Jacksonville, Ill.	20	ASCII
First Interstate Bank/ Day-and-Night Video Banking	Los Angeles	250	ASCII
Horizon Bancorp/ Horizon Home Banking	New Jersey	NM*	ASCII
Huntington Bank/BankShare	primarily Ohio	NM*	ASCII
Madison National Bank/ Home Teller	Washington, D.C.	300	ASCII
Manufacturers Hanover Trust/NA**	New York	NM*	ASCII NAPLPS
National Bank of Detroit, Applied Communications/ Video Information Provider	Detroit	NM*	Prestel
NCR Universal Credit Union/Companion-at-Home	national	over 100	ASCII
Penn Security Bank & Trust/People Server Videotex Service	Scranton, Pa.	50	ASCII
Shawmut Bank of Boston/ Home Banking	Massachusetts	100 NM*	ASCII
Toledo Trust/VistaBanc	Toledo area	120	ASCII
United States Trust Co./ UST Master Account	New York	70	ASCII
VideoFinancial Services, Viewdata Corp. of America/Applause	south Florida	about 850	NAPLPS

*NM: not meaningful; in startup phase
**NA: not available
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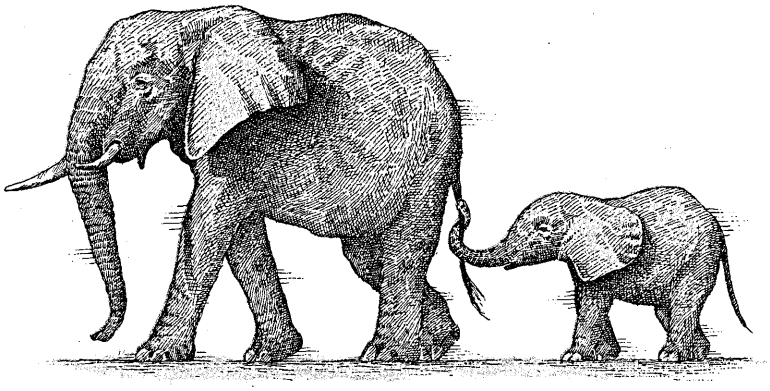
WHEN IT COMES TO LINKING PC's TO MAINFRAMES, ONE COMPANY IS A MILLENNIUM AHEAD.



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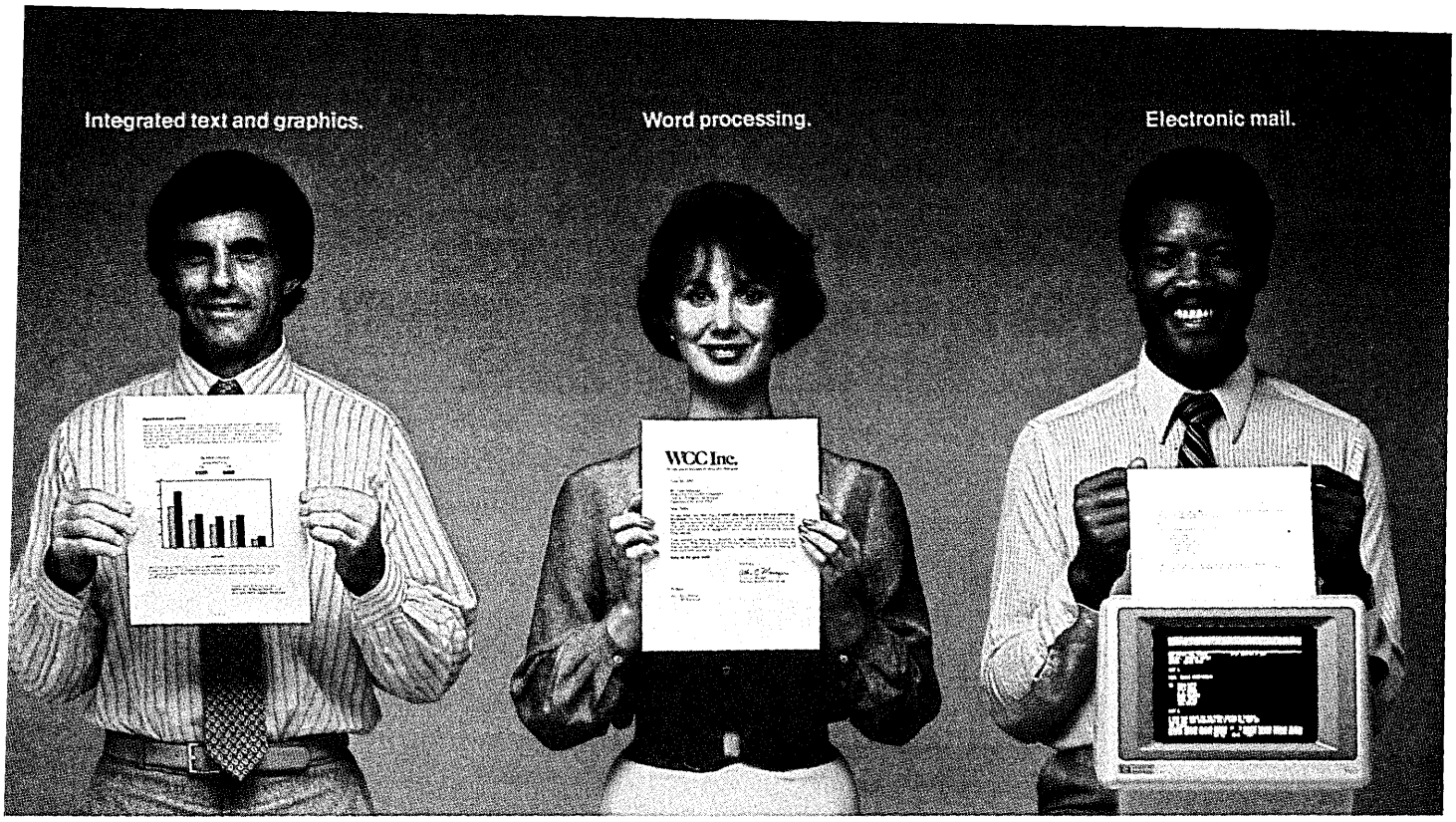

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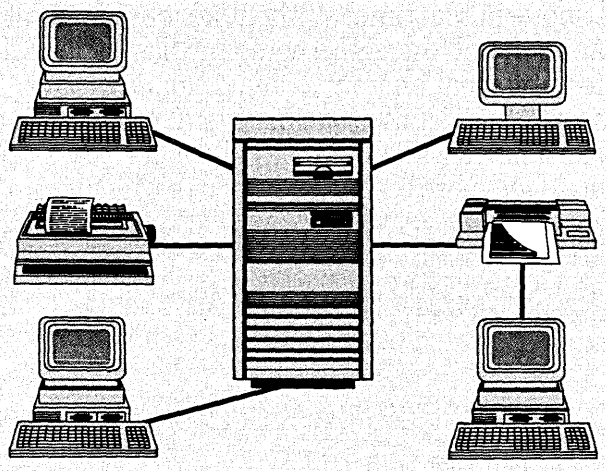

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CIRCLE 43 ON READER CARD

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and pcs. He foresees NAPLPS software that will give the videotex terminals increased capability and eventual building of NAPLPS chips into personal computers. "In five years it'll be difficult to differentiate."

He feels availability of terminals for under $100 "is essential if home banking is ever to really take off." He believes it will happen. "The question is when. We're moving that way. Remember the price you paid for your first television set? Or for your first handheld calculator?"

He's not alone in predicting growth for home banking. A study by the New York research firm Frost & Sullivan titled, "Home Financial Services Delivery Systems," predicts that one in 10 thousand households will utilize electronic home banking by 1991. Fraser of First Wisconsin expects that 10% of all households will be using it by 1990.

John F. Fisher, senior vice president of Bank One Corp., Columbus, Ohio, said at the American Bankers Association's National Operations and Automation (NOAC) conference in Washington, D.C., that the 1990s "will usher in the final development of videobanking technology, preceded in the 1980s by the initial introduction of the technology and development of the standalone home information appliance and the full network."

Home banking, however, was not the hot topic this year at NOAC. Much more attention was paid to things like shared automated teller machines (ATMs) and back office automation.

Floyd Egner, director of the Home Terminal Research Program at Reistad/PSI, Tampa, Fla. (formerly Payment Systems Inc.), says home banking "hasn't generated a lot of excitement in the last six months or so."

Chemical's Forbes believes this is because banks are giving other dp projects higher priority. "Home banking has been something that is moving more slowly than we had anticipated. Shared ATMs to a limited extent, POS [point of sale], and consolidation of back office functions are eating up technical resources."

Talk about home banking has "dragged on to a point that it's tiresome," says Henk Koehn, futurist for Security Pacific National Bank of Los Angeles. "It's going to happen but its unclear what segment of the population it will go to. There's a synergy between VCRs and home computers. [Home banking] will appeal to those types of households."

Koehn believes the ultimate providers of home banking will probably not be banks but third-party vendors. "They're selecting their partners and the first minuet is under way."

THE PC AS STOCKBUYER

Purveyors of most electronic financial services for the home are faced with educating users to doing something in one environment that they have been doing for years in another.

Not so with the independent investors. "Independent investors are very independent. They want to make their own decisions and they're used to initiating transactions from their homes and offices via telephone," says Eric Kobren, director of marketing for Fidelity Investor's Express, an interactive discount brokerage service launched last spring by Fidelity Investments, Boston. It is available to owners of personal computers and dumb terminals.

Kobren himself uses the latter. "It's a $250 Quazon [by Quazon Corp., Carrollton, Texas], which hooks up to my tv and my phone."

Most Investor's Express users, however, use Apple, IBM, and IBM-compatible computers, he says. "Heavy investors have the money to buy computers so their use is the rule rather than the exception."

Fidelity introduced the service with a price tag of $195, but in June cut back to an "introductory" price of $49.95. Kobren said the price would move back up, probably to $95, by the end of this summer. Fidelity is conducting demonstrations of Investor's Express at its 28 investment centers across the country.

Kobren won't say how many subscribers Investor's Express has, only that there are "about several hundred," and that interest has been high both in the U.S. and Europe. He says the most attractive feature to investors is the fact that they can initiate transactions 24 hours a day. "Most of our activity is at night. A lawyer can't buy and sell stocks when he's in a courtroom or a doctor when he's in surgery."

He says customers feel less independent when they buy or sell orders by phone. "Our traders don't try to influence customers over the phone, but when customers are talking to someone, they perceive that they're being talked into or talked out of something." A person placing a buy or sell order at night has the option of changing his mind right up until the market opens.

Software for Investor's Express was developed by Trade*Plus, Palo Alto, Calif., which runs it on DEC VAX computers for Fidelity. Leonard Schwartz, vice president of marketing for Trade*Plus, says his company began offering the brokerage product last year after a year and a half in development.

The first customer for the product was C.D. Anderson, a 10-year-old San Francisco brokerage firm that created a subsidiary, DeskTop Brokerage Inc., to market it not only to brokerage customers but to other brokers on a franchise basis. C.D. Anderson was the first brokerage to offer such an interactive service but DeskTop Brokerage president C. Derek Anderson doesn't feel like a wounded pioneer. "There was a thirst for this type of product," he says. "I know a lot of people who have gone out and purchased modems just to use our service and a few who have bought computers for the same reason."

When he takes the product to market to brokerage houses, probably on Sept. 15, Anderson says he will launch a nationwide promotion for the name DeskTop and he expects potential franchisers will want to take advantage of this.

Do customers ever blame the computer for erroneous transactions? Schwartz of Trade*Plus says this is less likely to happen than with telephone sales. "Brokers tell me that's a big beef with telephone buyers. The stock goes down and they claim they didn't buy. With our system you have a hard-wired trail."

Anderson said his customers make the most use of the system at night and particularly like the fact that they have access to it in case of emergency, "like war or any unforeseen positive or negative news. Usually at times like that all the phones get tied up."

Microperipheral Corp., located in Redmond, Wash., is developing its own system for on-line stock transactions. The system, to be called Stock Mate, is not up as yet. And Michael Darland, president of the company, could not say when it will be up.

The banks will be in there, too. Both Chemical Bank and Madison National Bank of Washington, D.C., have announced they will add stock transactions to their home banking offerings this year.

The stock quotation services are also getting into the act. The Source, the on-line database from Source Telecomputing Corp., McLean, Va., recently announced a deal with a Los Angeles broker, Spear Securities Inc., to supply brokerage services to the 57,000 Source subscribers.

In addition to real-time transaction and confirmation, investors can use the Source for portfolio management. Several brokerage firms are also selling their research to the databases. So far, though, computerized stock buying for the masses seems to be the realm of discount brokerages aiming at independent investors.

—E.M.

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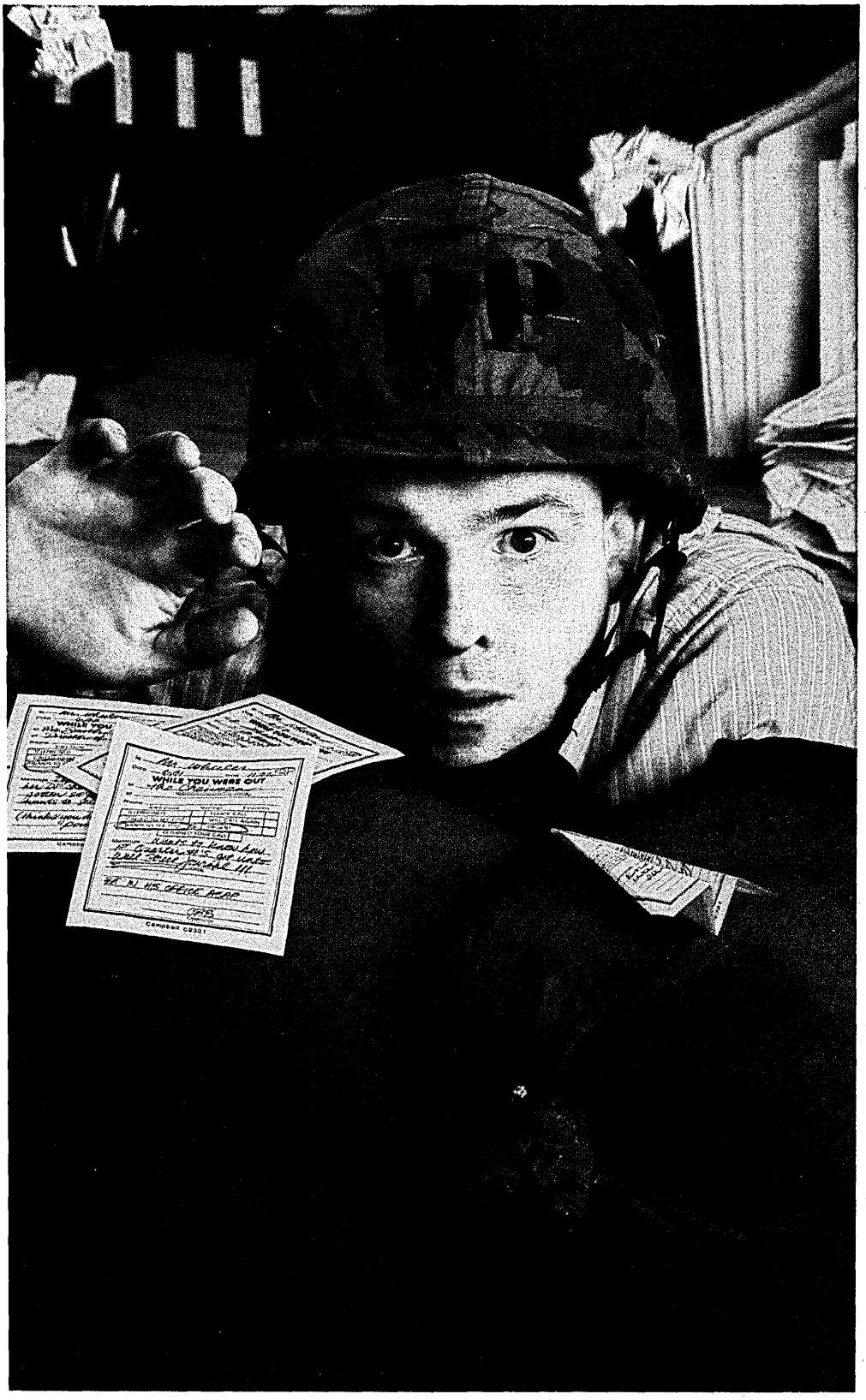

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CIRCLE 44 ON READER CARD

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One such partnership is between CBS, Sears, and IBM, which announced early this year it would develop a videotex service. "That gives home banking the kind of credibility that will make it go," says Thacker.

Sears in June started a telephone bill paying service in Southern California which it called Stage 1 and which it plans to take national next year. Phillips of ADP says both First Interstate Bank of Los Angeles and Security Pacific are using Stage 1 terminology for their telephone bill paying services.

In mid-1983, Sears chairman Edward R. Telling told stockholders that home banking was a "top priority" for the company. "We have long felt that electronic delivery systems are extremely important to the consumer," he said at an annual meeting. "Automatic teller machines and in-home banking in various forms are a top priority for Sears."

Another major retailer, J.C. Penney Co. Inc., New York, is forming a new venture headed up by Stuart C. MacIntire, who, when he worked with First Bank System Inc., Minneapolis, was instrumental in setting up FirstHand, a home banking experiment in Fargo, N.D. Penney bought the FirstHand system and is lining up partners for a network service which undoubtedly will include home banking.

Egner of Reistad/PSI likes a consortium called Video Financial Services (VFS), which includes, among others, Honeywell, Field Enterprises, and Centel, in Chicago; Viewdata Corp., Miami Beach; Southeast Bank of Florida, Miami; Bank One Corp., Columbus; and Security Pacific. VFS, he says, does software development and transaction processing for the banks involved. It also is the switch and owns the host computer. The first on-line project is the Viewtron offering by Viewdata, a subsidiary of Knight-Ridder, in Miami. A project was being developed for summer introduction in-

"In-home banking in various forms is a top priority for Sears."

volving ASCII terminals from Honeywell that would ultimately include gateways for the use of the NAPLPS standard. Egner estimates involved partners have invested "several million dollars apiece."

Also high on Egner's list is an offering called TranstexT, announced May 31. Its parent is Integrated Communication Service, made up of Control Data Corp., GTE, NCR, Westinghouse, Southern Bell, The Southern Company (a utilities holding company), and "half a dozen smaller partners."

Key to the TranstexT offering is what Egner describes as a gray box—an elaborate meter and also a computer. "With this, a Touch-Tone telephone, and a home tv set, you have a total videotex terminal." The boxes would be installed in a garage or basement by the electric utility companies, which also would do on-line meter reading. First installations were for a beta test starting in June in Roswell, a suburb of Atlanta. It is expected to spread to 200 households this fall, all in the South. Banks involved with TranstexT include North Carolina National Bank; Charlotte Citizens & Southern National Bank, Atlanta; and Fulton Federal Savings & Loan, also in Atlanta, among others.

Egner is a firm believer that home banking as a service cannot stand alone and should be offered with other services. Phillips of ADP is not so sure. He says this is an important question for study in the Home Banking Interchange program. "Maybe people like to read their newspapers, like to go to the store. We want to find out what's important to people. Maybe our entire emphasis should be on banking."

Chemical Bank is continually adding services to its Pronto offering. In April it announced Information Services by which customers can get economic and business briefs, tax guides, *Consumer Reports* articles and a guide to all Chemical Bank services and current interest rates. This was added to the existing services of account maintenance, merchant payments, and electronic mail. At NOAC, Chemical announced it would introduce investment services on Pronto this fall (see box).

Mock of Madison National Bank says his bank will be adding discount brokerage services by the end of this year. Madison's existing services are bill paying, account balance, funds transfer, and loan applications. For the latter, Mock says, a customer can fill out an application via his terminal. "A hardcopy is turned over to the loan office which checks it out. If it's approved we call the customer to come in and sign. Maximum turnaround is five days."

Madison charges a customer $15 a month, which includes the Commodore 64. Chemical charges $12 a month for Pronto, and Bank of America charges $8 per month for its offering. "Cost is important," says Egner. "Customers want to perceive it as replacing an existing cost, say, check service charges."

John Farnsworth of the Private Banking Division of Bank of America and chairman of the Home Financial Services Committee of the Electronic Funds Transfer Association says Chemical Bank and Bank of America are the only two major banks active in the home banking market today. "Citibank's Home Base service hasn't really rolled on yet and Viewtron [the Viewdata service in Florida] is just now adding banking services." Viewtron has five banks offering some form of service through the videotex offering. A recently floated rumor in the New York press indicated that Citibank may try to refocus its home banking experiment toward small businessmen who already have a computer and want better control over their finances. *Citybusiness,* a business newspaper, predicts that new Citicorp chairman John Reed "plans to emphasize desktop services to the com-

Citibank may refocus on small businessmen who already have a pc and want better control over their finances.

mercial market. A far wider range of financial products interests the small businessperson more than the home banking customer," says columnist Daniel Burstein.

Farnsworth, who was with Chemical Bank before joining Bank of America last January and was closely involved with Pronto from its inception, compared the offerings of the two banks. "Pronto has a few additional dimensions to it for the back office end, but because of that, it suffers by being not quite as universal as the Bank of America's." The B of A service will work with virtually any personal computer. Pronto now works with Apple, Commodore, Compaq, and the IBM PC. Chemical is working slowly toward interfacing to other personal computers.

Farnsworth's committee has been in existence 18 months. "We track home banking systems that are quickly evolving all over the country. We also track legislative and regulatory matters but at this point there are no major obstacles to home banking. We want to make sure it stays that way."

What home banking services do customers like best? Mock of Madison National says that far and away it's statement display among his customers. This allows a customer to review his account activity since his last hardcopy statement. "It's used every session, every time a customer accesses the system." He says transfer of funds comes second and bill paying third. Madison has more than 350 vendors signed up to be paid via its system and is adding more all the time.

Bill paying comes in second among Pronto customers, according to Forbes. Chemical has some 1,300 merchants who can be paid and also is adding more regularly. "We'll put on anybody a customer asks for." Among Chemical's Pronto customers, balance inquiry rates number one, but bill paying is a very close second.

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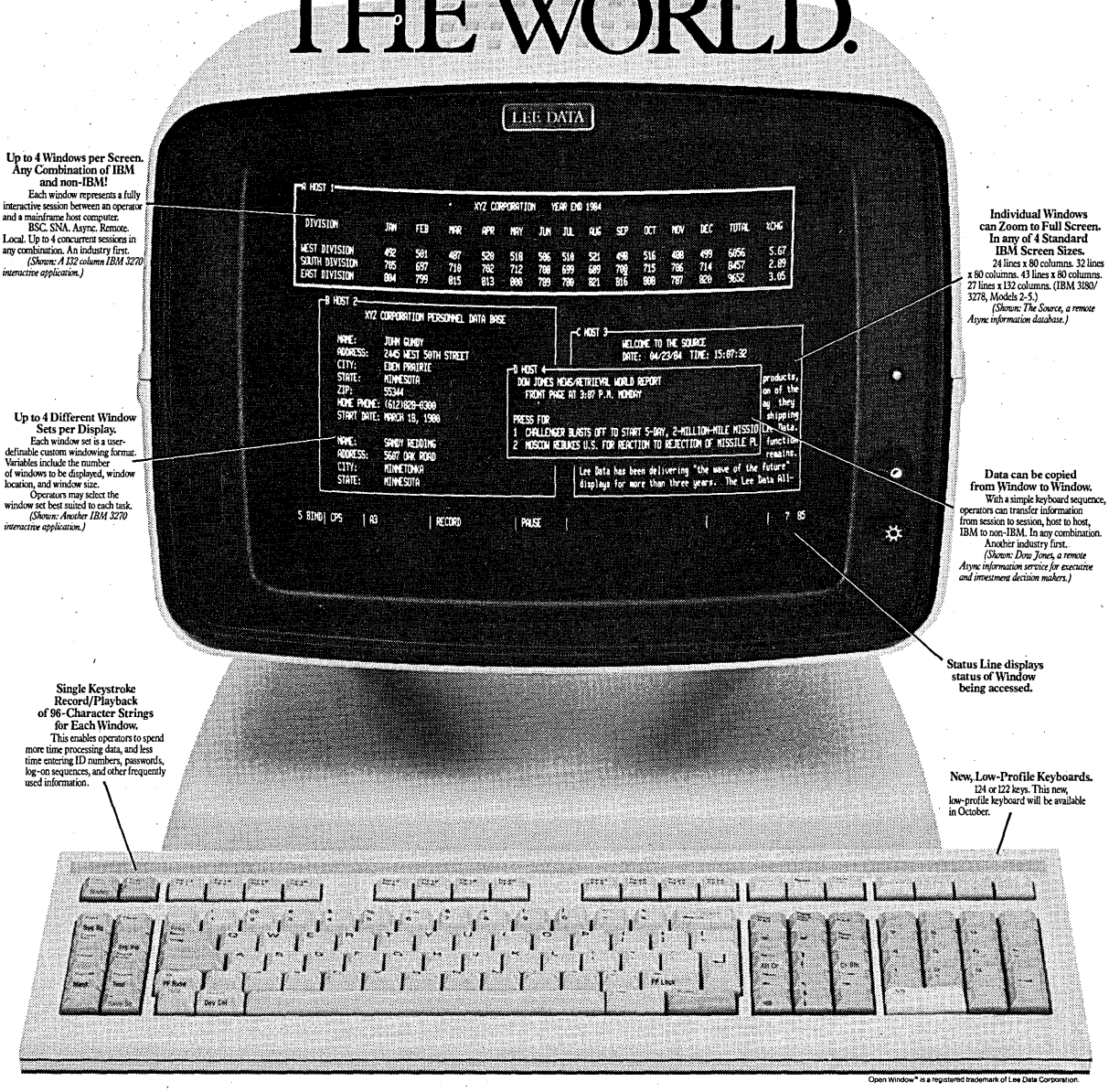

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Each window set is a user-definable custom windowing format. Variables include the number of windows to be displayed, window location, and window size.
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(Shown: Another IBM 3270 interactive application.)

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24 lines x 80 columns. 32 lines x 80 columns. 43 lines x 80 columns. 27 lines x 132 columns. (IBM 3180/3278, Models 2-5.)
(Shown: The Source, a remote Async information database.)

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CIRCLE 45 ON READER CARD

Madison, which calls its offering Home Teller, didn't have any problem selecting customers for a pilot program begun last fall with 100 users. "They just walked in and asked for it when we announced we were going to have it," says Mock. He says the bank began promoting the service in May and received more than 900 applications in June.

Selections for tests of home banking have come in for criticism on grounds that there is a selection bias and that often the tests are free and therefore not a valid way to evaluate a service for which charges eventually would be imposed.

Egner of Reistad/PSI, admittedly not a fan of Home Banking Interchange, feels its selection process is particularly suspect. "All members select their own groups and some are even handpicking among their employees."

Fraser, of HBI participant First Wisconsin, says each group selected a random sample of customers and from that sample selected users for the tests. "There were some parameters but we were aiming at getting people from all segments of society."

When HBI moves into its test with pcs, Fraser says, selection will be different. "We'll want people who already have pcs. We'll probably talk to user groups."

Fraser says banks participating in HBI aren't permanently tied to each other or to ADP. "At the end of the study we'll ponder the results; then each bank can do whatever it wants."

They hope the study will show the actual benefits to banks of offering home banking. Many banks feel it will appeal to high-income customers. B of A feels it will recoup the $2 million to $4 million it spent developing its service. Some check handling will be eliminated by electronic bill paying, and some teller time will be saved through electronic funds transfer and statement review.

Indeed, for many bankers the advantage of electronic services for their retail customers centers on the savings in back office costs. "Home banking is one endeavor to offset the costs of the back office," contends Ralph Watson, president of Powerbase Systems Inc., a New York-based micro software house that formerly was solely in the bank dp services business. Its staff was part of the contract programmer team that developed Pronto for Chemical Bank. "Banks have a huge cost of processing paper, and it eliminates key punching and back office paperwork."

For Mock of Madison National the biggest immediate benefit has been new customers. Of the over 900 applications Madison received after promoting Home Teller, he says 80% were from new customers.

"Out there in the Ozarks somewhere, somebody will be using a number 10 tomato can and a string."

Madison is talking licensing agreements for Home Teller to at least three other banks, but with new customer response what it is, Mock won't talk to local [Washington, D.C.] banks. "Why should I?" he asks.

Chemical has licensed eight other banks to use Pronto. They are Crocker National Bank, San Francisco; Manufacturer's National Bank of Detroit; First National Bank of Pennsylvania, Erie; Union Trust Company, Stamford, Conn.; American Security Bank, Washington, D.C.; Bankers Trust of South Carolina, Columbia; Florida National Bank, Jacksonville; and Worthen Bank and Trust Co., Little Rock, Ark. Forbes says Chemical was "talking to a number of others." He predicted in late 1983 that Chemical would sign up 50 licensees by 1985, but at midyear this year he said he would have to revise that downward somewhat.

Current Chemical licensees have what Forbes calls a Phase 1 license allowing them to work with "a couple of hundred customers through our hardware." A Phase 1 license carries a one-time price tag of $25,000 plus maintenance and per customer processing fees. Next step would be a full commercial license for $700,000 plus maintenance and processing. Again, Chemical's Tandem NonStop II processors would handle transactions. Forbes says it is not out of the question that Chemical would consider placing hardware at customer sites at a future date.

Michael Darland, president of Microperipheral Corp., says his company can put a bank into a home banking business where it can make a profit charging customers $5 per month and $3 per connect hour. He says his firm has designed an autodial/autoanswer modem that can be used with any personal computer. It's straight ASCII, he says. "NAPLPS is too costly." The terminals come in two versions, a 17-key model for $175 and a 52-key model for $250. An entire system with 16 ports sells for $86,000 and with 48 ports for $134,000.

Shuttle Corp., a Microperipheral subsidiary, has placed systems in two banks, one in Pennsylvania and one in West Virginia. Darland said in late June that the banks were still testing and didn't want to go public with their systems as yet.

Periphonics claims that more than 250 banks in the U.S. have ordered its pc linking system, which it demonstrated for the first time at this year's NOAC. The system functions with all brands and models of home computers and uses Periphonic's voice response technology, the company says. When a customer calls a bank's computer to start a banking transaction, a human voice greets the caller, asking in multiple choice fashion for the customer's brand of computer, the transaction intended, and the account and security identification code numbers. Customers respond by pushing the buttons on their Touch-Tone phones. A Periphonics official says she is unsure how many of the banks have actually implemented the pc connection.

Phillips of ADP, which is implementing the HBI tests and which offers systems for home banking via telephone or pc or a combination of both to banks in general, likes to think his company has

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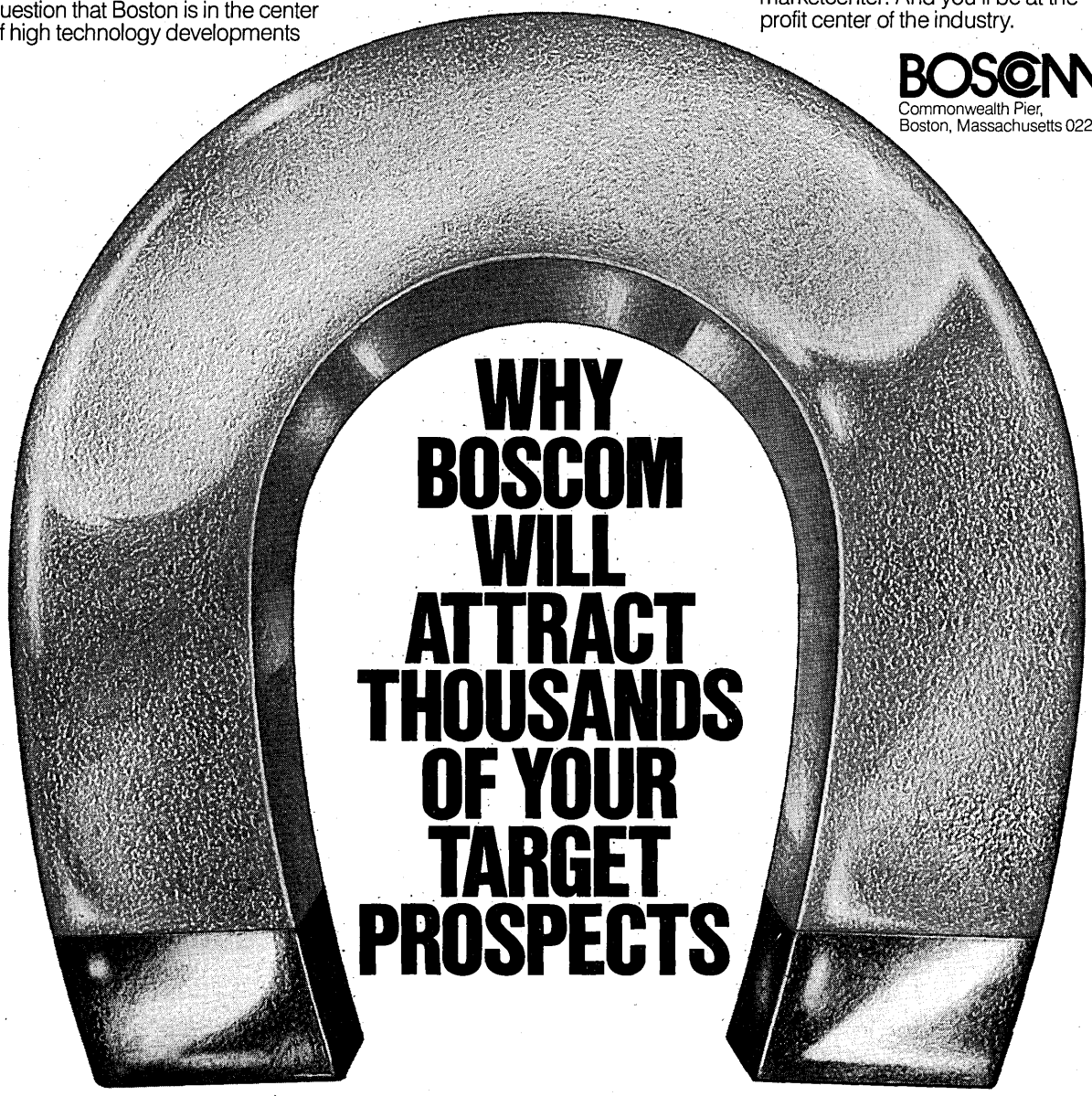

CIRCLE 46 ON READER CARD

been into home banking since 1973. The company was started that year to provide home banking via telephone with a service called Pay-By-Phone. "We thought it would take off in two to four years but we made big mistakes. We made it too complicated." Initially, the service allowed customers to handle a variety of trasactions via Touch-Tone phones. When it was scaled back to bill paying only, it gained acceptance. He sees home banking by terminals or pcs as being in a position now of having to proceed a step at a time. "It took 16 to 17 years for consumers to accept ATMs and 25 years for extensive use of credit cards."

It all boils down to selling consumers on the idea, agree watchers and providers of home banking. "You want to make them feel comfortable," says Thacker, who before starting his own company directed electronic banking services for the Bank of Montreal, the only non-U.S. bank in HBI. B of M started a Branch of the Future one and a half years ago; it is constantly updated with new technologies, and customers can come in and play with them. Basically, it's Telidon (the Canadian videotex technology on which NAPLPS is based) married to videodisk. The bank uses a controller manufactured by Pearl Systems, Toronto, to enable its mainframe to talk to videotex terminals. Thacker has high praise for these.

Chemical Bank in early summer was sending out free demonstration diskettes to owners of IBM, Apple, Commodore, and Compaq personal computers so they could become familiar with Pronto's services. Forbes says Chemical could make these demo diskettes available for licensees for their own promotion.

He said in late June that Pronto was being used in 7,500 to 8,000 households in the New York Metropolitan area, "which translates to 11,000 to 12,000 people."

"California's about the best market for pcs. Try New Orleans and you'd be lucky to find five."

Bank of America, the other early leader, had signed up 2,000 customers by June 15 and was looking for 25,000 by year-end. Unlike Chemical, B of A has only financial services, and while it is evaluating other offerings on a continual basis, no plans have been made to add on. Since it owns discount broker Charles Schwab, the opportunity to sell stocks by computer is obvious.

In southern Florida, the granddaddy of videotex services, Viewtron, which started as a test in 1980 and went commercial in 1982, is looking for 5,000 subscribers by the end of the year but, as Farnsworth points out, home banking is a relatively new component. Egner of Reistad/PSI estimates that only 1% of Viewtron subscribers use home banking. He is a subscriber and he does not. "I'd have to go into Miami to open an account to do that."

As for the differences in input devices, Phillips, who believes there always will be differences, says it's like automobiles. "Some people need big powerful cars and others, little sports jobs."

There are those who believe services tied to personal computers will find a geographic tie to their successes. Farnsworth feels B of A's success can be attributed in part to the proliferation of personal computers in California, particularly around Silicon Valley. Thacker notes: "California's about the best market for pcs. Try New Orleans, for example, and you'd be lucky to find five."

Another worry for pc-tied home banking services is the current downgrading by analysts of predictions for the home computer market. Banking isn't going to turn this around. "Nobody's going to buy a home computer just to do banking," says Thacker. ◉

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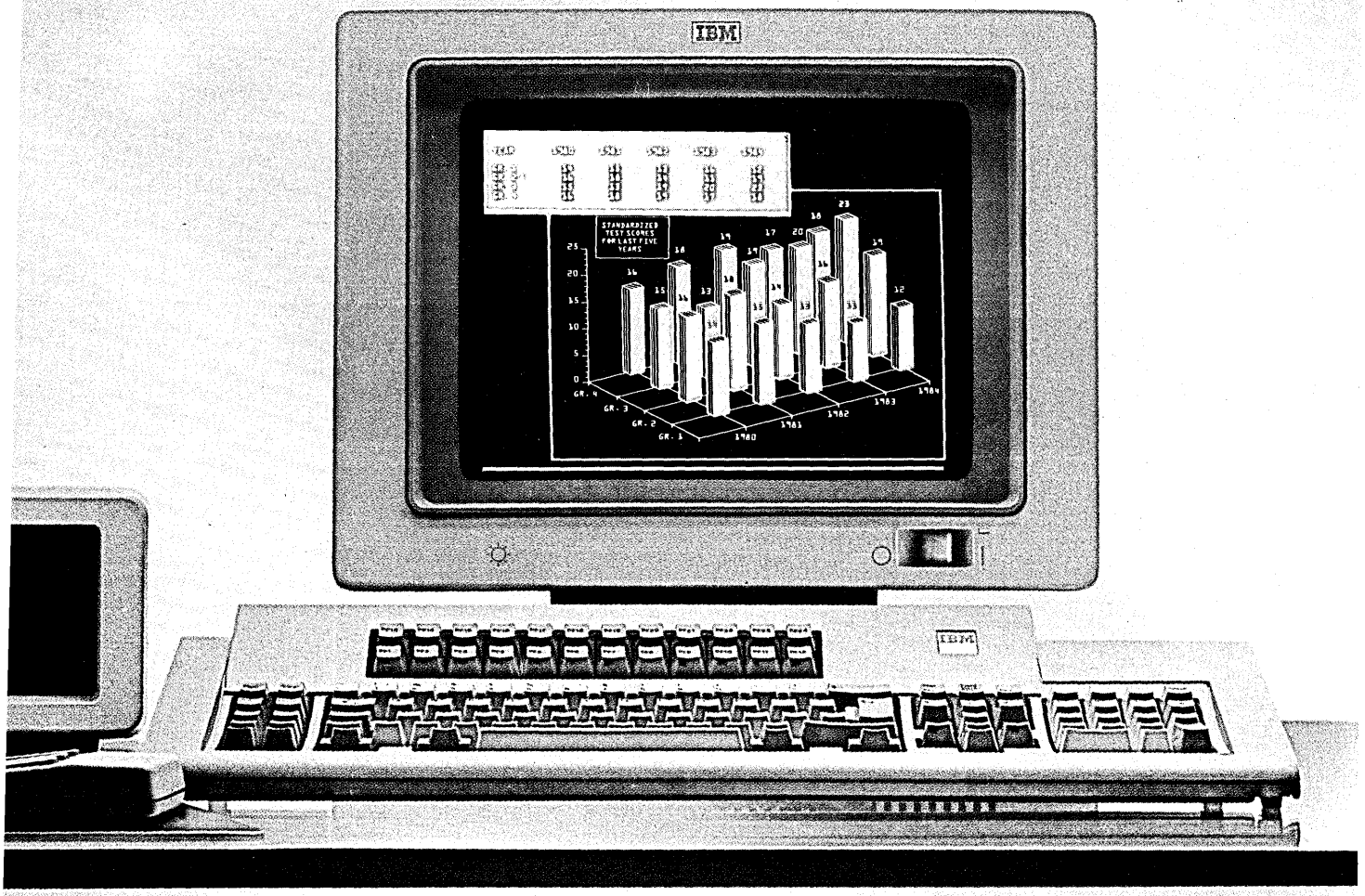

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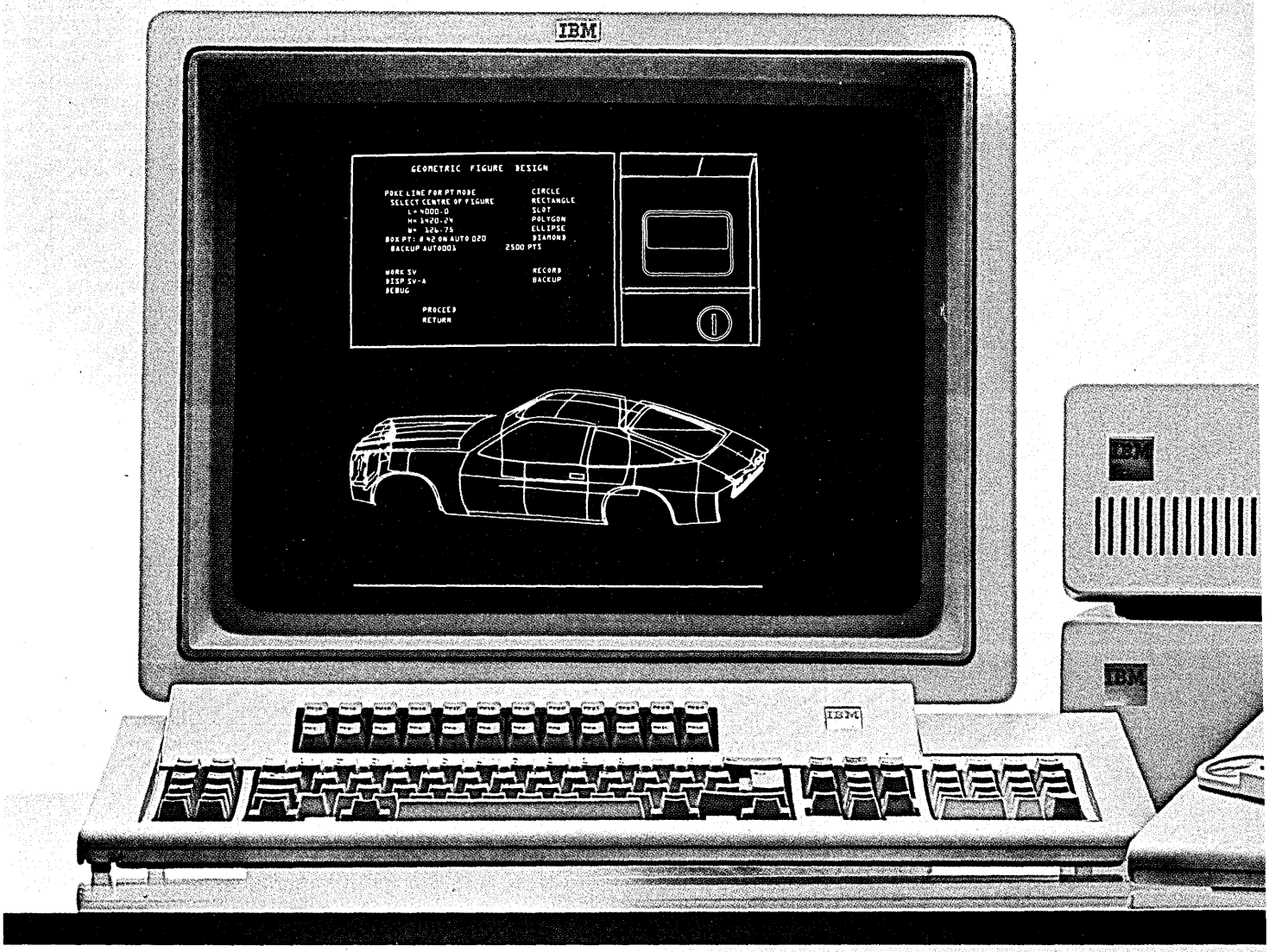

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NEWS IN PERSPECTIVE

ANTITRUST

UNDER THE GUN

Common Market officials are still watching IBM closely, although perhaps not close enough.

by Paul Tate and John Verity

The European Commission is still investigating IBM despite the withdrawal last month of its accusations that the company abused a dominant position in the European market. The EC is now looking into the tightened source code policy IBM instituted in 1982 and into "other aspects of its conduct," confides an EC source.

The suspension of the four-year-old EC case took much heat off IBM, whose public relations people showed as much craftiness as its lawyers in the final days of negotiations, but the company is still under the gun. Not only is its source code policy being examined, but the currently suspended charges may be reopened at any time the commission finds it necessary.

IBM's controversial source code policy severely limits users' access to critical systems software such as teleprocessing monitors, database managers, and the MVS operating system itself. Users and independent software companies quickly raised their voices against the policy when it was introduced, claiming IBM's intention was to limit their ability to modify key control programs to their own needs. The policy, they insisted, unfairly limited them from using hard-earned expertise with the MVS environment's intricacies. The IBM move was a not-so-subtle example of IBM rebundling its computer systems, the irate users and vendors charged (see "Plugging the Mole Holes," May 1983, p. 56).

Bundling in all its forms remains a key focus of the continuing EC investigation, sources claim. While in the past IBM was accused in the U.S. and abroad of abusively tying software sales to hardware sales, it may now face charges of forcing users to buy certain software products in order to take full advantage of other, previously accessible software.

The source code investigation was prompted by complaints from ADAPSO and other manufacturers, an EC member says. IBM for its part told the EC it wanted to keep the source code to itself to ensure that any changes it wanted to make could be made to all users' programs. The EC member conceded that in some cases IBM is justified in keeping the source code to itself, but said that the EC believes IBM has been too restrictive in its current source code policy. A more open operating system could achieve the same goals as IBM's current policy, he added.

Another possible area of current EC investigation is the effect that IBM's statements of long-term direction have on competitors. Some observers are concerned that such statements tend to freeze the market until competitors can see what IBM is developing.

The EC is also concerned, some observers say, with potentially explosive suggestions that IBM gives preferential treatment to certain customers when rolling out new products. In this scenario, IBM is said to hold open new product customer delivery slots that are vacated by canceled orders, and then offer them to customers farther down the list who are considering a PCM purchase.

But must IBM really care about the EC's doings now? The basis of last month's limited settlement was an "undertaking" from IBM that is very general and imposes few firm restrictions on the company. IBM says specifically it admits nothing by agreeing to the settlement and has outwardly acted as if nothing significant has changed.

Bundling in all its forms is a key focus of the EC's ongoing investigation.

Just as important, IBM the premier multinational has once again shown its determination to do whatever it takes to prevail. Using many of the same obfuscatory tactics it practiced on the U.S. Justice Department for 13 years, IBM played for the hearts and minds of its European adversaries. While snowing underfunded EC investigators with reams of documents, the company used direct lobbying assistance from high officials in the Reagan Administration and polished a homegrown image in each EC member country. As if to warn off any other bodies, national or supranational, considering moves against its market dominance, IBM made sure its corporate musculature was well appreciated.

Interestingly, at just about the same time that IBM made its "voluntary" move to provide interface specs and unbundle main memory, it was quietly negotiating to participate in the EC-sponsored Esprit advanced computer research project. Two U.S. companies, IBM and ITT, are expected this month to be named as participants in Esprit, on which are placed hopes for the improvement of Europe's standing in the global computing market-

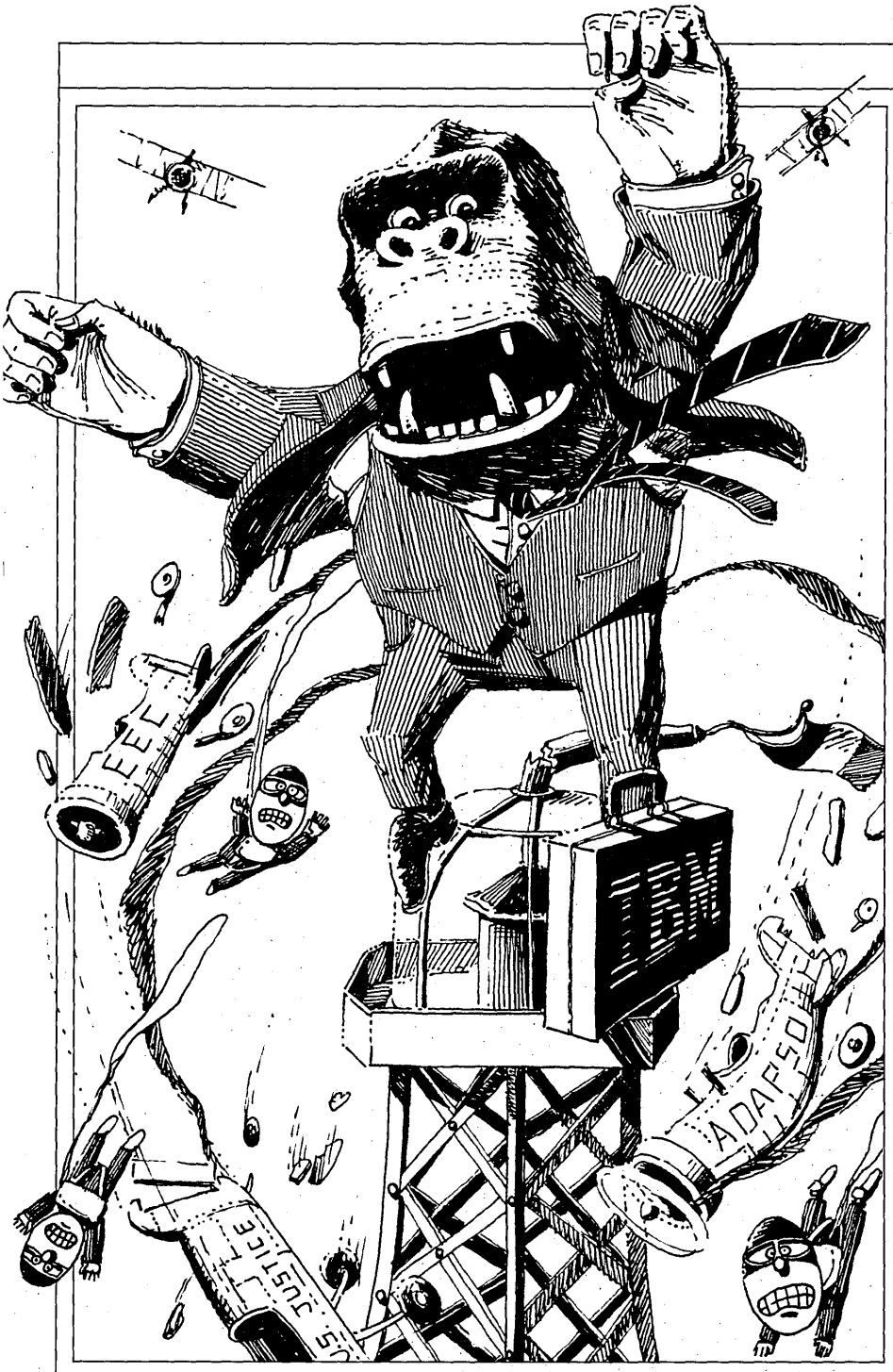

ILLUSTRATION BY JAMES R. JONES

place. According to informed sources, opening the door to IBM, even with its 100,000 or so employees and a dozen research labs in Europe, is a controversial development (see Look Ahead, Aug. 15, p. 13).

The industry giant was nevertheless obviously relieved to get the EC off its back for a while, and played its agreement with the commission very low-key. "The understanding satisfies the commission's desires and puts the matter behind us without requiring us to make significant changes in how we do business," IBM chairman John Opel said in a tersely worded press release. (IBM Europe had no comment on the EC settlement.)

In fact, some argue, the actions IBM is to take will do the company much good. "IBM has placated the EC and ended up agreeing to very little," says one large French user. "It will mean IBM is more open on interfaces, but all that will do is to aid IBM in establishing de facto standards."

That attitude seems as widespread in Europe as in New York where the company's share price took a good-sized aump on the stock exchange right after the announcement in Brussels that IBM would change its ways only so slightly. If such a reaction is the main result of the 10-year-old EC investigation, IBM has little to fear, and much to anticipate.

Naturally, the EC doesn't see it that way. Frans Andriessen, EC commissioner for competition, says he thinks the settlement was significant. He stated at the time of the announcement in Brussels that IBM had, in fact, agreed to "change its business practices" in Europe and that as a result the "European industry now has a chance to increase its share of the market." IBM held 65% of the $5.4 billion European market for large-scale mainframes last year, having shipped $3.5 billion, according to International Data Corp., a market researcher in Framingham, Mass.

Andriessen adds, however, that "there are no victors or vanquished in this case. . . . We have found a solution which we believe will enable what we consider to be acceptable, responsible market behavior."

"It will mean IBM is more open on interfaces, but all that will do is aid it in establishing de facto standards."

Certainly the EC feels it has achieved more than the U.S. Justice Department in wringing some concessions out of IBM, and it has left itself free to step up pressure on IBM if it wants. In a letter to IBM's chief lawyer Nicholas deB. Katzenbach, Andriessen pointed out that the case is only "suspended" and can be reinstated if IBM doesn't abide by both the letter and spirit of its agreement. What's more, wrote Andriessen, the settlement does not preclude the EC from "initiating a new proceeding in respect of IBM's conduct." The letter specifically notes that the EC does not accept IBM's exclusion of source code from the settlement and will continue to investigate the firm's source code policy.

One of the EC's directors for competition, John Ferry, who is party to the continuing investigations (including those into the source code issue), adds that the EC "can still take further action, and if necessary we will."

In practical terms, however, the settlement means that IBM has got itself off the EC hook quite easily. The commission has made some hefty concessions after six years of investigation and four years of formal legal wrangling (see box).

The long-standing EC case, designed to give competitors supplying compatible products an earlier chance at selling to the huge IBM installed base, was finally whittled down to two main points: the disclosure of interface information and unbundling of main memory on cpus.

The EC's requirements of IBM are good only until 1990, and beginning 1989 IBM must notify the EC a year before it intends to pull out of the deal. The docu-

NEWS IN PERSPECTIVE

BRITISH SNA NET

As IBM was settling its affairs with the EEC, European supporters of the OSI networking model suffered a setback with the news that IBM has teamed up with British Telecom, Britain's PTT, to develop an SNA-based value-added network.

The move has infuriated British computer maker ICL, which only recently concluded a deal with AT&T to build a similar network (see "British VAN Plans," July 1, p. 38). ICL's network, which is to use AT&T switching equipment, is based on OSI (open systems interconnect) standards. OSI is a seven-layer networking protocol put forth by the ISO for attaching dissimilar computers. It is seen as a European-backed attempt to dodge IBM's SNA scheme and create a standard backed by many vendors.

ICL says it would oppose British Telecom's application to the British Department of Trade and Industry for a license to run the network on the grounds of unfair competition. A license application is not expected from British Telecom until the final shape of the service is decided on this fall.

"British Telecom is a common carrier and this added-value network will create a monopoly," was the final reaction of Chris Gent, ICL's divisional director for network services. "I hope there is going to be an outcry," he added. AT&T was in no mood to comment after claiming that its deal with ICL was a significant step forward for the OSI camp.

British Telecom and IBM plan to set up a national data network management service centered on IBM's service bureau in Warwick, England. The service would provide security, customer access control, service level monitoring, and accounting for U.K. users who want to set up their own networks. Additional network applications like electronic mailboxes and database access will also be offered. The service will be run by a separate organization funded equally by British Telecom and IBM.

Simultaneous with the IBM deal, British Telecom announced a $70 million expansion of its existing packet switched network using the OSI standards. British Telecom promised to enhance the service, which has not proved a runaway success. Users have condemned it for being too expensive and too complicated to use. British Telecom has some 1,000 on-line and 3,000 dial-up customers for the service, which has been running since 1975.

Ron Back, managing director of British Telecom's national network services, explained at the launch why British Telecom was backing two standards horses. "SNA is more developed than OSI," he said. "If SNA and OSI developed separately then value-added networks will have to be developed for one standard or another." Back went on to explain that British Telecom planned to build a bridge between the IBM SNA network and circuit-switched or packet-switched networks based on the OSI model. "This will greatly add to the prospect of the two 'languages' moving together," he said.

An IBM spokesman, however, was quick to emphasize IBM's commitment to SNA. "We have supported OSI since the early days of 1977. SNA is and will remain the direction we are taking with our products. There is a long way for open systems interconnection to go yet."

A recent study carried out by British research firm Langton points to some resistance in the U.K. to the idea of SNA-based value-added networks. After polling 31 large users, Langton concluded that 60% favored a public interconnect service based on OSI standards. About a third of the users polled were IBM shops.

"SNA is seen by some as a moving target," says the Langton report, "which will develop in line with IBM products rather than market needs. If the primary method of interconnection [in a public service] is based on SNA, many users would be concerned that IBM might inhibit any further enhancements to the service which were not in IBM's interests."

A more typical reaction to the news of a public network based on SNA comes from Bob Bramley, managing director of Allied Breweries Management Services in England. "It's a good move," says Bramley, "although in one sense such a network is a solution chasing a problem. An awful lot of companies already have their own networks set up, so it's probably more advantageous to the smaller companies."

On the OSI vs. SNA issue Bramley sees no contest. "It's typical of the dp industry that instead of operating under the constraints of the present, it is looking for a panacea for the future," he comments. "Why should IBM change? Those who want a worldwide architecture [like OSI] are whistling in the wind."

Bramley, like most large IBM users, insists that all systems come in to his IBM central site under SNA—and IBM seems well set to cash in on such customer loyalty throughout Europe. The company has already forged links with the West German Bundespost, for which it is developing a videotex system, and is expected to strike deals with other countries for various networking projects. Sources indicate that STET, Italy's PTT, is close to signing IBM on as a partner in some sort of hardware marketing venture. In addition, the company is already well entrenched in the Japanese networking market.

All this leaves European companies like ICL fuming. "It really is a joke for British Telecom to get up and say it has an arm's length relationship with IBM," says Gent. "British Telecom is building on its general networking with SNA."

British Telecom's Back is at pains to point out that the investment in the SNA network, described as amounting to tens of thousands of pounds, will be matched by investment in the PTT's OSI network. He says British Telecom had opted for SNA because "value-added networks will only flourish if they can be developed economically."

He points out that by 1986 there should be 1,000 local access points for the OSI packet network in business centers throughout Britain, installed at a cost of $112 million. This, he says, would help stem the import of information technology products into Britain.

—John Lamb

ment covers System/370 products such as the 43XX, 303X, 308X families, but not the increasingly important System/36 and 38, Series/1, 8100, and Personal Computer lines. The PC XT/370 is included in the document only if it is used as a terminal to the covered mainframes, but an IBM Europe spokesman concedes that virtually every XT/370 is used for that purpose.

Under the settlement IBM has agreed that:

- It will say whether there are new interfaces involved when a System/370 product is introduced.
- It will supply, on request, hardware-hardware and hardware-software interface information on the new product within four months (the EC had originally been seeking to have that delay be as little as 30 days) or at the time of general availability, whichever comes first. This would apply to the EC wherever IBM decides to launch a product, so there will be no transatlantic delay.

These are no great problems for IBM, observers say. The company currently supplies the necessary interface documentation after about seven months, although in some cases the delay has been as long as two years. Effectively, it means IBM will have to get its documentation act together. A Europe-based executive will be appointed by IBM to handle the requests for information.

- IBM will supply software-software interface information when "the interface has become reasonably stable," which essentially leaves the ball in IBM's court.
- The same disclosure rules will apply to SNA, the mainframe-based networking scheme that is becoming increasingly im-

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NEWS IN PERSPECTIVE

WHO WON?

The European Commission first disclosed its investigation of IBM for possible "abuse of a dominant market position" in June 1973. The trigger for the investigation was IBM's Project Smash, the August 1972 introductions of the 370/158 and 168 mainframes, which obsoleted prematurely the 2-year-old models 155 and 165.

It looked to every competent industry observer of the time that the 158 and 168, despite their virtual memory, were not really new processors, but just 155 and 165 machines with bundled semiconductor memory and base prices that had been hiked to make up for the lower cost of memory increments. To the trained eye, in fact, it looked like IBM's motive with the new configurations and pricing structure was to soundly smash the plug-compatible memory suppliers.

Why did it take so long for a conclusion of the investigation? And why is the final settlement concerned with quite different issues? The EC, even more than the U.S. Department of Justice, is perpetually short of money and was able to assign only one inspector to the case. Even assisted by outside professional consultants, it took that inspector until 1976 to establish proof that there was a case to be pursued in the pcm memory issue. At this point, EC regulations demanded that the case be handed over to the legal department of the directorate-general for competition. They decided that if the EC was going to have to fight with IBM, it should be on broader issues than just main memory bundling, and a wider investigation of IBM business practices began. The following year, the EC received three official complaints:

- from Itel Corp., on IBM's refusal to let Itel AS users have its IPOs (installation productivity options, which make it easier to SYSGEN an MVS environment);
- from Amdahl Corp., on IBM's refusal to supply details of changes to its 370 instruction set at the time the 3033 and MVS/SE introductions were made in March 1977;
- from Memorex, on IBM's refusal to supply details of changes to its 370 channel-to-controller and controller-to-device interfaces at the time of announcement of new disk or memory subsystems using the changed interfaces.

In addition, the EC solicitors felt that if IBM was going to be nailed on memory bundling, they should also object to the bundling of operating systems and other systems software. There were thus now four issues at stake with IBM instead of one.

The EC could only object to IBM marketing practices, however, if it could establish that IBM was a dominant firm in the dp industry. Dominance by itself is not an offense under the Treaty of Rome, but abuse of dominance is, and amongst the abuses specifically listed in the treaty is "making the sale of one product dependent on the sale of another." That is, in the case of IBM, the bundling of memory and operating systems. A series of market surveys had to be commissioned to prove the fact of IBM's dominance, which explains why the EC directorate for competition was only able to publish officially its "statement of objections" to IBM marketing practices in December 1980.

Most of 1981 was taken up by IBM legal maneuvers before the European Court of Justice to get it to establish that the commission was acting ultra vires. IBM lost and was told to go through the procedure of trying to convince the commission.

There were two hearings, the first in February 1982, on the EC objections to IBM marketing practices. IBM tried without success to intimidate the EC officials with the weight of the legal talent and the expert witnesses they wheeled out.

The second, in June 1983, centered on the EC's proposed remedies. IBM was much more conciliatory, and the technicalities of interface disclosure were discussed in a more relaxed and friendly atmosphere.

In the meantime, IBM had already settled the IPO issue with National Advanced Systems (heir to Itel), and had unbundled its operating systems of its own volition. The pcm memory industry—for whose sake the investigation had originally started—had long since died, evidently because of aggressive price-cutting by IBM. This left only the issue of changes to the System/370 architectural and software-to-software interfaces, on which the EC and IBM announced their agreement to compromise Aug. 2.

The interface disclosure statement will make it only marginally easier for manufacturers of plug-compatible processor, peripheral subsystems, and system software suppliers to develop and deliver earlier their compatible equivalents of IBM's latest gear, as well as to adapt them to major new IBM operating system releases. Since all the PCM hardware manufacturers build their equipment in the U.S. or Japan, whereas IBM produces 90% of its hardware for the European market in Europe itself, IBM has long been puzzled over why the EC directorate for competition should be so concerned about the interface issue. The answer is that the directorate's task is to look after consumers rather than producers.

Of greater interest to European computer manufacturers and software houses is IBM's promise to also reveal software interfaces, notably concerning the SNA networking scheme. The terms of the settlement will make it easier for the independents to connect their own terminal systems and applications software to SNA networks, and thus make SNA a more open system architecture. Since this, however, will help SNA rather than the OSI model become the de facto network standard in Europe, it is as much in IBM's interest as in its competitors'.

Who, then, has won? The EC has established—de facto, if not de jure, which could only have been done by the European court—that IBM is not a law unto itself, but is subject to the regulation of its market by public authorities, at least in Europe. It hopes this will act as a brake against any predatory instincts within IBM, and reduce the effectiveness of the so-called FUD factor (for fear, uncertainty, and doubt) in the activities of individual IBM salesmen.

IBM has avoided a court case before the European court—one which might have ruled that IBM is a dominant firm within the dp industry. If the court had so ruled, it would have laid the corporation open to an unending string of suits for damages from users who consider themselves overcharged in the past.

—Fred Lamond

portant to multinational corporations as a way of tying different computers together. IBM says it will publish extensive information regarding SNA formats and protocols, and will add to those details for products using enhancements to SNA. Specifically, IBM would commit a format and protocol manual for Logical Unit 6.2 attachments by the end of 1984 and a services description manual within 60 days.

This openness over SNA is clearly in IBM's own interest, observers point out, as it will make it easier for competitors to design products to fit into SNA, and this will help the scheme establish itself as a de facto standard.

Many small computer families were excluded from IBM's agreement with the EC.

- System/370 processors are to be offered in EC countries without bundled main memory. Again, this is not expected to have much effect on IBM's business, or that of competitive suppliers, as memory is so cheap these days. There is little incentive to get into the add-on memory market, but if a memory price war does ensue, IBM is evidently in a position to undersell virtually any competitor.

All these actions by IBM take place with the company asserting that it retains

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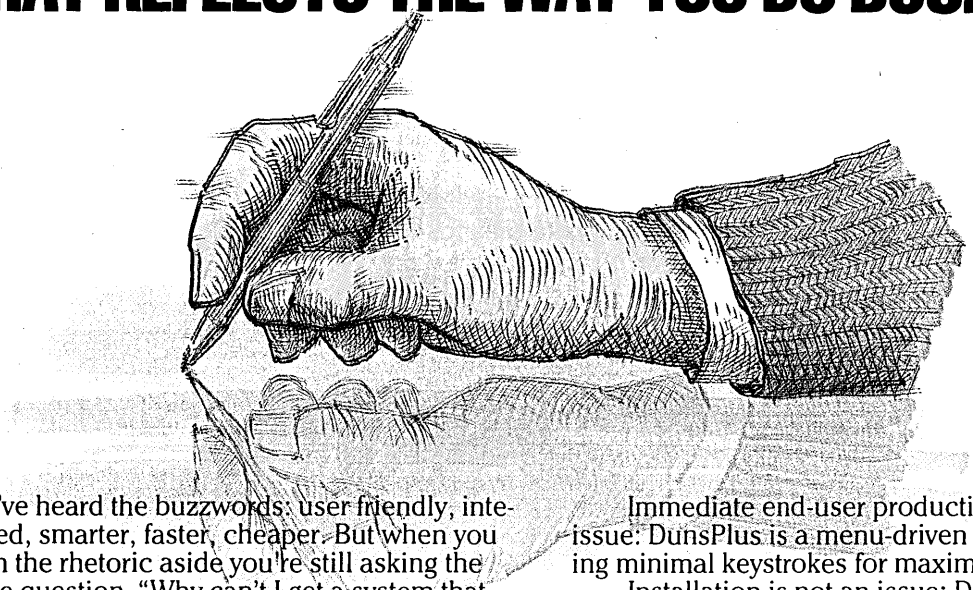

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the right to withhold what it considers proprietary design information, including source code. It will also charge nominal fees for provision of interface specs, and any competitor requesting information must be prepared to disclose similar information of its products to IBM.

"That," mumbled one observer about the mutual disclosure rule, "is a very good deal [for IBM]." But it is not the company's only gain. Also, by heading off the EC case in this way, the company has avoided a legal finding in a high EC court that it is truly dominant and has abused that position. A ruling like that could have resulted in fistfuls of lawsuits from European users demanding compensation for alleged past overcharging. "And it could have opened up a whole new can of worms in the U.S.," adds the EC's Ferry, referring to potential actions by the U.S. Justice Department.

But for all the talk of a washout of the EC case, IBM has shown that it is prepared to buckle under, ever so slightly, to the EC's pressure in order to protect its crucial standing in the European market. With the new investigations going on, IBM is not out of the woods yet. If the EC and industry monitors find IBM is not true to its word, there is the possibility of a reinstatement of the long-standing case.

Plug-compatible manufacturers tried to make the most of the happenings in Brussels, claiming that the new interface disclosure schedules would speed their competitive products to market and therefore provide users with increased bang for their buck. "We are delighted," says a spokeswoman for Amdahl Corp., Sunnyvale, Calif. "This [agreement] will open up competition on a product-by-product basis rather than on the systems level. It will mean more competition at the front end of the product cycle."

Pcms tried to make the most of the happenings in Brussels, saying that the ruling would speed their competing products to market and provide users with increased bang for their buck.

She claims that had IBM followed its new agreement when introducing the 31-bit addressing Extended Architecture (XA) to the world in October 1981, Amdahl would have had XA specs in its hands as early as February 1982, 14 months ahead of when it actually saw them. "This is the first time a governing body has accomplished something [against IBM]," she states.

A spokesman at National Advanced Systems, which sells Hitachi 370-compatible mainframes, says IBM's new ground rules would "clarify previously inconsistent policies" regarding release of interface specs and would make the timing of such releases more "predictable."

Not necessarily, suggest some market analysts. While it has agreed to make specs available on a timely basis, IBM may find new ways of keeping off balance annoying pcms and software makers. One such tactic might be to bundle product introductions together rather than make them one by one as is often done now. The object would be to confuse the marketplace by overwhelming it periodically with large batches of new products.

For its part, the EC can at least congratulate itself on crossing an important legal threshold. That was what one of the EC lawyers was doing as he sat contentedly in his Brussels office on the wet August afternoon following the long-awaited settlement. He had been working on the IBM case for eight years and across the room stood a flipchart with large blue letters scrawled across it saying, "Bye Bye Big Blue, 1/8/84."

"Even I have to admit it's a little premature," he said—but he couldn't hide a satisfied grin. ◉

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NEWS IN PERSPECTIVE

EXPORTS

EAA BOGGED DOWN

A year later, the Export Administration Act is still not law.

by Willie Schatz

The Export Administration Act (EAA) was going to be the 98th Congress's crowning achievement of bipartisan trade policy. So much for promises. For a year, it's been all show and no go.

A week before its August recess, the House told the Senate it had nothing more to talk about concerning the EAA. Barring a very sudden thaw in the icy Capitol Hill weather, it is highly unlikely that there will be a new version of the EAA, which expired last Sept. 30.

"It doesn't appear a workable bill will happen," a Department of Commerce (DOC) source says. "There's a real feeling of pessimism. The House has caved in completely to Sen. Garn's national security requirements. The House has gone 9 yards and 35 inches. Garn is trying to get the extra inches."

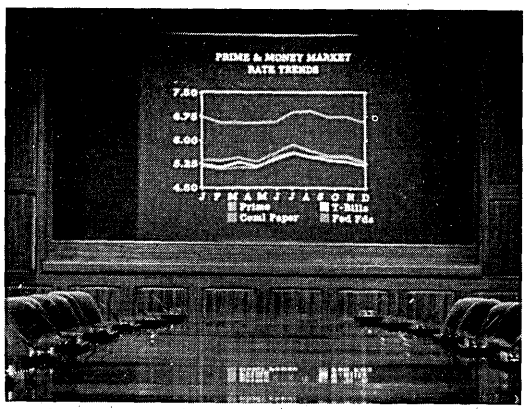
"The Senate has been greedy, overbearing, and obnoxious," says an attorney for a leading computer trade association. "Their counteroffers to the House have been absolutely ludicrous. They're playing a dangerous game with [section] 10g. Their greed in that area may bring the whole bill down. And from industry's standpoint, that may not be the worst thing in the world. Some of us are in a position now where we'd almost rather have no bill than some of the things we've seen floating around Capitol Hill."

You remember section 10g. That's the one that allows the Department of Defense (DOD) to see almost anything it wants before it leaves the U.S. All the other parties involved in this ongoing saga—the business community, the Department of Commerce, and the administration—think the shipment's level of technology should have something to do with whether either DOD or DOC should take a peek at all. But with DOD, it's look first and ask questions later.

That philosophy has led to the struggle between DOD and DOC for the hearts and minds of the House and Senate. The latest shot in that war was fired by none other than White House chief of staff James Baker. In mid-July he wrote a letter to Sen. Garn reminding him that President Reagan thought the problem had been settled by his March 16 National Security Decision Directive. Baker's letter followed one from Defense Secretary Caspar Weinberger to Garn in which Weinberger said DOD "must review cases" involving what it deems strategic materials and technology even when being sold to CoCom countries. Baker's letter was seen as a rebuke to Weinberger for bypassing the chain of command.

"In recent weeks, the conferees have sought to negotiate a compromise which, among other matters, delineates the roles of the Departments of Commerce, Defense, and Treasury in the implementation of the EAA," Baker wrote. "The specific issue of DOD licensing review and export control enforcement was considered personally by the President as recently as March 1984, at which time he issued an interagency directive. "The President administratively defined responsibilities and authorities while indi-

The latest shot was fired by none other than White House chief of staff James Baker.



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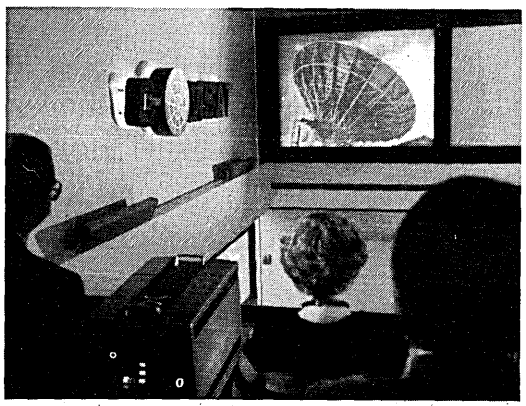

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CIRCLE 52 ON READER CARD

cating his opposition to the inclusion of any statutory change in authoritites in the pending EAA legislation," Baker wrote. "The President stands by these decisions. We respectfully request that the Congress give due consideration to the administration's views on this matter."

At least half of Congress indicated it might do that. Rep. Don Bonker (D-Wash.), chairman of the House Subcommittee on International Economic Policy and Trade and purportedly industry's best friend in a high place, wrote back to Baker and told him he agreed completely with his views. Thus the worst of enemies had become the best of friends. Politics does indeed make strange bedfellows.

"In our discussions with the Senate, the House conferees repeatedly offered to delete virtually all language that would further delineate Commerce, Defense, and Treasury Department roles, leaving those matters to administrative discretion under provisions of the current act," Bonker wrote. "It has been at Senate insistence that House conferees agreed to the compromise language on agency responsibilities and import controls. It remains our preferred position, consistent with the views of the administration, to remove the provisions you cite, and we are ready to vote accordingly at any such time as the Senate might be prepared to alter its position."

Aye, there's the rub. The Senate was proving a mighty immovable object. If not after Baker's letter, then when? According to informed sources, not until Garn received a phone call from Reagan. And even then he might not be moved.

"Sen. Garn is not necessarily a fan of the administration's handling of export licenses in the past," explains Rep. Ed Zschau (R-Calif.), the former Silicon Valley executive who has been instrumental in fashioning several of the attempted compromises that have flown back and forth across Capitol Hill. "What one branch suggests is not necessarily what another automatically follows."

The EAA isn't going to be high on the must-do list in September.

"I think the reason Garn ignored the letter is that he considers it part of the turf battle between DOD and DOC," says Hugh Donaghue, Control Data's vice president of government programs and international trade relations. "He doesn't seem to think it has any substance. We're now at the point where political considerations are overshadowing substantive ones."

And looming over all this is the calendar. Congress reconvenes Sept. 3 after the Republican convention, and takes off for the rest of the year on Oct. 5, when the members go home to try to ensure they'll be back in 1985. The EAA won't be high on the must-do list for September.

Besides, there aren't many alternatives left. The Business Coalition for the EAA, the high-tech industry's only unified voice on Capitol Hill, has gone about as far as it can go. In many ways, the industry is locked in the middle, which is the last place it wants to be. It loves the House version of national security, but hates its contract sanctity provisions, which list four occasions under which the President could abrogate a contract. The Senate's version says a contract is a contract is a contract. Conversely, the Senate's national security language makes the high-tech industry gag. As much as the industry likes new provisions in the approved amendments, such as the comprehensive operations license, chances are it will try to kill any bill containing section 10g before it reaches the floor.

Should that occur, Congress could fill the ensuing void by extending the present law. But both Bonker and Garn have indicated they won't do that, which means the administration would be

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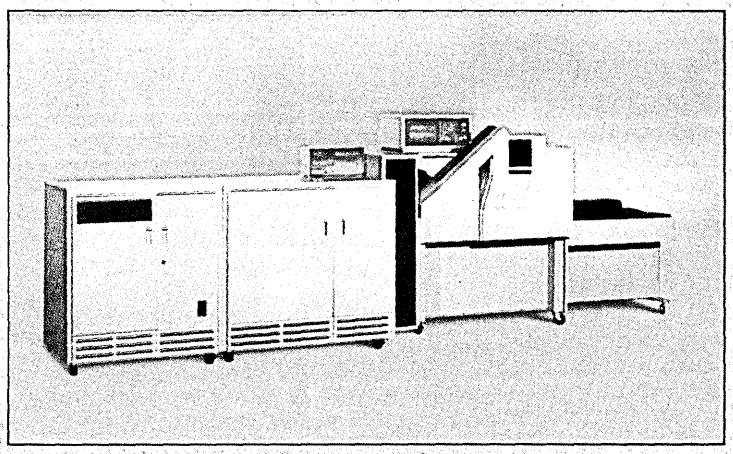

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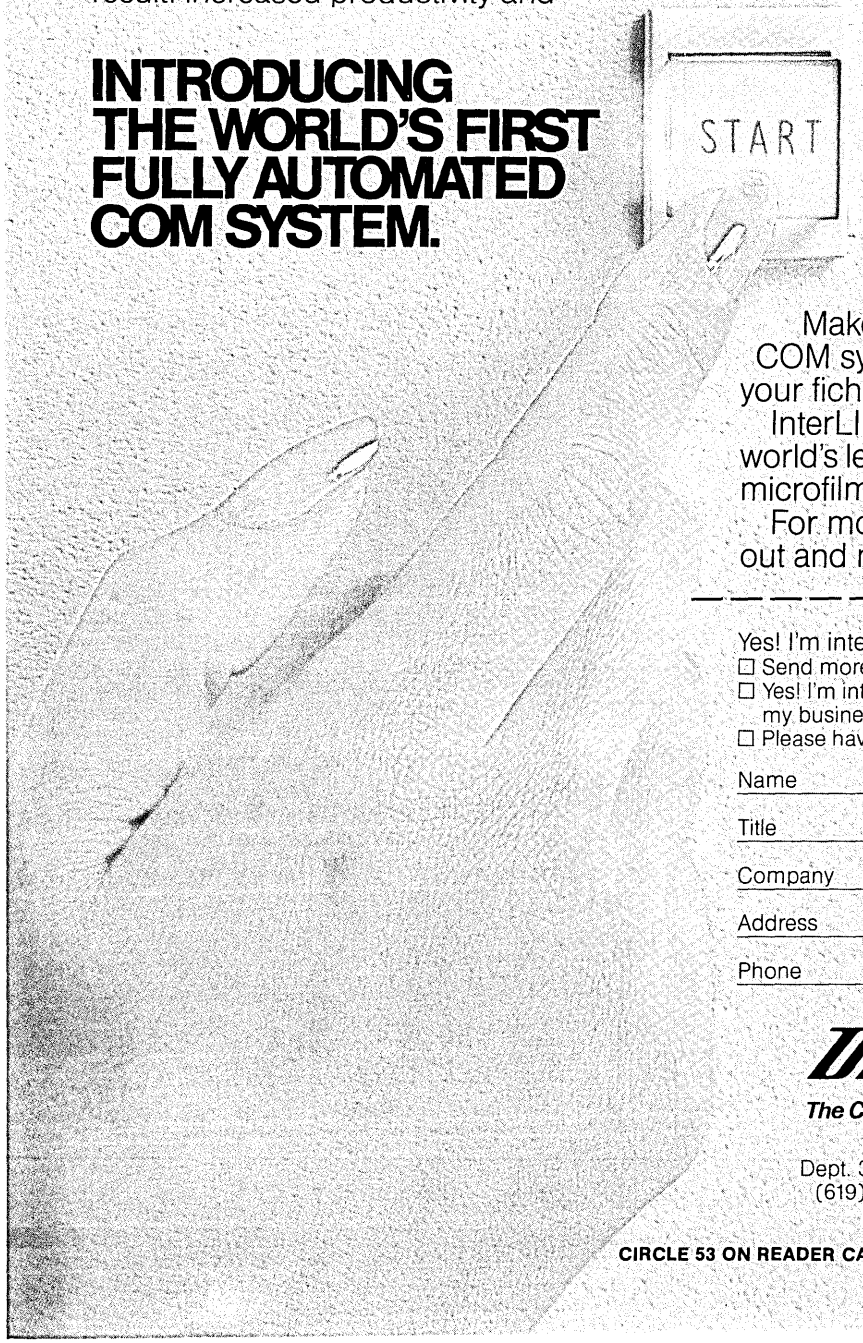

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CIRCLE 55 ON READER CARD

forced to rely on the International Economic Emergency Powers Act (IEEPA) to retain its authority to institute export controls. It's been living off the act for the past 11 months, but the IEEPA has been challenged in a Seattle lawsuit and its constitutionality is open to question.

DOC, on the other hand, has indicated it prefers a two-year extension of the present law. Permitting further DOD involvement in the licensing process is anathema to Commerce Secretary Malcolm Balridge, and informed sources say he'd rather see the bill die than give DOD one more license category to inspect.

Even on the single occasion when DOD and business actually agreed on something, it's been shot down. Business proposed a fast-track system for CoCom exports, under which all CoCom cases would be processed in 15 days, including DOD review where authorized. DOD would retain the right to ask for an additional 15 days to investigate, but that would be it. All CoCom cases would thus be processed in 30 days.

"Our whole relationship with the business community has been a series of ups and downs," a DOC source admits. "They want us to help them, but they don't want to help us."

"If DOC had waded in early and made their position clear, the business community would have been much more supportive," CDC's Donaghue counters. "We got no support from them, then all of a sudden they turn around and say they need our help on 10g."

"The whole bill is going in a negative direction for business," an experienced EAA participant says. "When people realize that, they'll be less reluctant to try to pull the plug before the bill reaches the floor. If we can't do that, a tolerably acceptable bill for industry is the best we can hope for." Even that may be asking too much. ◉

COCOM MAKES GOOD

The West has finally decided how to deal with computer exports to the East.

by Willie Schatz and Paul Tate

Coming soon to your neighborhood! The latest in transatlantic technology transfer! The scintillating story of how 15 countries got together to keep the Western world safe for technology!

That "CoCom: Two Years Before the Bargaining Table" has actually been released for public consumption is a small miracle in itself. The agreement by the hush-hush Paris-based Coordinating Committee for Multilateral Export Controls (CoCom) is the result of two years of mind-numbing negotiations by the 15 members—basically, the NATO countries plus Japan. The latest version finally revises CoCom's hopelessly outdated eight-year old embargo list for computers that can and cannot be exported to the Eastern Bloc nations. So beware, Eastern Bloc nations. The capitalists cometh, at least from Europe and Japan. The U.S. may show up later, if it does at all.

That 1976 list was technically dead shortly after its birth. CoCom members have spent the ensuing years arguing about revising it. It was essentially a 14-1 situation, as hawks from the U.S. Department of Defense (DOD) hankered to spread their restrictive wings over everything; the other CoCom members "generally lined up against them," confides one

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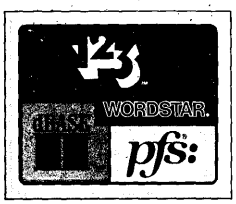

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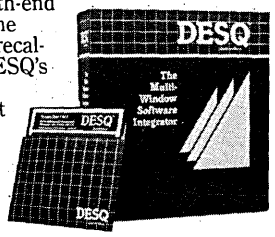

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CIRCLE 56 ON READER CARD

U.K. official involved in the CoCom negotiations.

DOD found plenty to crow about, nonetheless. Supposedly third in the U.S. pecking order, behind the Department of State and the Department of Commerce (DOC), which will have jurisdiction over the licenses mandated by the new agreement, DOD took the lead in the negotiations. It was the only one of the three agencies that had anything to say on the subject, even going so far as to call a press conference to trumpet its success.

"We think we did pretty well," says Stephen Bryen, deputy assistant secretary of defense for international economic trade and security policy. "We would have liked tighter controls on small computers. But now we have certainty and predictability. Industry has always been concerned about that. Now we've met their desire."

They may have met some of the Europeans' wishes as well.

"The end result is a realistic compromise," says a U.K trade official. "There was a fair degree of horse-trading going on. Significant improvements were made over the hard-line approach of the U.S., although some members still feel there is room for further relaxation of the controls."

Industry is completely cut out of the action and involvement.

"This is only one of a series of negotiations," adds a French official. "The details will have to be worked out over the next few months."

Indeed. Now that the politicians have finished, the technicians can start. They will have the unenviable task of refining the general agreement into specific regulations, a job which will last at least until September and may extend into January. And until DOC releases the ensuing regulations, no one is quite sure exactly what will be acceptable or unacceptable.

"Anybody who thinks they totally understand the CoCom agreement is crazy," William Archey, DOC assistant secretary for trade administration, told a recent meeting of computer industry execxutives. "There are one hell of a lot of unanswered questions."

"We're not sure what's been decided. Nobody knows what it means yet," says a government relations executive at a major computer company. "It's not perceived to be that sweeping. And if [assistant secretary of defense for international security policy] Richard Perle came out very happy with the results, that doesn't bode well for companies who want to expand trade."

For sure. But DOD should care? it hasn't exactly been a love story existence for DOD and the high-technology industry. The CoCom process, tortuous as it was, doesn't appear to have altered the two parties' states.

"We had extensive consultation and help from industry," Bryen contends. "I suspect they'll find this a good agreement, although I really wouldn't want to characterize the reaction of the computer community."

Most of industry's input came through the Computer Systems Technical Advisory Committee (CSTAC), an advisory group mandated by the Export Administration Act. The CSTAC's 13 government and 12 industry members are divided into hardware, foreign availability, and licensing procedures subcommittees.

"CSTAC was consulted from time to time on PDR [processing data rate] specifics, rotating mass storage questions, and software issues," says chairman Don Pederson, a consultant for Control Data. "We had no participation at CoCom. Some of the agreement's values are comfortable for us. Others are lower than we

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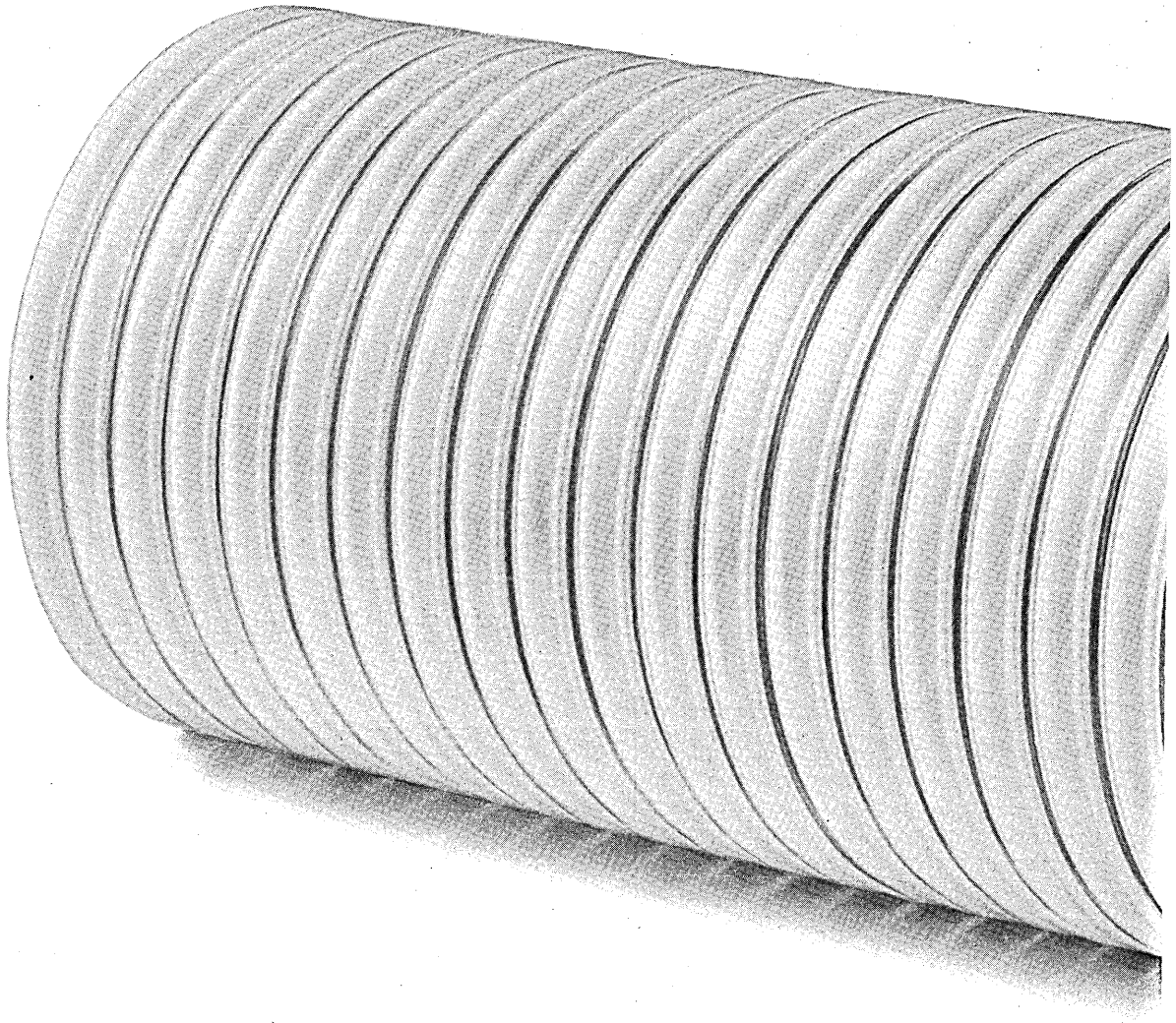

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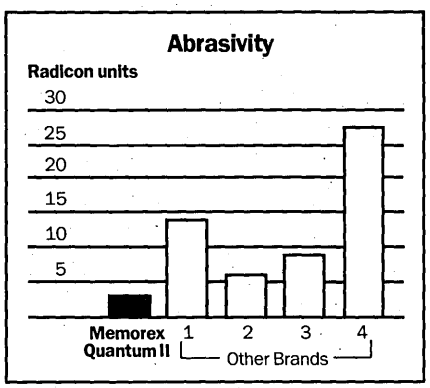

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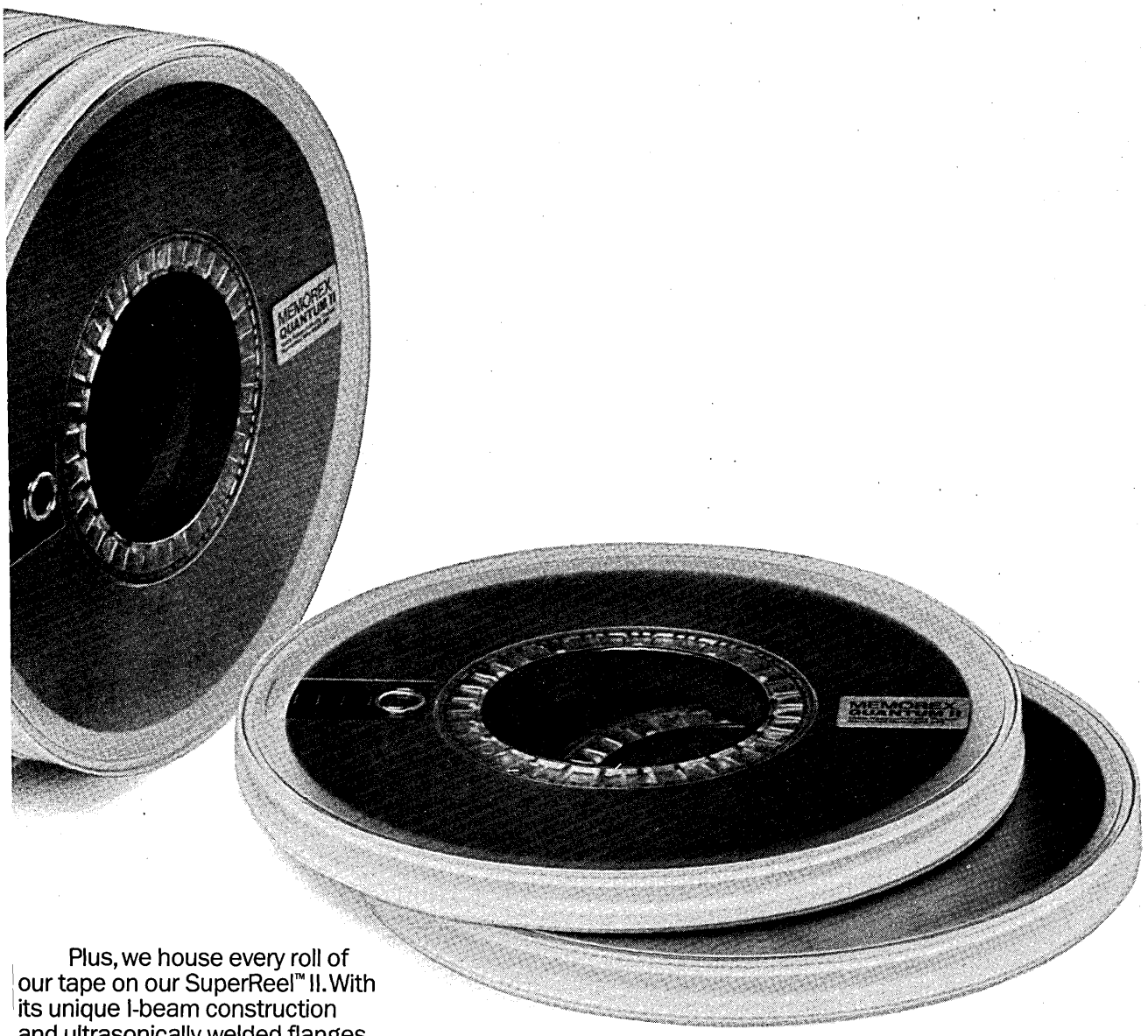

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CIRCLE 57 ON READER CARD

NEWS IN PERSPECTIVE

WHAT'S YOUR PDR?

CoCom has broken down the regulations covering computer hardware into four basic levels, each based on a processor performance measurement developed by Cocom and called the processing data rate (PDR).

The four levels are as follows:

1. *Free from control.* This designation applies to systems with a PDR under 2 and includes such machines as the 8-bit Apple II and Sinclair home computers. This type of machine may be sold in quantity to the Eastern Bloc without a license.

2. *National discretion.* This level has been considerably expanded by CoCom as part of the trade-off with the U.S. delegation and allows much more flexibility for individual member governments to make their own decisions about the granting of licenses. This level involves three different categories of licensing:

- Systems with a PDR between 2 and 5, which covers most 16-bit microcomputers. Licenses will be granted by national governments with a minimum of fuss.
- Systems with a PDR between 5 and 15, covering supermicros and minis. Licenses will be granted but more detail of the specific contracts must be submitted to make sure the end user is not the Red Army or some other banned organization.
- Systems with a PDR of between 15 and 28, covering systems in the IBM 4331 class. The government can still grant a license but must give advance warning of 30 days to CoCom before doing so. In this case, CoCom members could make objections but have no right of veto.

3. *Favorable consideration.* This covers systems with a PDR between 28 and 48, such as the IBM 4341. Licensing has to be checked out with CoCom, although as the category title suggests, these requests will be viewed "favorably" and no problems with other CoCom members are expected.

4. *General exceptions.* This involves systems with a PDR above 48, which are effectively prohibited from export to the Eastern Bloc. Licenses can be requested if there are unusual circumstances, but the case must have the unanimous approval of CoCom members.

CoCom's PDR measurement formula was devised to assess processing power across a wide range of machines, from micros to mainframes. It is essentially a function of the number of bits per instruction word, the number of bits in an operand, and the execution time of instructions. It encompasses both floating and fixed-point processing:

Fixed point cpus: PDR = (0.85A + 0.15B + 0.55D)/(0.85F + 0.15G)

Floating point cpus: PDR = (0.85A + 0.15C + 0.4D + 0.15E)/(0.85E + 0.09H + 0.06I)

The values of A, B, C, D, and E refer to the number of bits in a fixed-point add instruction, fixed-multiply instruction, floating-point instruction, fixed-point operand, and floating-point operand, respectively. The variables E, F, G, H, and I are the execution times of fixed-point add, fixed-point multiply, floating-point add, and floating-point multiply instructions, respectively. CoCom's final documents offer specific guidelines for measuring execution times consistently in different cpu architectures.

The PDR calculation is no passing bureaucratic whim. Every supplier will need to know the PDR of its products when selling them to the Eastern Bloc. As the Eastern markets open up to Western products, this technical grading is effectively the basis for a new processing currency giving a strategic technical value to computer and communication hardware products. As such, it lies at the heart of future East-West trade relations in many high-tech goods.

—P.T.

would have liked."

"Qualitatively, Bryen's statement is not incorrect," says Arnold Frutkin of Burroughs, chairman of CSTAC's licensing procedures subcommittee. "The negotiations were going on for a hell of a long time. There were discussions on a variety of subjects. How they related to the results is another story. I wouldn't want to say anything about that."

The list of products proposed for the DOC's technical list (which determines a product's licensing requirements) is reviewed by the appropriate technical advisory committee, such as CSTAC, according to the technical specifications of the product. The CoCom list will be reduced to specifics this month in Paris by a technical task group, which is all government and no industry. But once the TACs get their word in, there's a question about how much it means.

"There's a sincere attempt to get industry involved, but only in the early stages," says Roger Grossel, Hewlett-Packard's export administration director and former director of export controls in DOD's research and engineering divison. "But after a certain point—I'd say it's about 15% of the total—there's no meaningful participation by industry.

"Industry is completely cut out of the action and involvement. The government goes on its own and develops a position. You get hard-liners like Perle and Bryen influencing the decisions and

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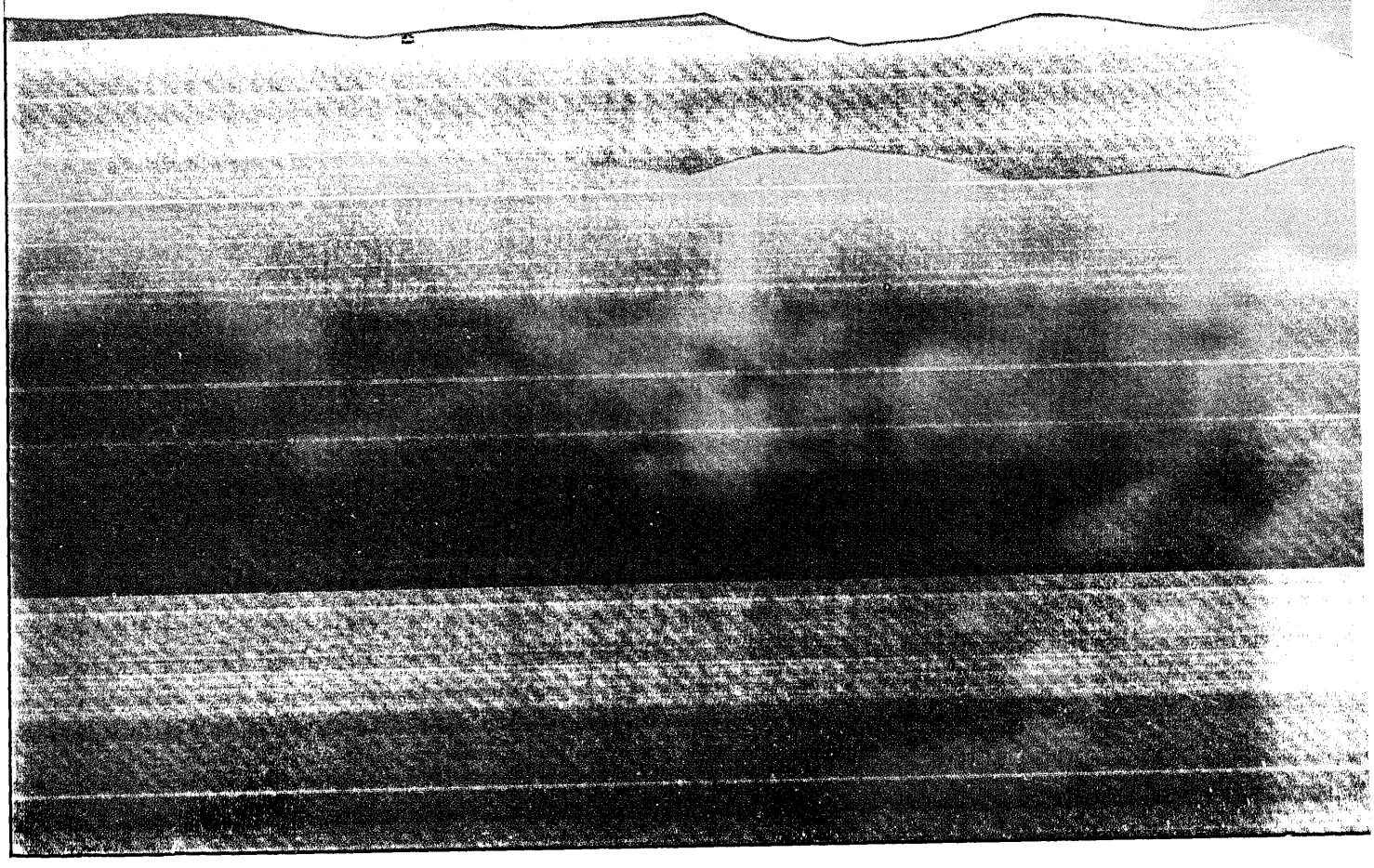

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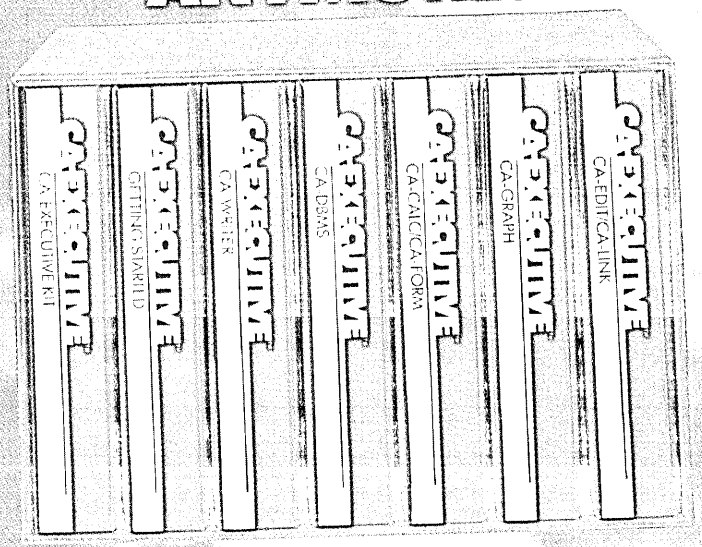

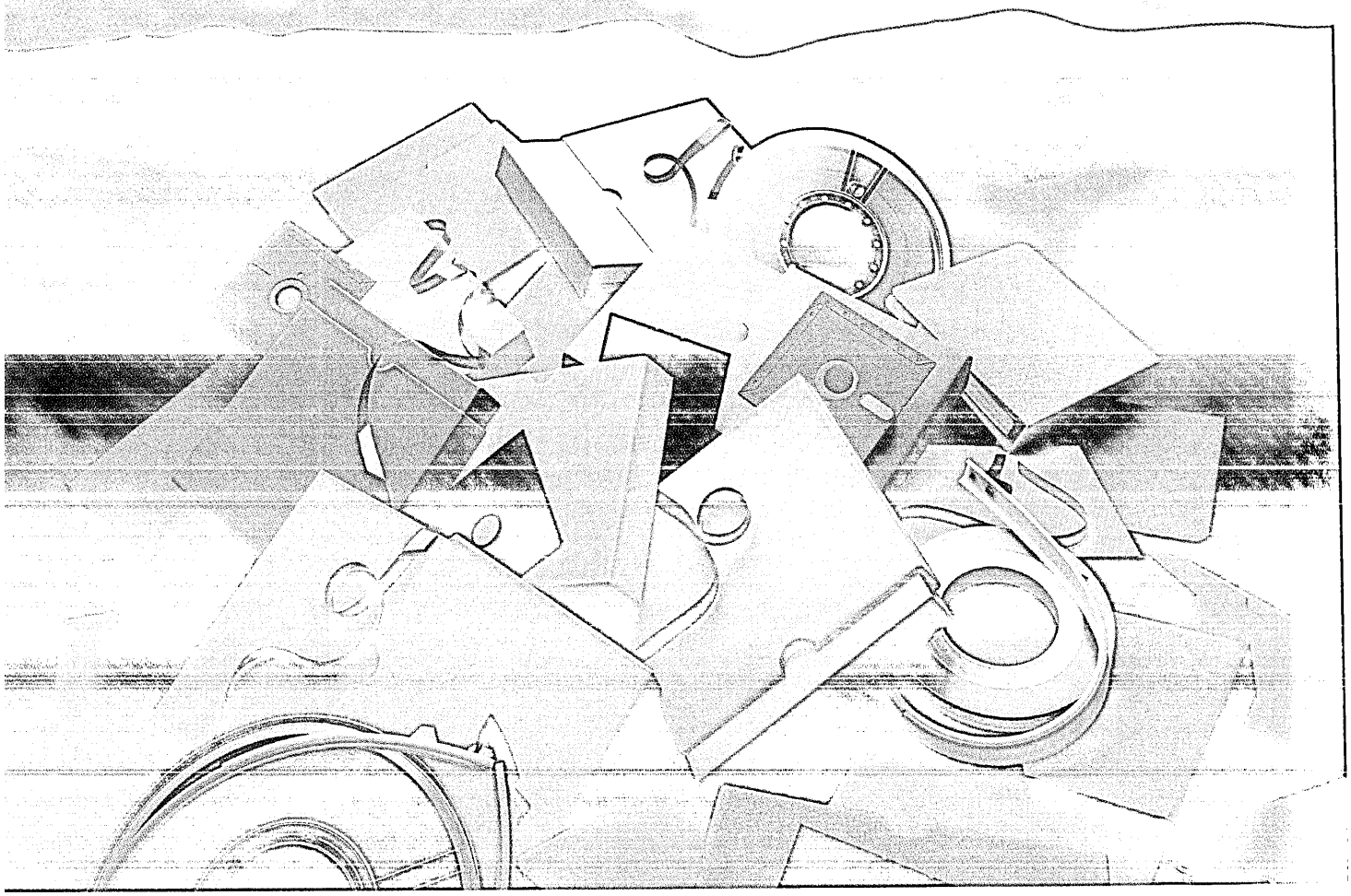

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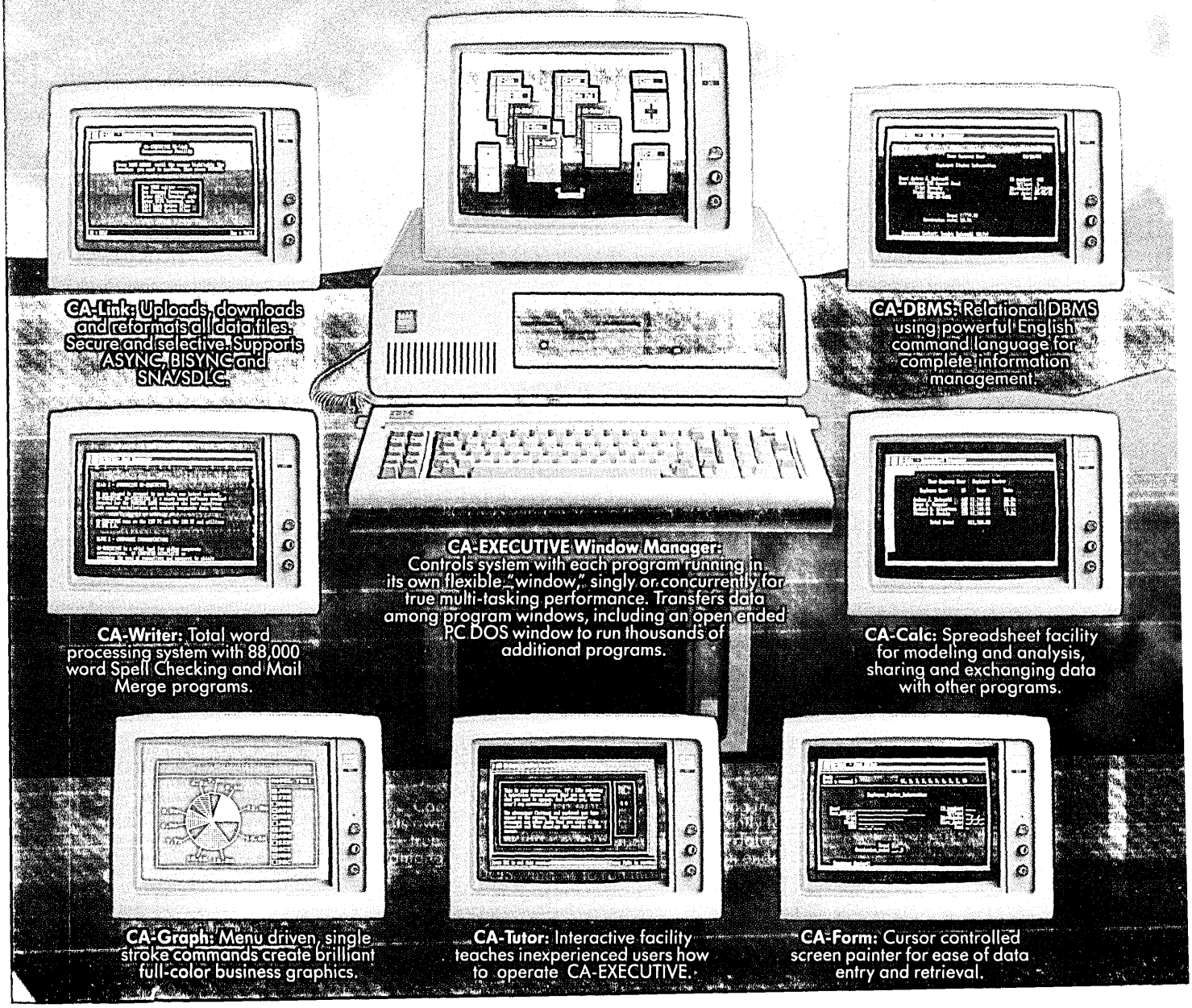

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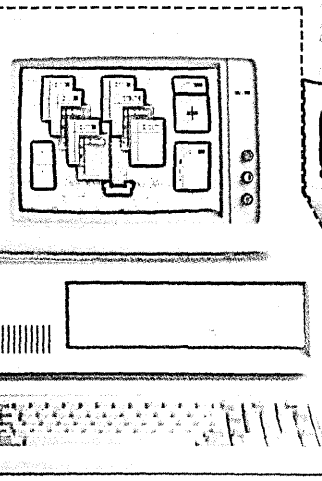

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there's no opportunity for an opposing viewpoint. It's almost like incest."

For sure, at least in the U.S. Nevertheless, depending upon where the company is located and what it wants to export, CoCom opened some previously closed doors.

They certainly have been smashed on the low end. Restrictions on exports have been abolished for personal computers with a PDR below 2, such as the Apple II, the Atari 400, the TRS-80, and the Sinclair series of home computers. In addition, the policy of allowing national governments to decide on the licensing of certain levels of hardware has been significantly extended (see box).

The result may be a flood of European and Japanese micros into the Eastern Bloc markets. Within a week of the CoCom announcement, West European micro suppliers were tripping over each other in their haste to enter the East European market. Sinclair started looking for distributors in the Soviet Union, sent out feelers for a sales manager to oversee Eastern Europe, and announced a deal for 400 of its ZX81 machines in Czechoslovakia. "It's a great opportunity for us," claimed a Sinclair spokesman.

"Other manufacturers also responded positively to the new controls. The European arm of Xerox, which has been selling its word processors and copiers to Eastern Europe for years, is now hoping to use the same distribution channels to sell its micros in those markets without the need to get individual export licenses.

"The new regulations sound quite encouraging," says Ralph Land, Rank Xerox's general manager for eastern export operations. Although we don't know all the details yet, it means an easing of the situation for low-end equipment. But it's not a major change. Besides, the East is short on foreign currency and it makes some things itself. So I don't expect a huge increase in business following the new CoCom rules."

Neither do U.S. manufacturers. They're not talking flood. They may not even be talking trickle.

"Ever since Afghanistan we've had damn near a complete embargo on computers to the Soviet Union," says Arnold Frutkin, chair of CSTAC's licensing subcommittee. "This frees up a piece of the market to Eastern Europe and Russia. From a purely commercial standpoint it's clearly an advance.

"But this never was as big an issue for industry as it was made out to be. The market is limited and expensive to pursue. Any manufacturer interested in selling there is going to have to test the market again and see if it's worthwhile. They've been out of the market for four years. They'll have to start all over again."

They'll have to be careful where they begin, though. For the first time, CoCom has introduced formal regulations covering software and telecommunication equipment. On the hardware side, the policy of allowing national governments to decide on the licensing of certain levels of hardware has been significantly expanded. Some of these controls will become effective immediately, such as the restrictions on telecommunication equipment. Others, at least in Europe, will be embedded in the national legislation of the member governments by the end of this year.

To demonstrate its sensitivity to strategic software, and perhaps to mollify the U.S., CoCom for the first time developed a controlled software list. This was one the U.S. lost. It wanted a negative list, i.e., an enumeration of products that could be exported. But the Europeans prevailed with their positive list, which names the products that couldn't be exported. The list runs 12 items long. Included are such generic products as artificial intelligence, military applications, software development systems, newly emerging software of strategic concern, and signal processing, image enhancement, and networking.

"I'm wondering if my company is going to get anything out of the country."

"That means they've still got some strangleholds on the low-end personal computers," HP's Grossel contends. "If you've got a machine with a PDR under 2 but it has some networking capabilities, that apparently means that it will be controlled. I'm wondering if my company is going to get anything out of the country."

Those into computer-controlled communication switching and telecommunication networking are doubtless asking themselves the same question. Following the CoCom agreement, several European manufacturers had significant contracts canceled because they violated what DOD calls a "substantial tightening of controls" in those areas. The U.K.'s System X large-scale telecom switch, supplied by Plessey and GEC, has been dropped from the bidding for a new telecom switching network in Bulgaria. System X falls into the general exceptions category of CoCom controls and is therefore prohibited from being exported to the Eastern Bloc, at least until 1988. "The System X switches for Bulgaria have been put on ice for four years," explains a U.K. official. "But this may change if someone else starts to compete seriously for the deal."

The Defense Department was expected earlier this year to tightly control AT&T's much ballyhooed Unix operating system. It was not immediately clear if

Ruggedized computers are tightly controlled under the new regulations.

Defense won in that regard, but Unix is often noted for its strength as a software development system and would therefore seem to fall under the software categories.

The new CoCom agreement does relax controls on older low-performance office environment equipment, but who knows if the East Europeans or Russians want that stuff anyway? CoCom also placed a four-year moratorium on all terminal and transit switches for networks, which is what short-circuited System X. Controls were also tightened on categories of equipment with the greatest strategic potential, whatever that means.

The list of hardware items prohibited from export to the Eastern Bloc—those on the "threshold," as DOD's Perle called it—grew significantly. Included are ruggedized computers "beyond what normal office use requires," according to Bryen. Foremost among these are the Grid series. There was no word on the 8-bit Apple II, which Perle told Congress was being used for nuclear targeting. Also on the list are superminis with a half-gigabyte of virtual memory; all computers with a PDR over 48; upgrades to bloc manufactured systems; large bubble memory machines (over 256K); computers for microelectronic manufacturing or design; and technology for any computers.

Bryen likened this last category to implementing the recommendations of a 1976 Defense Science Board (DSB) report. In that paper, Fred Bucy, chairman of the DSB and now chairman of Texas Instruments, urged the U.S. to concentrate on stopping "know-how" rather than products.

"The real CoCom problem has been that these countries have no law permitting technology control," Bucy says. "It's very important that those countries begin to take technology control very seriously. This appears to be a step in that

CoCom has devised a cpu performance formula to fix categories of export control.

direction."

It may even be a leap. CoCom will control the technology for development or production of computers, even if the computers or software are unembargoed; the use of computers, except the minimum necessary to use an approved export; and the integration of computers into other equipment, unless both the computer and the other equipment are unembargoed.

So, after two years of talking, there has been some action. But industry isn't at all sure it will like what it sees.

"A lot of things that used to be controlled now won't be," says a government relations expert at a leading computer company. "But we don't trade much with the East anyway. The real question is whether this will reflect on West-West trade. If items are decontrolled to the East, does that mean they'll be decontrolled to the West? I think so. But I'm not sure it's going to matter."

"What appears to have been agreed upon is negligible," HP's Grossel contends. "In practice, the PDR hasn't been increased much at all. They could have moved higher. I just don't think this is going to amount to very much for industry."

Stay tuned. They've only just begun. ◉

DATA COMMUNICATIONS

LANS MAKE HEADWAY

The local area network market is gaining momentum as vendors and customers overcome certain drawbacks.

by Michael Tyler

Local area networks used to follow the old saw about the weather: lots of talk and little action. LANs still generate their share of hot air, but this summer they have seen a surge in corporate purchases as several traditional objections have fallen by the wayside. The result, says industry analyst William Zachmann of International Data Corp., is that today's LANs will usher in "a new era in how we see information systems, how we build them, and how we use them."

Leading the charge has been Ethernet, which has overcome the doubts of many critics and become an accepted standard backed by several dozen manufacturers. Exhibitors at July's National Computer Conference demonstrated how their equipment or software hooks into what is an increasingly common yellow Ethernet cable. "The show was a hysterical festive crescendo of LANs, an orgy of computers coupling indiscriminately," says Bob Metcalfe, chairman of 3Com Corp. in Mountain View, Calif., and coinventor of the Ethernet concept.

Companies that provide local networks, especially Ethernets, have reaped the rewards. 3Com, for example, more than tripled its revenues, to $16.6 million, in its latest fiscal year, which ended May 31. The firm expects to reach $35 million this year. Ungermann-Bass Inc., a Santa Clara, Calif., LAN supplier, grew 125% in 1983 to $25.4 million, and expects to double again in 1984.

While the established vendors continue to grow, many new entries are flooding the market. Industry watchers such as IDC and the Yankee Group have pegged the LAN market at about $400 million now, growing at 35% to 50% per year. Xerox reports that it has installed over 800 of the estimated 5,000 Ethernets operating in customer locations worldwide, and that for several successive months its rate of new network installations has "set records." That trend has intensified during the summer, the company claims.

The reasons for the boom in local networking in some ways parallel those behind the growth in personal computers in the past few years. Until recently, large corporations stayed away from local networks, as they had once shunned pcs, because of a lack of any standardization; the absence of IBM, AT&T, and other important vendors; and high prices. Any purchaser was taking something of a chance in buying a LAN. Moreover, just as the pc market was fueled by software products like VisiCalc and 1-2-3, so the LAN market is seeing key network-based software and peripherals finally being introduced.

NCC attendees found, however, that most of these reservations were no longer valid. Several seminars and many large system vendors emphasized the IEEE's certification of Ethernet as its 802.3 CSMA/CD standard, while others preferred the 802.4 token bus sold by Concord Data Systems or the 802.5 token ring approach that IBM has been favoring. On the microcomputer side, vendors and users seemed to be converging on 3Com's

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implementation, which gives micros access to large systems via Ethernet that is not possible using products such as Corvus Systems' Omninet, Novell's Sharenet, or Orchid Technologies' and AST Research's PCNet, which segregate micros from other information resources.

While that may seem like a large number of "standards," the acceptance of these architectures coincides with a sharp drop in the attractiveness of LANs that are not compatible with these networks. "The new generation of local networks comes out of the fragmented approach we've seen until now, and has been coalescing around Ethernet because so many vendors support it," says Dick Loveland, product planning manager for office and information systems at Digital Equipment Corp. DEC was one of the original inventors of Ethernet, along with Xerox and Intel.

Claims Bill Krause, president of 3Com, "Now it's simply a question of Ethernet or Ethernot."

Hardware vendors who chose networks incompatible with those that are emerging as standards may now regret their actions. Dharam Ahuja, senior vice president of marketing and sales for North Star Computers Inc. in San Leandro, Calif., says about his firm's NorthNet product, "If we had to make the same decision today, we would not have decided to offer our own network product. Instead, we would conform to the standards set by the big network players."

Those players have indeed tossed their hats into the ring, albeit tentatively. AT&T, for example, has already announced three network schemes for its fledgling 3B line of computers. One is its ISN, a star-type network that essentially is a small data PBX, according to Mark Stahlman, a local network analyst with the Stanford Bernstein stock brokerage firm in Upper Montclair, N.J. The second is its 3B Net, based on Ethernet, and the third is Corvus's Omninet for the low-end 6300 pc.

"AT&T is not a major computer systems supplier, but it is hoping to become one," Stahlman says. "It's not looking to create a network standard the way it did with the Bell System, but instead it is using other vendors' standards to help sell its computer line."

Similarly, IBM has moved cautiously—some would say too cautiously—in adopting a local network of its own. As long as no other scheme was a de facto standard, IBM's lack of local networking products had stalled some potential customers. Together with the increasing acceptance of Ethernet, IBM's announcement of a local network cabling product and statement that its token passing ring network is still at least two years down the road have caused many customers to consider changing their networking plans, and opened gaping opportunities for competing vendors. The Yankee Group, in Boston, recently reported that IBM will join the bandwagon with an Ethernet-based LAN in early 1985, in addition to its later token passing ring product. Yet even an announcement early next year may not be soon enough for some buyers.

"At this point, customers need networking too badly to wait for IBM, and once they've installed their own networks, they won't abandon them when IBM finally introduces its own," says William Carrico, president of Bridge Communications Inc. in Mountain View, Calif. "IBM will certainly suffer a significant setback because of the delay, since Ethernet works now." Bridge is seen as a promising vendor of Ethernet hardware, which it oems to various systems suppliers.

The other major hardware vendors, from DEC to Sperry to Data General and others, have for the most part followed the Ethernet path because it is a current technology. Moreover, the semiconductor manufacturers, led by Intel and Seeq, have focused on providing Ethernet chip sets, which have had a crucial effect on standardization, volume, and pricing.

Large corporations stayed away from local networks because of a lack of standardization, inaction of some important vendors, and high prices.

"The key breakthrough that had to occur was getting the Ethernet protocol onto a chip set," says John Adams, manager of strategic planning and marketing for distributed systems at DEC. "Hewlett-Packard and DEC and 3Com and others are just now beginning to get the Ethernet chips out into the market, and that means that the other vendors can standardize on an inflexible chip instead of developing their own gate layouts. Volumes can get very high, and prices are going to come down to the point where customers will find it cost-effective to buy LANs."

Carrico of Bridge says, "We've come over a big hurdle. For years, everyone tried to poke holes in Ethernet because there is tremendous resistance to nonstandard products, but now the semiconductor makers have the chips and the hardware vendors are supporting it, and customers no longer worry about whether it is standard."

The high volumes that are possible with the Ethernet chip sets—3Com alone now ships up to 500 networks per month,

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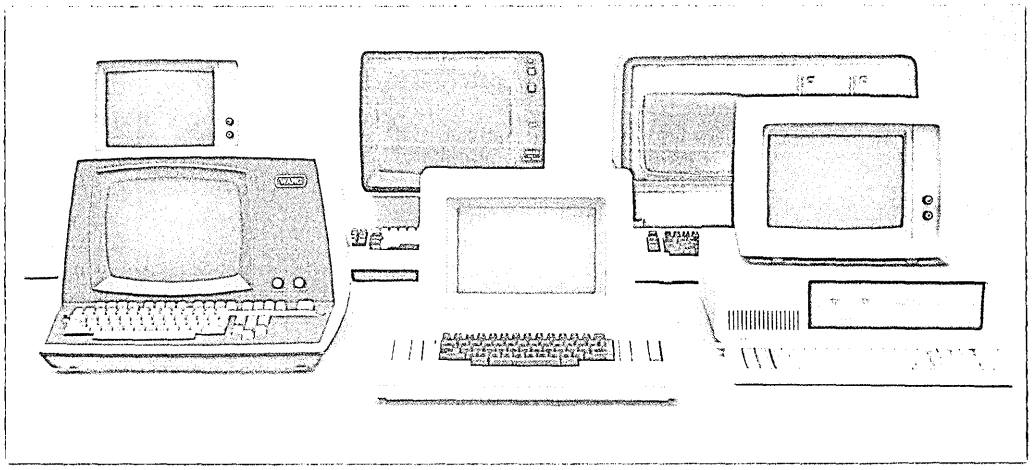

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Another example: a document is prepared on a Xerox word processor at Division headquarters and must be sent to a user at a Wang word processor in New York for further editing and printing, and to an IBM Displaywriter user in Europe for review. The Xerox operator simply transmits the document to Soft-Switch at the IBM host, and instructs Soft-Switch to route the document to the New York user and to the European user. Through its directory, Soft-Switch recognizes that the sender and receivers are using different word processors, and automatically translates the Xerox document into DCA, and then into Wang and Displaywriter formats. The recipients are then notified that documents are waiting.

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each with an average of five cpu nodes—means that the installed base of networked systems can finally grow significantly. So far, networking has largely been limited to minicomputers and mainframes, but the pc is quickly taking over.

"The density of personal computers has reached a critical mass," 3Com's Krause says. "In order to build a network you need at least two computers, and because of the growth of pcs in the past few years we've just now hit the knee of an exponential curve in the potential growth of networks." Micro retailers, he says, are eager to sell Ethernet-based networks because the networks include volume pc sales and also promise a means of differentiating the retailers from their competition.

DEC's Adams notes that current local networks have an average of about 10 terminals hanging off each cpu, but that the addition of many pcs directly to networks will bring that average down considerably over the next few years. Pcs, he says, will be connected directly to corporate networks rather than to segregated pc networks, in order to gain access to corporate data.

Another factor that until recently has hindered the growth of the local network market has been a perceived lack of functionality. While hardware technologies had been developed to enable computer systems based on different architectures to communicate on the same physical networks, the software needed to make those communications meaningful has only recently begun to arrive. IDC's Zachmann points to the General Motors and National Bureau of Standards demonstrations of multivendor networks at NCC as "landmark events" in that they involved development of software that allows incompatible computer architectures to transfer files and perform other basic network functions transparently.

Such intervendor communication is key to the success of local area networks, and several products were introduced at NCC that provide some degree of such communication. Bridge, for instance, showed software that allows Sperry mainframes to participate in an Ethernet network. The package, which was developed in response to a proposal by the Baylor College of Medicine in Houston, enables Sperry Uniscope terminals to link to mainframes via Bridge's Ethernet interface units and the DCP front-end processor at distances up to the 2.5 kilometer limit of Ethernet rather than at the much shorter distances Sperry allows for direct connections.

Xerox showed the capability of tying IBM Personal Computers directly to its own file and print servers over the Ethernet cable, and 3Com introduced a chip set that connects IBM PCs through Ethernet without the aid of a file server. Finally, several vendors, including Techland Systems of New York, promised to provide SNA gateways to let local networks attach to mainframe-based networks.

Shortly after NCC, 3Com introduced its EtherTerm product in conjunction with Bridge. It lets IBM PCs emulate ASCII terminals on an Ethernet. "The product basically gives our customers the capability that Ungermann-Bass provides, which is avoiding the need to have a terminal and a pc sitting next to each other and both hooked into the network," Krause says. A 3270 SNA emulation package will come later, he adds.

All of these new products are designed to increase the connectivity of devices to local networks, Zachmann of IDC notes. "Full connectivity, in which every computing resource in a company can talk to every other, is crucial for the success of the LAN market," he says.

The main area in which the network vendors have begun increasing LAN functionality is software. Says Krause, "The network vendors must provide the system level software to facilitate network transparency. They should also provide system level services for multi-user programs, like record locking. We also have a tremendous opportunity to provide network-based applications, such as disk and printer management, electronic mail, terminal emulation, and executive calendars." 3Com introduced a networked version of VisiCalc at NCC, CertiFlex Systems of Dallas now sells its accounting packages for networks, and Ashton-Tate sells multi-user versions of its popular dBase II.

Intervendor communication is key to the success of local area networks.

Finally, network vendors are attempting to make their products easier to install and use. Wang recently introduced FastLAN, a version of the broadband Wangnet that is designed to be installed entirely by end users. Similarly, Fox Research of Dayton, Ohio, showed the 10Net LAN and a network version of the 10Base SQL-like DBMS, both of which are intended to be completely user-installable. Techland's SNA gateway is also used by 10Net.

As the network market heats up with new vendors and products, a shakeout is bound to occur, many observers say. 3Com's Krause argues that there are already too many vendors in the market, even though none of them can currently keep up with the demand for their products. "When IBM and AT&T compete head

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to head, they will each take up about a third of the market, and that leaves very little room for the rest of us," he says. He forecasts a shakeout within the next three years, with vendors tied to proprietary schemes most likely to fail.

DEC's Adams notes that network vendors must provide full transparency in their products. "The user should not have to know where any data or programs are in the network. The network should be able to find them transparently. Vendors that cannot do that will not survive."

Zachmann concurs. "We're witnessing a reversal of the Copernican revolution," he says. "The development of distributed operating systems and intelligent network software means that network resources are available to the user transparently from anywhere in the network. The user's individual workstation becomes the center of the dp universe, with all the mainframes and other devices that were once at the center now on the periphery. The centrality of the Middle Ages is restored." ◉

MICROCOMPUTERS

BULLISH ON CHINA

Yankee-style capitalism underlies an entrepreneurial push into personal computing by the People's Republic.

by R. Emmett Carlyle

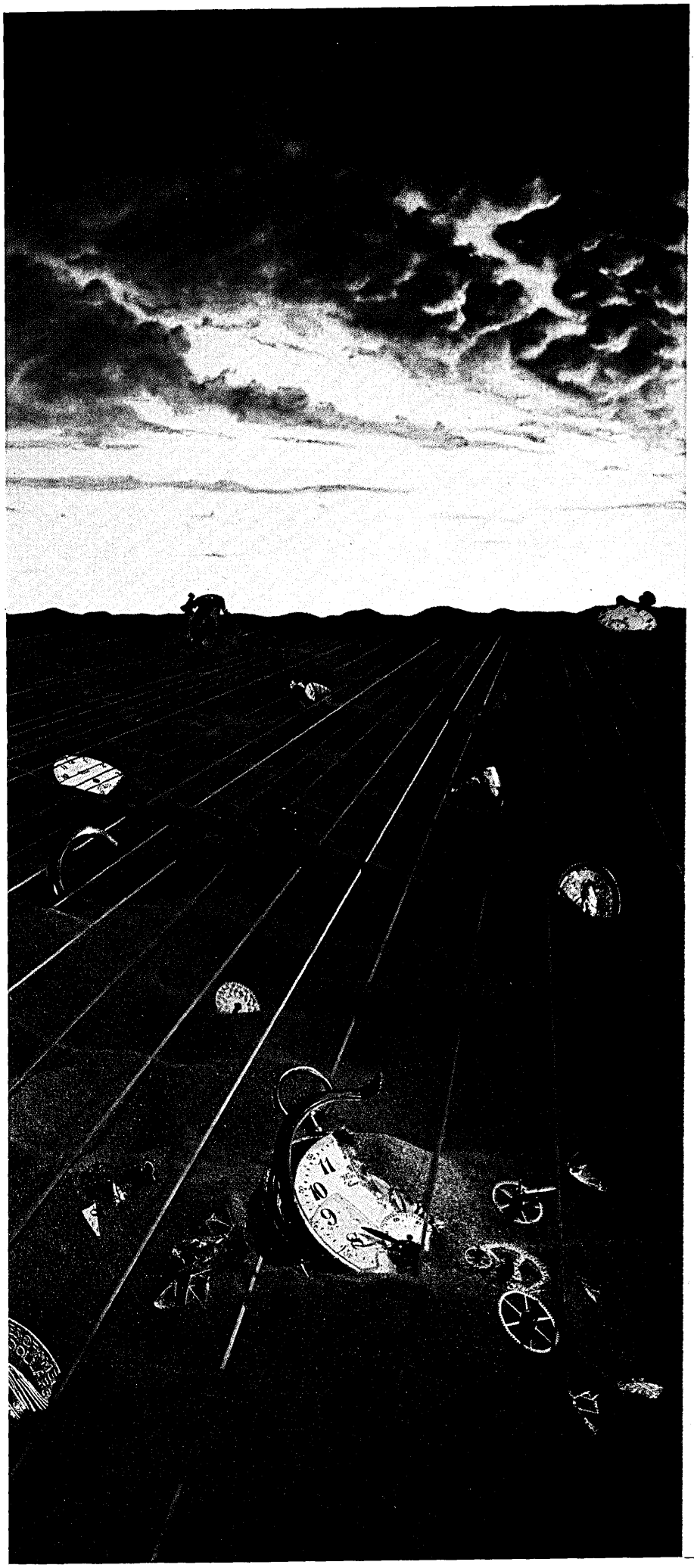
Four years ago it was a compact fishing village of about 20,000 people. Today a nuclear power plant is required to feed its new apartments and factories. Its skyscrapers are so numerous, says one visitor, "that they block out the sun." But, since the 300,000 inhabitants are so intent on turning the place into the next Silicon Valley, they have little time for sky-gazing anyway.

This is Schenzhen, a microcosm of the emerging capitalist China. More than a million people are expected to be living and working in its increasingly polluted air in three years. The city is growing so fast that it already resembles that throbbing testament to capital that it borders, Hong Kong.

Formerly, the ties that bound the people of Schenzhen were feudal and of the land, but there is little place for that in the city's newfound dynamism. Increasingly, the bond is of a token kind: cash payment and naked self-interest.

Schenzhen, with its capitalist sociopolitical infrastructure, is one result of a number of experiments set in motion by Chinese premier Deng Xiaoping—perhaps his most potent creation so far. He makes no apology for its intrusion into the traditional fabric of Chinese life. "If your objective is to catch a mouse," he says, "it matters little whether you use a black cat or a white." The mouse is a higher standard of living, a modernized China that can take its rightful place as a senior member of the world's community of nations. Schenzhen and other new enterprise zones are a ticket to that dream. Schenzhen has been created as a magnet to draw (and accommodate) U.S. technology in one form and eventually reexport it in another. Deng's plan calls for a full 50% of production to be exported to world markets.

Of course, it takes more than an "instant city" and the world's most prolific and low-cost labor pool to create a manufacturing mecca of computers, observers point out. Deng has aped the



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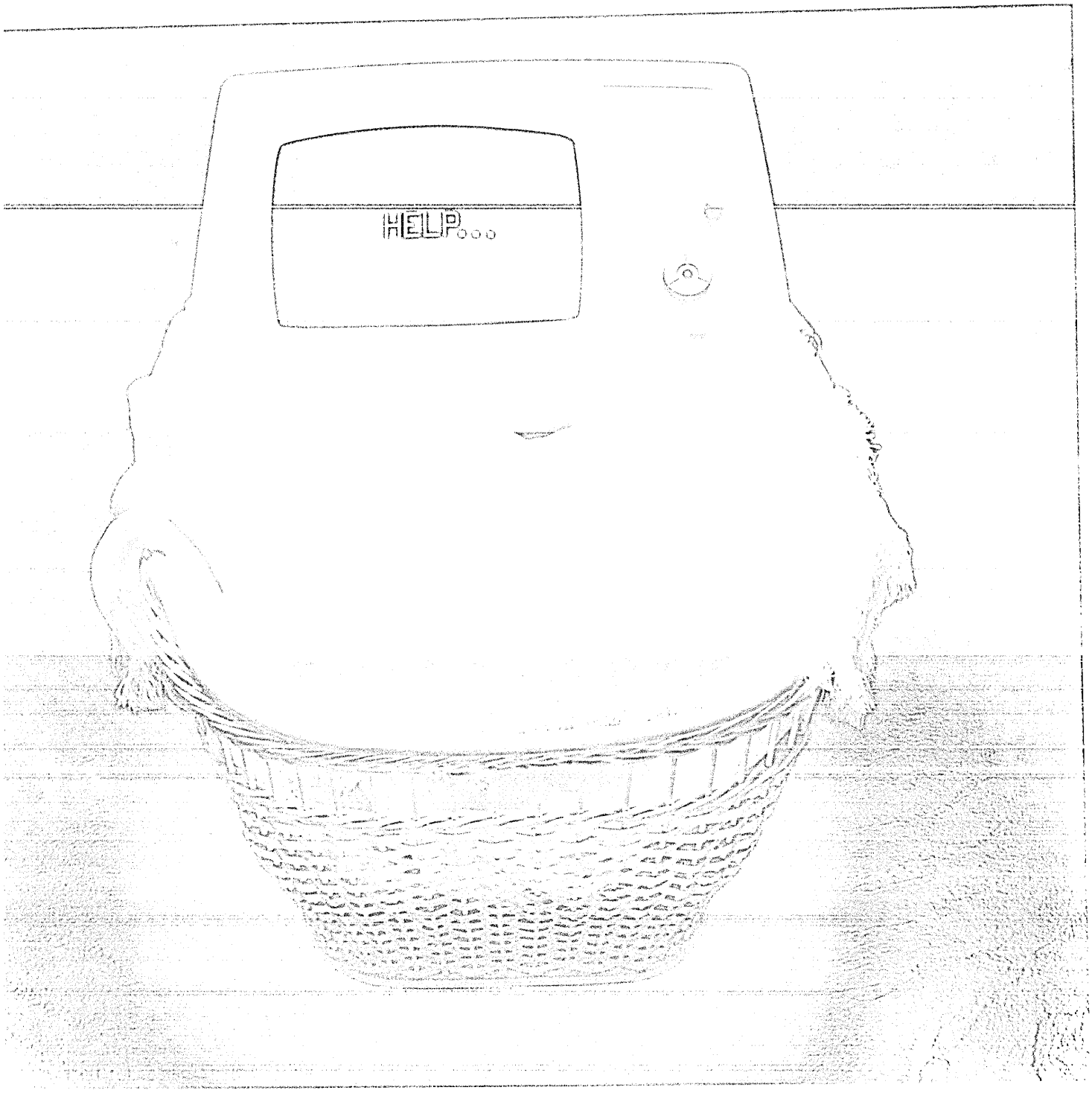

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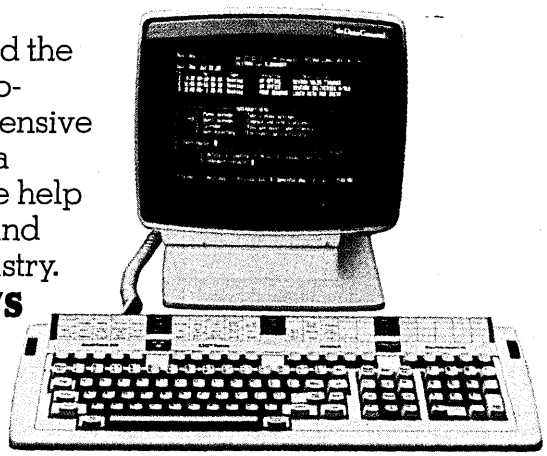

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West's infrastructure, but can he go all the way by using it to produce its technology? The West is shifting to more complex, and capital-intensive technologies whose automated character increasingly excludes people from the manufacturing process.

"This clearly would be a dangerous course for Deng," warns Ed Lee, ceo at Pro-Log Corp., Monterey, Calif., whose company could soon have a cooperation deal signed with the People's Republic. "He has an awesome number of people who want to work and the people still hold the power in China."

Schenzhen is undoubtedly remarkable for its capitalist managers with their power to hire (from all of China) and fire. In the various Chinese provinces the government is the only employer and pays the employees each factory may recruit only in its local area. But even these managers are accountable to their work force after each two-year interval, and can be removed from office by them.

"No one knows what the impact of 1 billion Chinese with ample iron, coal, and oil could do now that they are entering the world's competitive production market. Look what the Japanese did with

Deng has aped the West's infrastructure, but can he go all the way by using it to produce its technology?

100 million people and no natural resources," suggests Lee. "But clearly they need an appropriate technology to find out—and that technology is low tech," he adds.

It's ironic that those American concerns most likely to benefit from this state of affairs will be the less glamorous companies, and those far from high tech's leading edge.

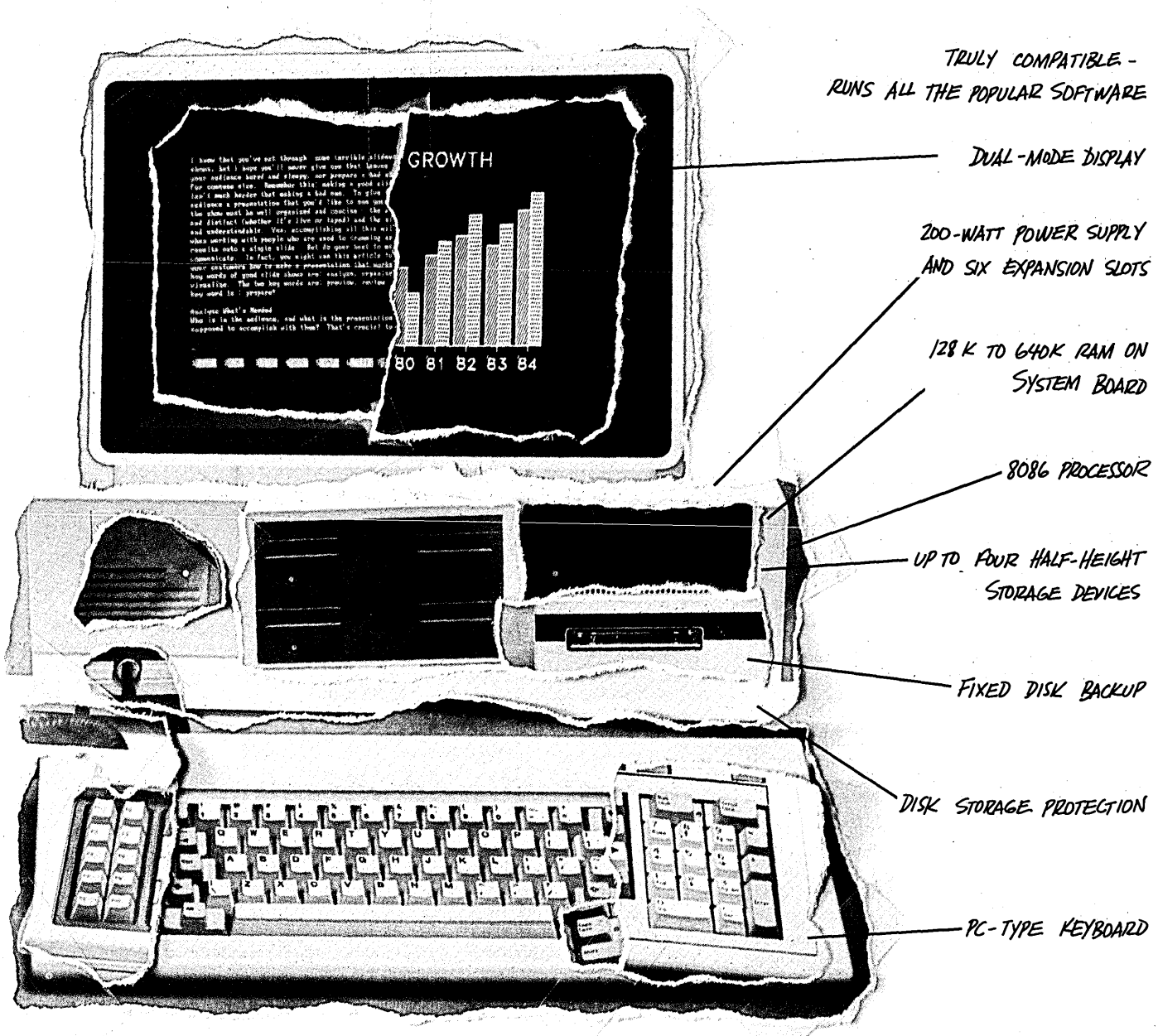
Many would argue that the most memorable thing about the tiny New Hampshire-based dot matrix printer maker, Santec, was its Chapter 11 filing in 1980 following a long stretch of unprofitability, sluggish sales, and production problems. Although 2,500 of its S 700 printers have been sold since then, the company has yet to show a profitable quarter. Yet its management claims that Santec recently was the object of a $2 million investment by the People's Republic—that country's first in a U.S. information processing company, and is a likely partner in a multimillion dollar international marketing venture with the Chinese.

While the Santec printer is described by experts as "expensive and lacking market focus" in the competitive U.S. market, it clearly holds more appeal for the Chinese. A dot matrix printer is an important element in the computer-based typewriter they must create (a Chinese typewriter with its 4,000 characters is more like a printing press) but their investment in Santec has essentially bought for their engineers an education in U.S. ways and a chance to begin manufacturing mechanical and low-tech parts like cases and hinges for the printer in mainland China. In time the Chinese will get to manufacture the whole printer, and additional benefit will accrue from the marketing experience.

The scale of today's personal computers also holds much appeal for the Chinese as a possible manufacturing option. Hundreds of IBM PCs have been flooding into China—either officially or unofficially, according to Pro-Log's Lee—but so far IBM has resisted overtures from Deng for a licensing deal or the creation of an IBM subsidiary in China.

Deng, as shrewd as ever and always the pragmatist, is drawing on the native competitiveness of the Chinese provinces (each with its own language

Computer dreams.



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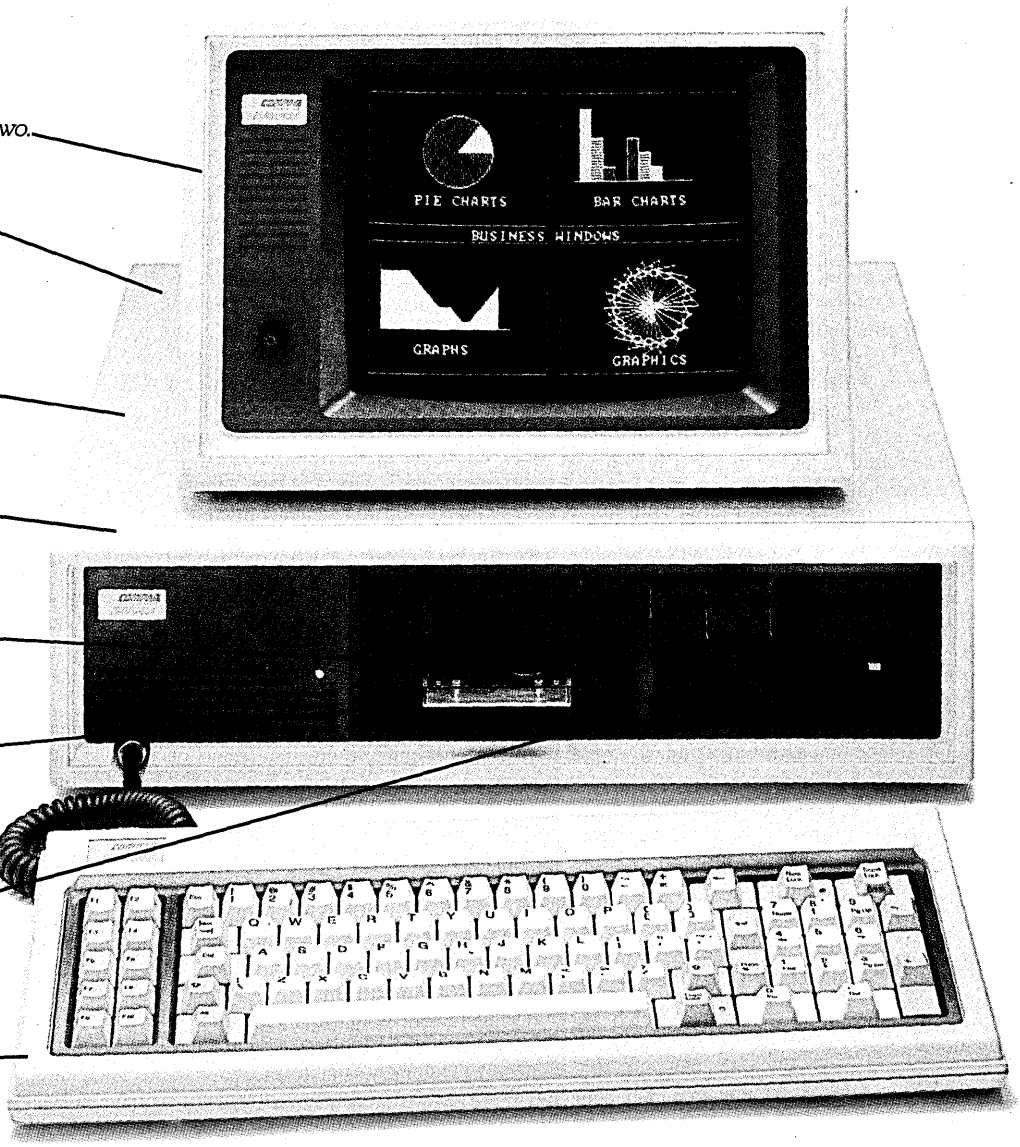

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and customs) by pitting them against one another in a contest to produce the first PC manufacturing facility in China. "They've been saying on television that whoever wins will be a hero of China," says Abe Wong, a manager in Cullinet Software's international division, and one of a group instrumental in making the Westwood, Mass., company the first software supplier to have distribution rights in China.

One contender, the Fujian Electric Company from the Fujow province near Taiwan, has recently been scouring the U.S. looking for a manufacturing licensing deal from one of the IBM PC clone companies, and for a U.S. concern to help build the factory in China. An earlier attempt to engage IBM in talks of a deal using the Chinese vice premier as a go-between during his last visit to the U.S. failed when IBM (which hosted the Chinese number two at a reception) told him they didn't wish to meet with Fujian, sources reveal.

Insiders say that Fujian may have recently secured a paper deal with an unnamed PC-compatible manufacturer, but also may be considering other ways to build a personal computer. "The IBM PC presents a problem for Chinese manufacturers," says Pro-Log's Lee, "because it has one big board in it that requires automation in the test area to produce it. And," he emphasizes,"the Chinese don't want an automated system."

Lee has been trying to interest the Fujian team in building a PC using the 8-bit SPD bus (number two in the market after the Intel Multibus and an IEEE standard), which accommodates the 8088 processor. Pro-Log makes a line of small (4½ x 6½ inch) cpus and I/O cards for the bus, which can be "tested with a minimum of automation and assembled by hand."

Lee adds that while the SPD bus is designed for industrial control, it can double up for dp use, making it very useful for the Chinese taking their first tentative steps into the two areas. "There's also a CMOS version that will allow them to develop portables and lap-top computers," he adds enthusiastically. Pro-Log's management has been invited to tour China in October, they reveal, and is clearly hoping to seal the visit with a joint venture or with what the Chinese refer to as a cooperation agreement.

Where the scale of the technology is too large and too complex and can't be made in China, Deng has little choice but to import from overseas to fill the void. At least the Chinese can now get the technology into their country, though the U.S. and other leading western nations impose stringent conditions on the sales. "In the past, Mao put China in a cultural vacuum," says Cullinet's Wong, and "as a result, a scholastic and scientific culture with no idea of how to apply its research to industry evolved." Much worse for Deng as he tried to mobilize the existing pool of engineers has been the sacrifice of a whole generation to Mao's cultural revolution. Only three older generations, three tiers ranging in age from the late 30s to 70 years, are available to him. Wong says that a fourth tier ranging in age from 25 to the late 30s, which was exposed to Mao's conditioning, is now virtually illiterate and unable to function in Deng's modern China. This group of around 20 million is roughly the equivalent of Western bums and is known in China as the "rootless ones."

A major achievement of sorts by China's engineers—all of whom graduate from one of two universities, one in the north and one in the south—has been the creation of an IBM 4331-class machine just from manuals and books smuggled into China before Deng's open door policy came into force. "The only language they speak is hardware. There are no software engineers and no generalists, no engineers to understand the needs of the industry," says Wong.

China can't take the hardware without the software that lies behind it, makes it possible, and keeps it moving.

Since 1980, Deng's new administration has pushed for a more mainstream approach. Numerous IBM mainframes have been acquired to aid in manufacturing, help control the relocation of people, and predict changes in weather patterns. Before 1980, there were no IBM or IBM-compatible mainframes in China. Today it is believed there are 50, with half being supplied by the Japanese, whose conditions of sale are easier to meet.

Now that the mainframes are in place, the Chinese wish to proceed with all speed to broaden their applications spectrum. But dealing with IBM face to face has proved difficult for them. This could prove to be a stroke of good fortune for Cullinet, which could reap a bonanza in the world's largest domestic marketplace, for all its years of development of IBM software. Unlike IBM, Cullinet is a small, accessible company with more than its fair share of Mandarin Chinese-speaking employees, and software that embraces all levels of IBM's hardware business, from PCs to mainframes.

Wong, focusing in on the Chinese sense of urgency, says, "When we really got down to talking, the negotiations only took six months—remarkably fast by Chinese standards." Santec's chairman, Chuan Chu, the man responsible for the company's Chinese connection, says they are not interested in sitting down and hammering out a deal in double-quick time. "Like their paths and bridges, their talk weaves all over the place, alternately serious and playful. They like to feel they are talking with friends, and each potential business partner must prove himself a friend to China."

Cullinet, like Santec, Pro-Log, and others that will follow, faces one big hurdle to its business opportunities. Though China is under the impression that it recently upgraded its relations with the U.S. to a level on par with its European allies, the U.S. acts as if it were still threatened by a Communist system. "U.S. Commerce Department approval for the sale of hardware and software to China can take upwards of a year," Wong explains, "and the Chinese seem bemused by it all."

"The U.S. wants to export its culture and its system of free elections to China," argues Chuan Chu. "They don't seem to realize that the best way to do this is to open all doors and let the technology flow because a technology created by a capitalist system bears the marks of its origin. China can't take the hardware without the software that lies behind it, makes it possible, and keeps it moving."

Chu adds that technology is not idealogically neutral. "Iran says, for example, that it needs only the West's technology, not its ideology. But the evidence is overwhelming that where countries employ the same technology or modes of production they act very much the same and become more alike each day." Or as one economist quips, "Mindless work in an office or factory is equally mindless under any political system."

It's difficult for Americans to accept the full reality of modern China, not only because of the past 30 years' propaganda, but because of the absence of a historical perspective. The U.S. message seems to be the individual reigns supreme, and the Chinese line is that the citizen is committed to the good of his fellow man. Chu stresses the importance of picturing these views, East and West, as fertilizing each other, not in open confrontation.

Through the common bond of a shared technology and with both sides pursuing the same goal (or mouse) of a higher standard of living, the dictum of East is East and West is West could be crumbling. There's a Chinese proverb that speaks of two fast horses racing with the sun behind their backs in the east and at the end of the race inevitably finding themselves facing the sun in the west. The same sun faces you whether you're in the East or the West. It's just a difference of angle. ◉

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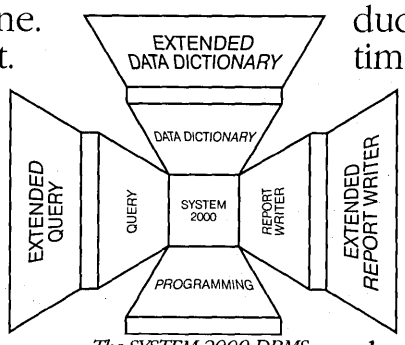

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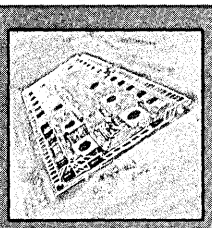
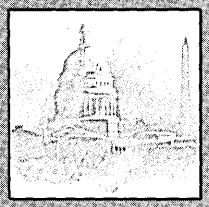


1970
Four-Phase announces the industry's first all-LSI Central Processing Unit to give you increased performance in a smaller computer system.



1973
Four-Phase wins the largest-ever contract with the Federal Government for a data entry system.

Motorola/Four-Phase introduces The 6000 Series–a new milestone.

A milestone for new standards in office information systems from the company that started it all.

From the moment Four-Phase introduced the world's first all-LSI computer in 1970, we have consistently presented the industry with innovative hardware and software products to help make business more profitable and productive.

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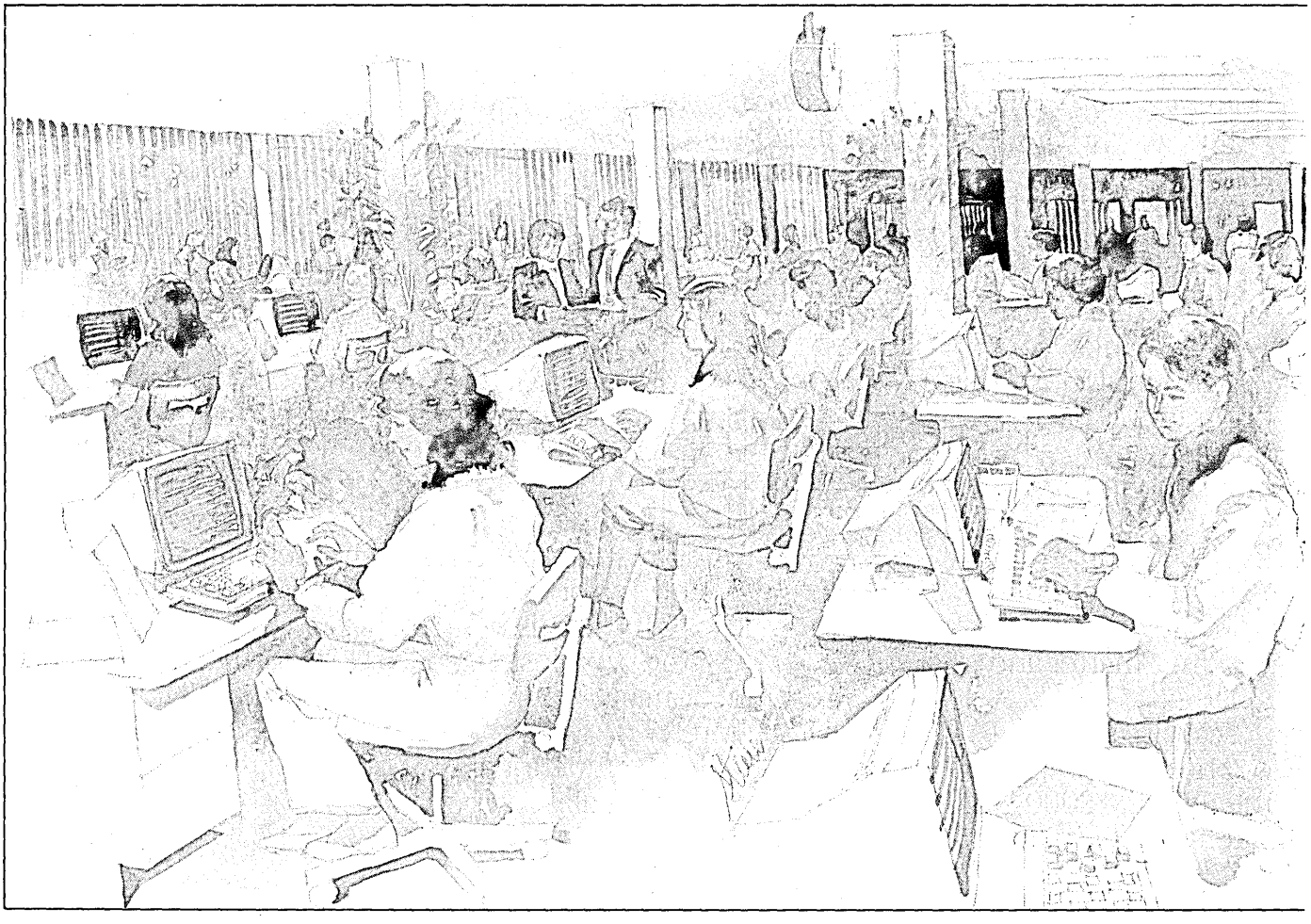
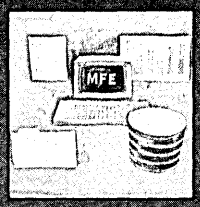
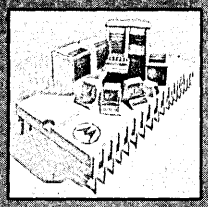
Technology for the real world.

Motorola/Four-Phase systems are tough enough and smart enough to deal with the real world—where speed, power, and reliability in a multi-user environment are prime considerations. The new 6000 systems feature the high-performance 32-bit Motorola 68010 CPU and an operating system derived from UNIX* System V under license from AT&T. We created





1976
Four-Phase announces The MULTIFUNCTION EXECUTIVE* (MFE), the first DDP operating system to allow multiple applications to run concurrently and independently.



1982
Four-Phase is acquired by Motorola Inc., combining our information processing expertise with one of the world's leading manufacturers of semiconductors and electronic equipment.

integrated system software that combines these two industry standards into a powerful, multi-user, multi-tasking environment that can stand up to practically any application.

There are two systems in the 6000 family. The 6300 supports 1-8 users, making it perfect for the smaller user or a remote office. The 6600 is a high-performance system designed to support up to 128 users. Both systems offer complete and integrated solutions—whether they're working in an operations-oriented environment where efficiency and precision are needed, or a results-oriented environment where flexibility and quality are key.

Service and support to match our technology.

At Motorola/Four-Phase, our commitment to you goes beyond providing quality, high-performance hardware and software. Support is just as important. Our award-winning Customer Support Operation is staffed with over 1,400 customer support specialists in over 175 cities across the nation. One phone call to our Operations Center will ensure prompt response from the nearest available specialist. And you can call the Center 24 hours a day, 365 days a year.

If you're a DP/MIS manager or OEM, find out what the latest milestone in office systems can mean to you. Contact Motorola/Four-Phase today at 1-800-528-6050, ext. 1599. In Arizona, call 1-800-352-0458, ext. 1599. Or write us at 10700 North De Anza Blvd., M/S 52-3B1, Dept. S., Cupertino, CA 95014.

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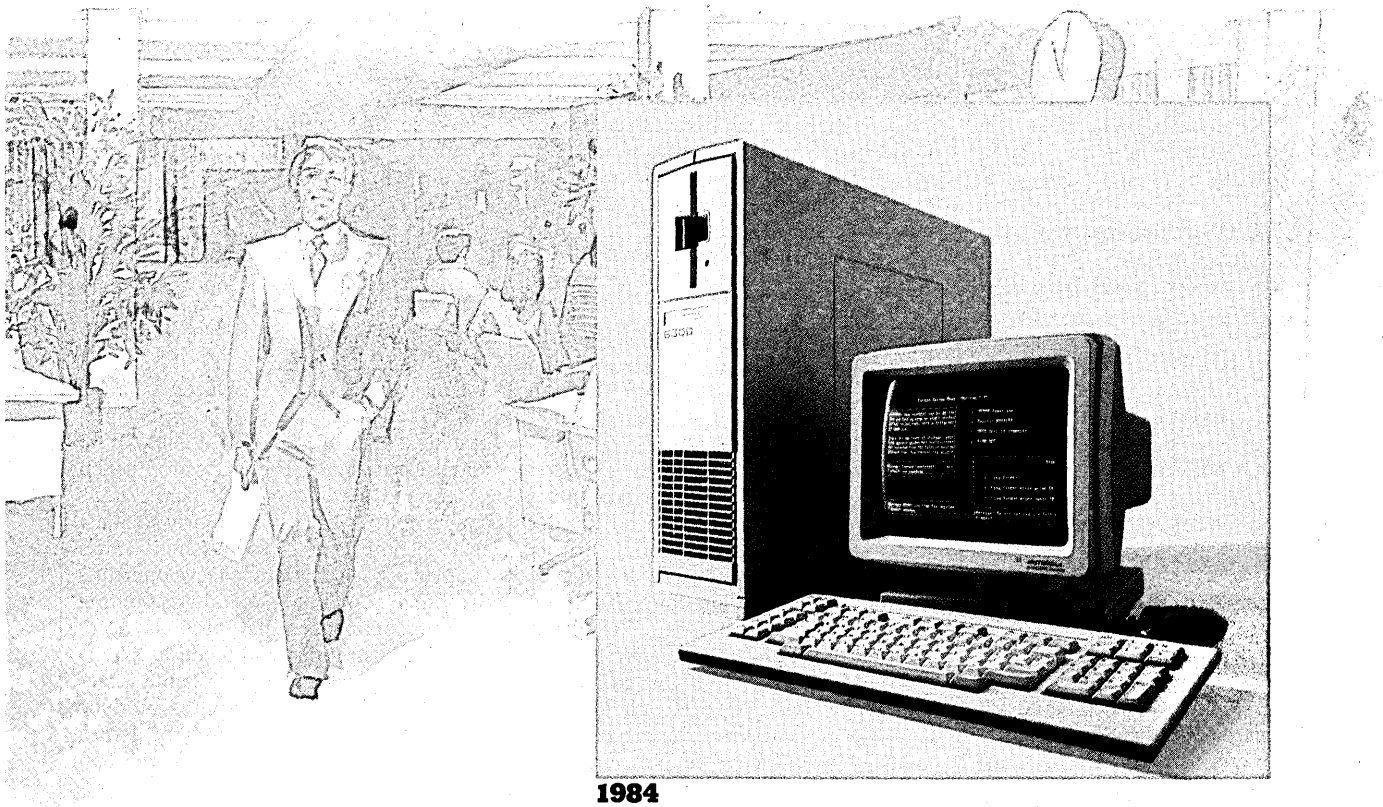

1984
Motorola/Four-Phase announces The 6000 Series—a milestone in productivity that delivers information processing performance today, and expansion capabilities for tomorrow.

NEWS IN PERSPECTIVE

BENCHMARKS

NEW PLANT: Syntrex Inc. doubled its manufacturing capacity with the opening of its new 165,000 square foot complex near its corporate headquarters in Eatontown, N.J. The facility enables Syntrex to up its production of word processing and office automation systems to 2,000 units per month, according to company ceo Dan Sinnott. The facility was largely funded by the New Jersey Economic Development Authority, which kicked in $2 million to Syntrex in 1982 to purchase equipment for the automated manufacture and testing of products to be made at the new manufacturing plant. The NJEDA funds also allowed Syntrex to add 100 new employees to its existing 500-worker payroll.

VIDEO BLUES: The medical establishment, which has so far failed to support claims that video display terminals can cause eye discomfort, difficult pregnancies, and other maladies, is beginning to recognize other possible side effects from prolonged exposure to crts. Vdt operators may be particularly prone to stress-related disorders like insomnia and depression, says Dr. Leon J. Warshaw, a clinical professor of environmental medicine at New York University. The disorders stem from job dissatisfaction and loss of job security, both of which are associated with increased vdt use, and may also include fatigue, physical isolation, monotony, and other symptoms. Separately, Dr. Arthur L. Frank of the University of Kentucky found that vdt operators are absent from work an additional quarter day per year, which translates to an estimated loss to the national economy of $500 million per year. His findings were based on a 2½-year study conducted at New York City's Mount Sinai Hospital.

NEW PDP MODELS: Digital Equipment Corp. brought out the second model in its Micro/PDP-11 series, the 11/73. The model cpu uses the new 15MHz J11 chip set, which until now had been sold only on board-level products. The chip provides four times the performance of the F11 chip, which is the basis of DEC's micro PDP-11/23. The J11 gives the micro cpu about the same performance as the top-end PDP-11/44, but without the peripheral support available on the older model. The 11/73, which comes out of the Merrimack, N.H., Business Computer Group, has an 8KB cache and half a megabyte of main memory. Up to 12 users can hook into the 11/73 simultaneously, up from four on the PDP-11/23. A system with the 11/73, the new RC 25 single disk 26MB subsystem, and an 8-inch removable cartridge tape drive costs $19,500. The unit, which runs the Micro RSX operating system and the A-to-Z open architecture software system, is being marketed to commercial oems in the small business sector.

CDC ACQUISITION: Ramtek Corp. and other investors in Digital Productions have reached an agreement in principle with Control Data Corp. under which CDC will acquire 60% of Digital Productions for $5 million in cash. CDC will also assume some unspecified "obligations" incurred by Ramtek in connection with Los Angeles-based Digital Productions. Digital Productions uses its proprietary software to generate moving imagery that stimulates three-dimensional objects on supercomputers. To date, this company has provided its services primarily to the entertainment and television advertising industries. A spokesperson for Ramtek said the company will retain rights to some of the technology developed while Ramtek owned Digital Productions.

DROPS SYSTEM: Harris Corp., despite spending some $40 million over four years in development, scrapped its 9000 series word processing system. The Melbourne, Fla., firm had introduced the line in May 1983, but never got past the beta test stage. Harris said the product was dropped because of the firm's acquisition of Lanier Corp. in October. "It doesn't make any sense at all for us to have two very similar products addressing the exact same market," said Harris senior vice president Jack C. Davis, who heads Harris's Information Systems sector. The 9000 is comparable to Lanier's 1000 business processor and 5000/6000 clustered network system. The company said that it would continue to use the technology developed for the product as a basis for a distributed processing system to be introduced early next year. The networking software developed for the 9000 will form the standard for all Harris and Lanier networking, the firm said.

REJECTS BID: British computer maker International Computers Ltd.(ICL) said a takeover bid of $516 million from Standard Telephones & Cables PLC of London was too low and immediately rejected it. At press time, the suitor said it was going ahead with its offer anyway and said it might raise its bid to make it more appealing to ICL stockholders. If such a deal went through, the resulting company would have total revenues of $2.64 billion, making it the largest British electronics company. Standard Telephones, until recently a wholly owned subsidiary of ITT in the U.S., had quietly purchased 9.8% of ICL's stock on the open market before announcing its surprise offer for the entire company.

CHOOSES NATIONAL: Burroughs Corp. said it is developing a new line of 32-bit office systems to be based on National Semiconductor's 32000 microprocessor. That makes Burroughs the first major oem to choose the National chip, which is being marketed jointly by National and its second source, Texas Instruments. No timetable was given for delivery of the new systems, but Burroughs said the development would have no impact on its current ties with Convergent Technologies, which supplies Burroughs with workstations and small computers.

FUNDS STARTUP: Schlumberger Ltd. has committed to spending $6 million to $12 million on Encore Computer Corp., a year-old startup developing a family of interconnected parallel processors. The seed money is part of a $20 million private placement Encore is about to complete, far short of the firm's original $40 million to $50 million goal. Encore, founded last year by ex-Prime president Kenneth Fisher, ex-Digital Equipment engineering vice president C. Gordon Bell, and ex-Data General executive Henry Burkhardt III, has not yet chosen the microprocessor that will be at the heart of its product line, but it is said to be leaning toward the National Semiconductor 32000 chip. Schlumberger subsidiary Fairchild Semiconductor is a second source supplier of that chip. Encore hopes to introduce its line of 1 MIPS to 100 MIPS machines in early 1985.

TIDBITS: Thomas A. Vanderslice, former president and chief operating officer of GTE Corp., was named president and chief executive officer of Apollo Computer Inc., Chelmsford, Mass. He takes over from Charles P. Spector, president, who assumes duties as vice chairman of the board. . . .VisiCorp sold its VisiOn integrated PC software to Control Data for an undisclosed sum. The software, which generates windows to run separate tasks concurrently, has sold poorly against such competitors as Ashton-Tate's Framework and Lotus Development's Symphony. . . .The General Accounting Office recommended that the Social Security Administration (SSA) reconsider a decision to purchase $16.2 million of additional equipment from Paradyne Corp., which last year was charged with fraudulently obtaining a $100 million contract from the SSA. Paradyne terminals were found to be breaking down at a rate "three to four times" greater than similar terminals from other vendors. ◉

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Fiber optics is getting a lot less exotic and a lot more useful. It isn't just for telcos anymore.

OUT OF THE LABS AND INTO THE STREETS

by Peter G. Balbus and Joseph L. Healey

Fiber optics is a bright idea whose time has come. No longer a laboratory curiosity with specialized telco applications, fiber optics has burst into the real world, offering unique capabilities at a good price. Barely 15 years old, fiber optic technology has now advanced to the point where fiber systems present viable alternatives to copper wire and coaxial cable in many telecommunication networks.

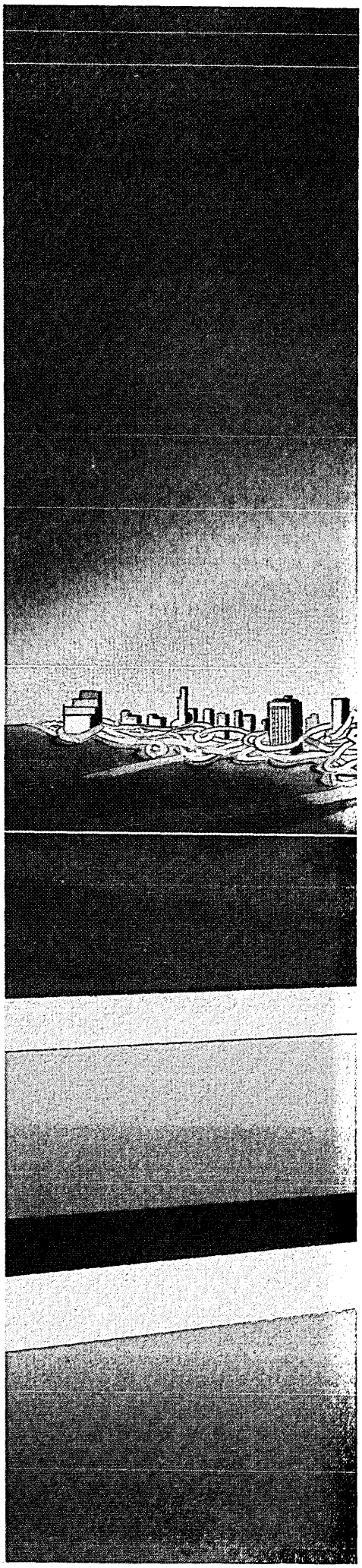
Demand within the telephone industry has led to technological advances and cost reductions for fiber optic cables, couplers, multiplexors, modems, and other components; this process is bringing fiber optics within the reach of users with moderate communication requirements. In the world of PBXs, Intecom uses fiber optics for communication between different components of its switch. Another good indication that fiber optics has gained commercial acceptance is the recently unveiled IBM cabling plan, which incorporates a fiber optic transmission option.

Ungermann-Bass and Siecor, Hickory, N.C., are offering a fiber optic local network based on UB's Ethernet implementation and Siecor's fiber optic transmission. (Fig. 1 illustrates the fiber optic Ethernet.) And ANSI is working on a standard—the fiber distributed data interface (FDDI)—for a 100Mb fiber optic token passing ring.

Thousands of commercial organizations, including firms doing business in banking and finance, electrical power, insurance, oil, and securities have used fiber optics to meet a variety of communication needs. For example, Merrill Lynch selected optical fiber from New York Telephone as the principal medium for its advanced telecommunication network, Mernet I. Mernet I supports high-speed telecommunication between Merrill Lynch's New York executive and sales offices, and floor brokers. The company chose the fiber solution largely because of delays in obtaining conventional high-capacity circuits from AT&T and NYNEX. Other important considerations included data reliability and security, media cost, expandability, and ease of installation. It uses General Datacom Megamuxes to transmit data and 32Kbps voice (half the speed of conventional voice) within the New York City area.

Citibank, also based in New York, operates an extensive fiber optic network that links its five major corporate centers in midtown and downtown Manhattan. The corporate network supports voice, data, and video communication over nearly 400 separate channels. According to Michael A. Laviola, assistant vice president of telecommunication, "Citibank decided in 1981 that the growing demand for high-speed digital transmission would be best served by the installation of a multinode fiber optic cable network connecting the major Citibank buildings."

Although many users might have preferred a turnkey solution from a vendor such as Western Union or ITT, Citibank chose to undertake network design and implementation without resorting to a turnkey vendor. Citibank engineers were thus able to concentrate on technical matters rather than contract negotiations and management. As a result, according to Laviola, "system cutover was expedited by at least a year." Citibank's freedom from contractual constraints provided the additional benefit of increased flexibility during system implementation. This flexibility allowed changing network requirements and scheduling priorities to be readily accommodated without the cost escalation likely to have been imposed by a prime contractor. At the current rate at which tariffs are rising, Laviola estimates that Citibank's payback period will be less than four years. "From the



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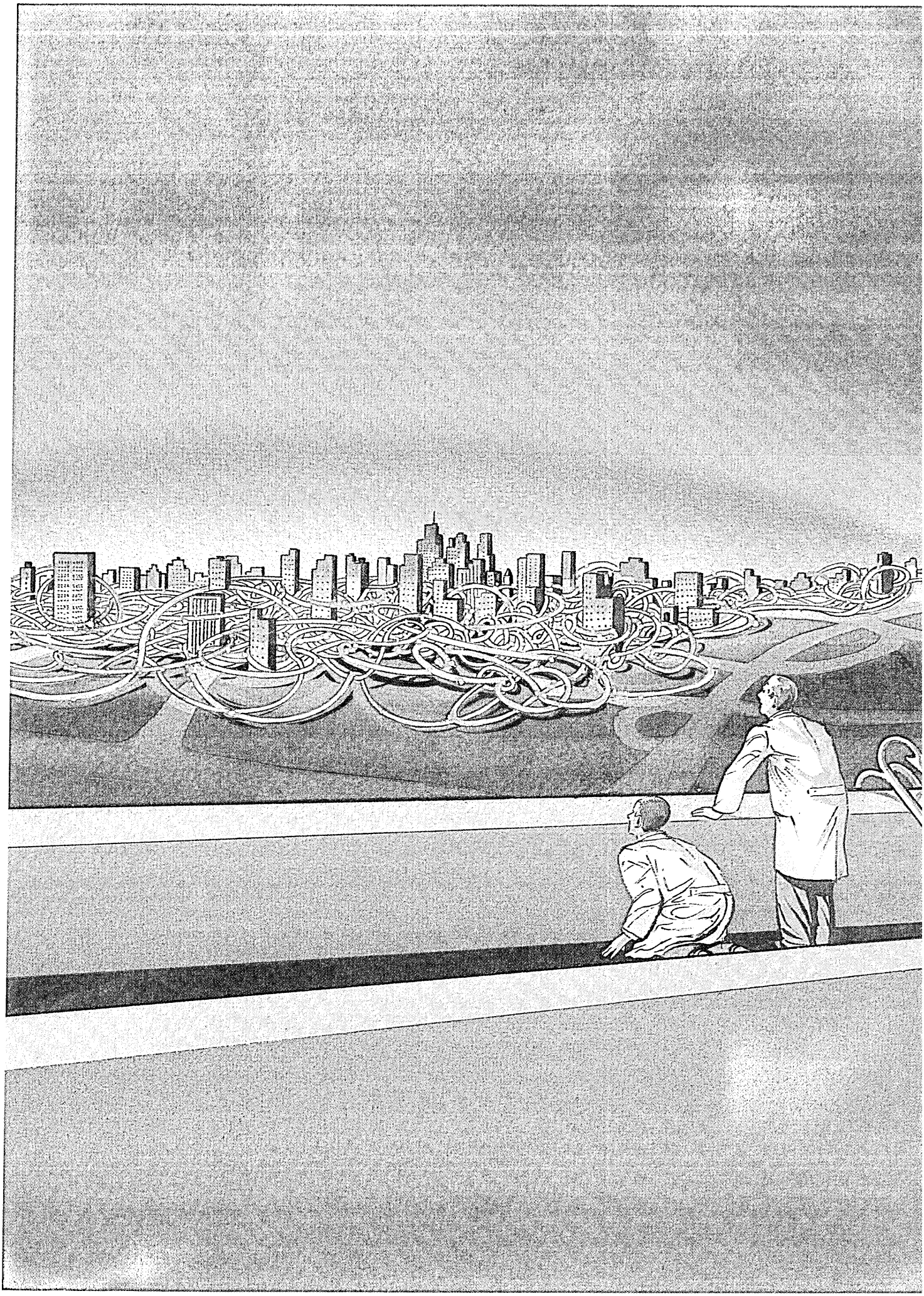


MANAGING A FIBER OPTIC INSTALLATION

To give readers an idea of what's involved in managing a sizable fiber optics implementation, we've assembled the following composite case study, based on Network Strategies Inc.'s experience with several client projects.

Joyce Industries, a large manufacturing concern, has a number of sites in the suburbs of Boston. Three large facilities—corporate headquarters, the principal manufacturing plant, and the R&D division—are within 10 miles of one another, arranged roughly in a triangle.

Joyce is experiencing three problems with its existing intersite telco facilities: poor transmission quality, rising tariffs, and insufficient capacity for future requirements. The quality and capacity problems are the result of old facilities that are unlikely to be replaced in the near future. Future local rates are uncertain, but recent actions of the local public utility commission foreshadow substantial hikes for businesses—more than Joyce's facilities usuage alone can justify. These three problems motivate the telecom manager—we'll call him Hestapik—and his department to undertake a study of the company's telecommunications needs and network alternatives.

Their first task is to perform a requirements analysis of existing and future communications needs. Voice, data, and some CAD/CAM applications currently dominate the existing traffic. Analysis of the data traffic indicates that most of it is being carried over leased lines at 9,600bps. The voice traffic has one striking feature: some of the calls are more than four hours long! Further study reveals that the timesharing system has many dial-up users who are on the system for extended periods of time. The study also finds that considerable managerial time is being used for travel to relatively short, local coordination and review meetings at various company sites.

Based on these findings, Hestapik issues an RFP to a number of vendors of turnkey communications systems, including the telephone company. The vendors selected represent a variety of transmission technologies—high-speed leased lines, coaxial cable, microwave, and fiber optics. Other options, such as satellites, cable tv, and infrared transmitters, are deemed impractical for Joyce and ruled out from the start. Otherwise, Hestapik's RFP does not presuppose a solution, and requires that the vendors address the issues of quality, capacity, and price assurance. The vendors are instructed to segregate installation and maintenance costs, and to provide guaranteed maintenance costs for the next five years.

Evaluation of the proposals turns out to be more difficult than anticipated because of the wide range of services and facilities. Each of the vendors has different strong points, and each of the various technologies has both advantages and disadvantages. Microwave, however, is quickly eliminated due to local zoning and geography: line-of-sight between the buildings is not possible, and local ordinances and public sentiment make microwave repeaters difficult to install. Joyce does not want to jeopardize its public standing. The telephone company proposes the use of existing T1 facilities, but cannot guarantee long-term prices. Coaxial cable is a strong contender, but compared with fiber optics is too expensive to install and maintain.

In the end, fiber optics emerges as the best choice; the company will get good performance for its money, and also the flexibility to rapidly and easily add new facilities, such as another T1 link. Obtaining rights-of-way to install the optical fiber seems straightforward—Joyce can simply work with the local municipalities.

Hestapik's telecom department is relatively small, and has no installation or operational expertise in fiber optics. It seeks to acquire a turnkey installation from a vendor who can provide rapid response in case of a failure (a potentially crippling event that's expected to be very rare). In essence, the vendor has to install the fiber optic system, provide routine checkups and preventive maintenance, and respond in force in the event of a failure. Joyce is unable to find this ideal vendor, and the contract is awarded to a national firm with extensive experience and a large local office. Joyce Industries decides it will have to be responsible for all the network outside the fiber optic transmission facilities.

Selecting a system vendor is, of course, only the beginning of the system installation and implementation. The more critical installation and implementation issues include failure recovery, premises equipment selection, and operations. Joyce departments are going to be individually charged for their use of the fiber optic network. The communications department is aware that they themselves will be "bypassed" if network performance is not up to par.

Hestapik has organized his department into a number of small working groups: voice applications, data applications, premises equipment (PE), failure and recovery, installation, and testing and cutover. Hestapik serves as chairman of a steering committee whose members are the managers of these working groups. While putting this organization in place, he added several new staff members qualified to aid in the implementation and management of the new network.

Since failure and recovery are major concerns, Hestapik's groups decide to install three links—one between each site—rather than just two. Each site has two links that enter the building through separate facilities, so that the failure of any one link will not interrupt service. Critical circuits are identified and ranked in order of importance through the use of a failure tree that categorizes the different types of failures. In the event of a failure, critical traffic takes precedence over noncritical. Voice traffic is considered the least critical because it can use the public telephone network in case of failure.

As an additional precaution, the telephone systems are overconfigured with outgoing and incoming trunks so that a network failure will not affect the performance of the voice network. At each site, switching equipment is installed so that circuits can be rerouted or disconnected. Voice switching is handled via a remote access switching patch (RASP), data switching via a matrix switch. Fig. A illustrates Hestapik's design concept. While planning for failure recovery, Hestapik finds himself walking a fine line between ensuring adequate backup facilities and avoiding an overpriced system.

While the failure recovery planning is under way, selection and installation planning are also taking place. The

financial point of view," he concluded, "this would classify the fiber optic network as a very successful system at Citibank."

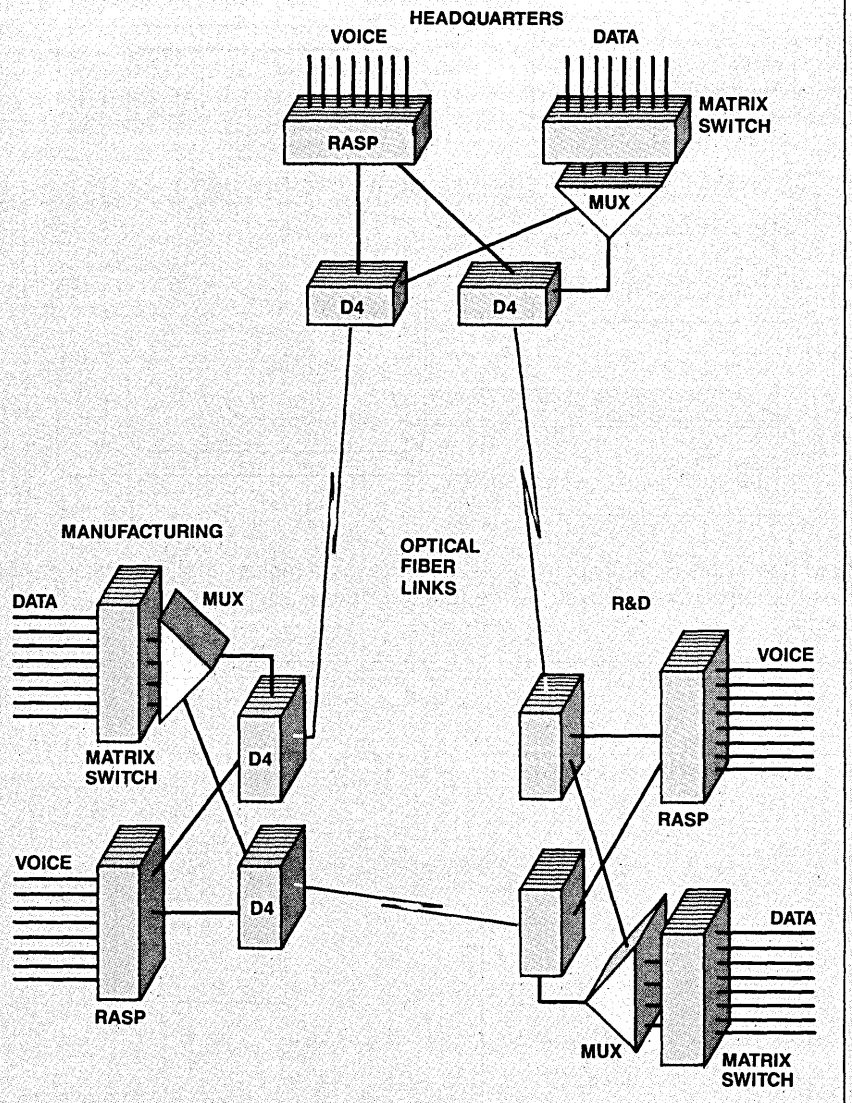
FIBER REPLACES COAXIAL

The engineering management of another large, diversified financial institution faced a major problem: the firm's five-by-seven-foot cable raceway was virtually filled with coaxial cable and twisted pair trunks. Yet rapid corporate growth demanded substantial new communication capacity; the operations department, for example, was in the process of acquiring an additional 200 interactive terminals. The solution: all coaxial cable was replaced with a single two-inch optical fiber cable.

Irv Becker, MIS director for a large East Coast hospital, turned to fiber optics as a solution to several problems. "I found myself in a terrible predicament," he says. "I was looking for a way to eliminate data errors in patient monitoring equipment induced by ground faults, lightning surges, and electromagnetic interference. We were also in the process of installing more terminals and our conduit space was rapidly becoming clogged." Manufacturers of regular cable would not guarantee that the network would function if any terminal was more than 50 feet from the host. "Some of my terminals were going to be over 400 feet from the host," he says. Rather than rely on traditional metallic media, Becker installed seven optical fibers that supported

FIG. A

FIBER OPTIC NETWORK



premises equipment group has to satisfy the failure recovery requirements, which means that the failure and PE groups have to determine what is not possible, and decide between cost and capability. The PE group decides upon telephone company standard D4 (T1) channel banks. Working closely with the operations department, the PE group also discovers that clear demarcation points between the different pieces of equipment are necessary for maintenance and problem identification. To their relief, they find that a number of vendors provide the equipment needed—analog switching systems, intelligent multiplexors, D4 channel banks, and test and monitoring equipment—and that costs are competitive. The final responsibility of the PE group is the mundane, but critical, site preparation: ensuring that adequate space, air conditioning, and reliable power are available.

The final element of the installation is testing and cutover, handled by the testing and cutover working group. Precutover testing is performed for each link, measuring bit error rates for data lines and transmission parameters for voice lines. Testing is also performed on lines that pass through two fiber optic links to ensure that no timing problems or transmission impairments develop. The fiber optic links are also submitted to rigorous testing, but this testing is the responsibility of the fiber optic system vendor.

For the actual cutover, the team installs A/B switches that switch between the existing facility and the network. These switches make precutover testing possible and allow fallback to the old facilities in the event of a postcutover failure. After a few months of smooth operation, the A/B switches are removed and the old facilities permanently discontinued. The cutover is performed on one fiber link at a time.

The final stage is day-to-day operation of the net. Joyce has configured the various control devices into a network control center, and it operates around the clock, responding to failure reports and also identifying problems before they become serious. Automated test equipment enables this control center to isolate failures within a particular piece of equipment. It can also remotely reconfigure the network to bypass any single point of failure.

Now the network is up and running. No major failures occur, although several individual circuits are briefly lost. Joyce plans to experiment with new services, such as teleconferencing through the fiber facilities. Teleconferences will be scheduled events that temporarily displace voice traffic.

Users are satisfied with the quality and reliability of the fiber network, and the ability to quickly add new high-speed CAD/CAM links has already proved valuable. Once the network has established a longer record of reliability, Joyce may distribute its computer facilities to reduce its vulnerability to a single-site failure.

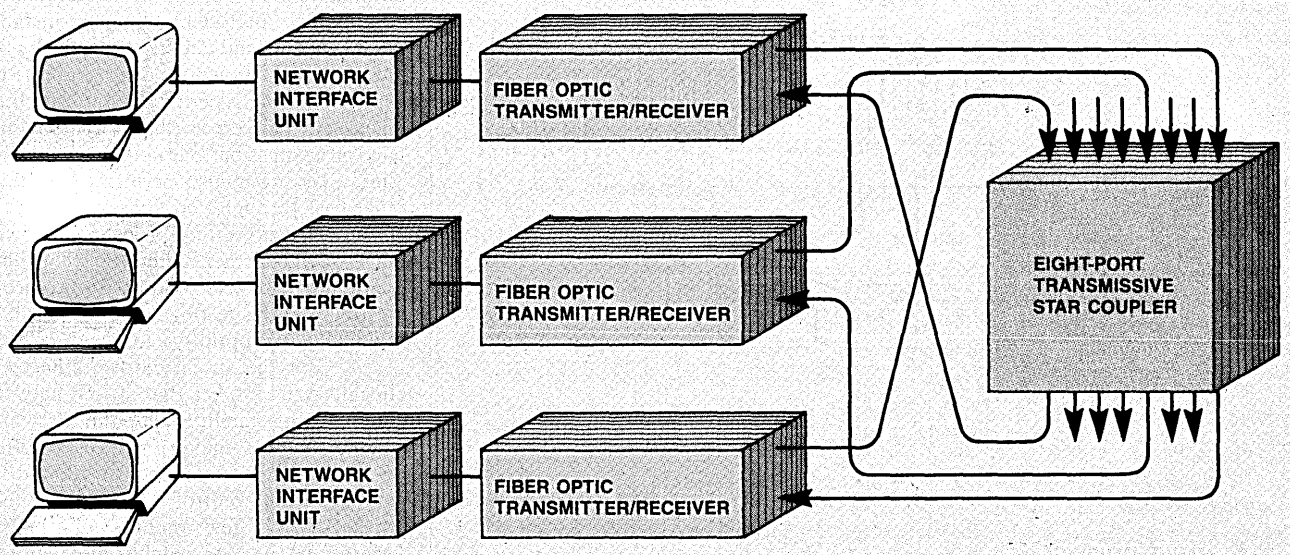
his patient monitoring equipment and also served as the backbone for 105 new terminals. The solution was powerful yet economical. "The cost for the fiber optic system was less than $400 per terminal," he says.

The Virginia Electric Power Company installed optical fiber links in many of its telemetry circuits, primarily to eliminate erroneous readings induced by nearby high-voltage transmission lines. Tom Holter, the company's director of MIS, emphasizes the reliability of data transmitted via optical fiber. "Problems such as high-frequency arc noise, induction, and ground potential rise have been totally eliminated with our fiber optic lines. Now we can place greater reliance on our numbers since false readings resulting from transmission errors are no longer a concern."

John Steitz, director of MIS and telecommunication for a San Jose, Calif., defense contractor, chose fiber for his firm's 700-node star network. "We went with fiber optics for two reasons," Steitz says. "First, it offers much higher usable bandwidth than either coax or twisted pair. Secondly, it met our Tempest [a government security specification] requirement." Settling on fiber optics was not an easy decision, however. "Our biggest difficulty was finding people who could answer our questions, " he explains. "We were looking for someone who could tell us what we needed, what we didn't need, and why." In fact, many potential users are reluctant to try fi-

FIG. 1

FIBER OPTIC LAN CONFIGURATION



Because fiber optic cable cannot be tapped easily, this Ethernet-compatible local network employs a physical star configuration. The central repeater provides the logical bus required by the Ethernet specification by broadcasting terminal output to all receivers on the network.

ber optics because expertise in the technology is still in relatively short supply.

Vendors echo this concern. Corning Glass Works, Corning, New York, is a leading manufacturer of silica and plastic optical fibers. Marketing supervisor Dave Charlton counsels that one of the pitfalls user organizations may face is an optical fiber distributor that is not sufficiently knowledgeable to recommend a custom solution. He warns that many local distributors "may not be able to offer the handholding, service, familiarity with technical issues, or experience managers may be seeking."

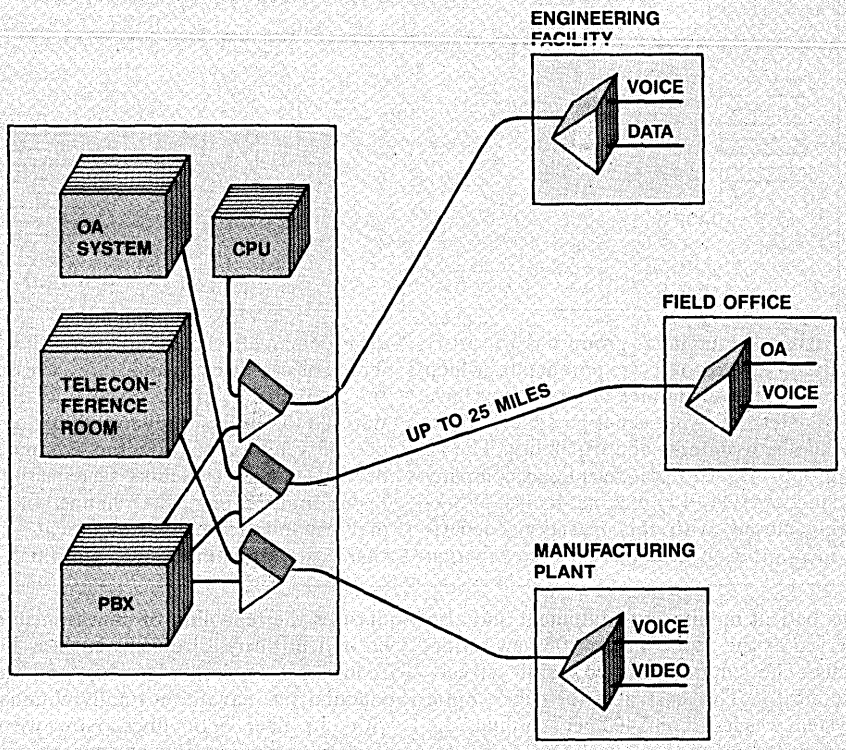
STAYING CLOSE TO TELCO

Charlton recommends that managers considering fiber optics for high-speed transmission over distances in excess of a kilometer should stick to standard solutions that are based on proven technologies. Although a nonstandard solution may save money up front, over the long run maintenance and operational costs may wipe out the savings. It's wise to design around telco-compatible products—those with 50-micron core and a .20 numerical aperture (a measure of the light-gathering capability of a fiber). "Staying close to the telco world is really essential for implementing a cost-effective network," Charlton says. "The key strategic issue for fiber optics planners should be, 'How can I, as an industrial consumer, take advantage of telco technology, instead of resorting to a custom solution?' "

The demand for fiber optics knowledge has spawned scores of startups that

FIG. 2

INTERBUILDING FIBER OPTIC NETWORK



Fiber optic cables run between a headquarters building and several local manufacturing and administrative sites. The central PBX can be utilized as a tandem switch for external communications, achieving higher utilization of telco facilities such as WATS lines.

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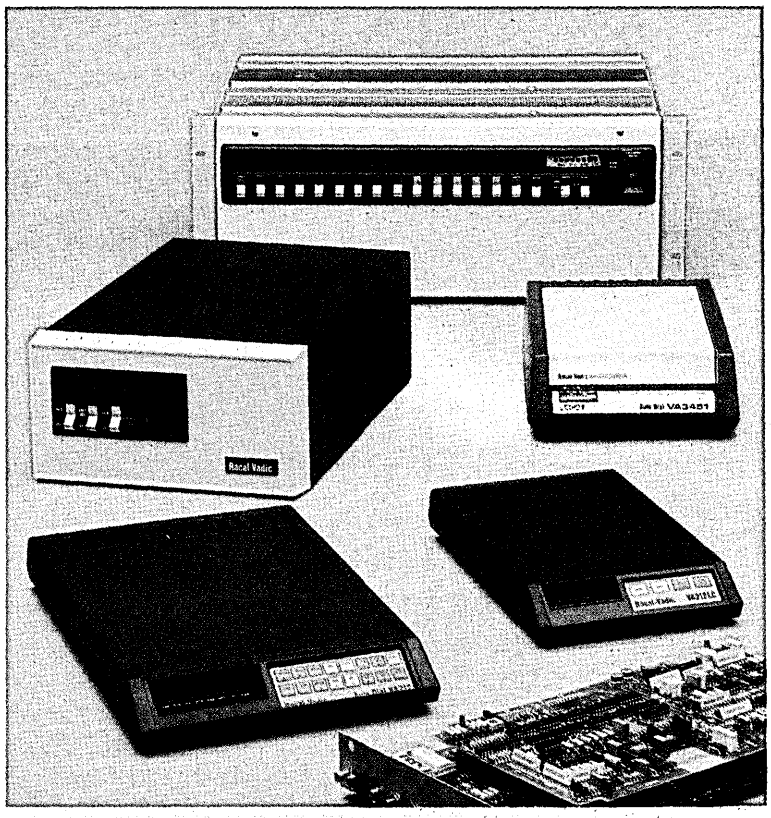

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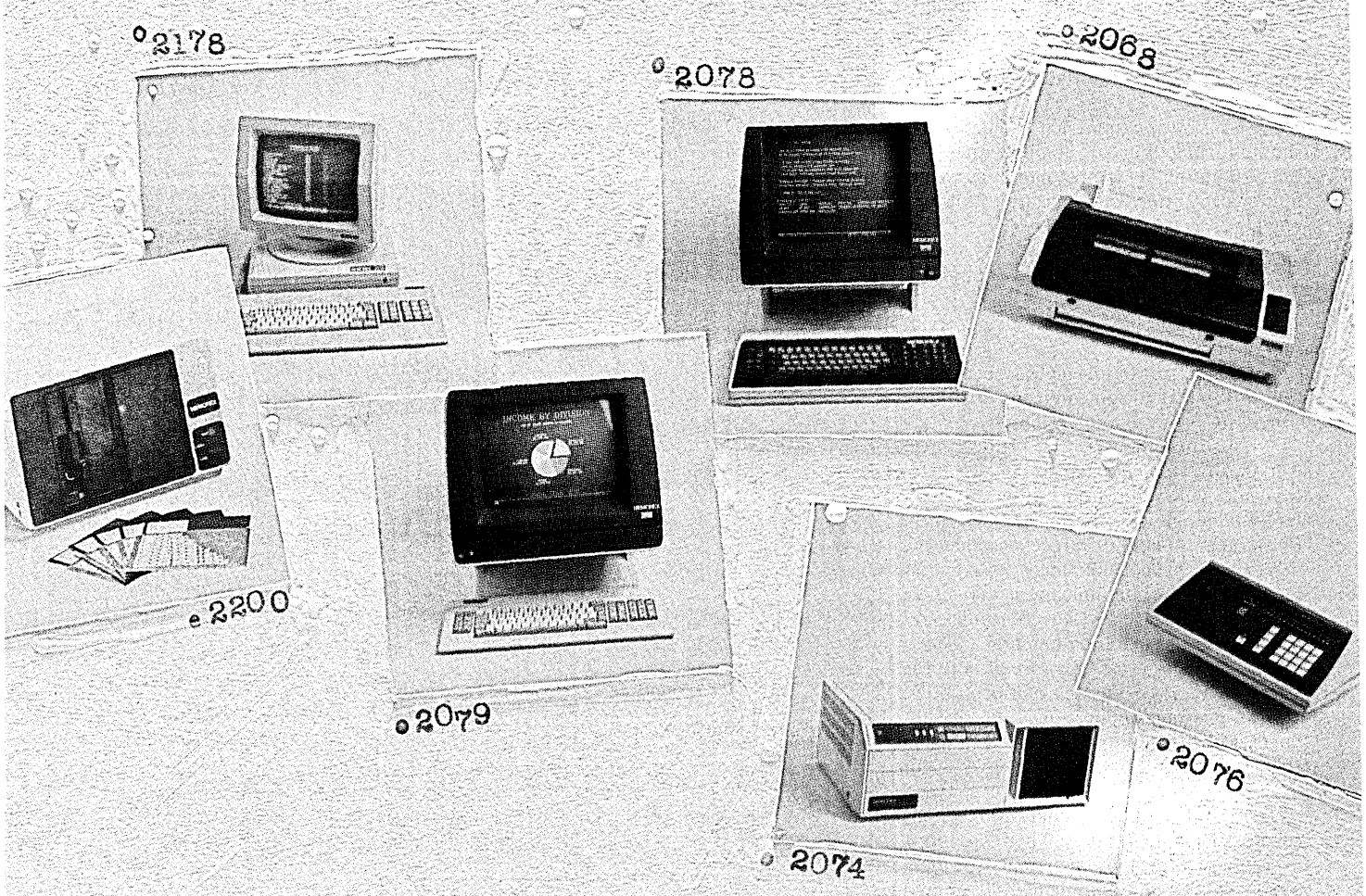

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Freedom from rising tariffs, plus a short payback period have made Citibank's fiber optic network very successful.

provide assistance in network planning, routing and right-of-way acquisition, cable installation, and maintenance. Sylvia Blanco, an independent consultant based in Gaithersburg, Md., notes that "many managers are reluctant to try fiber optics because it's foreign to them and they are uncomfortable with the notion of building networks supported by fibers no thicker than the hair on their heads. More than three quarters of my job consists of educating clients so they can make intelligent decisions."

For the astute manager, fiber optics presents multiple opportunities—cost reduction, cost avoidance, enhanced flexibility, and the capability of offering new, advanced services. Incorporating fiber optics in the right place at the right time in the right way may very well provide the manager, and the manager's company with a leg up on the competition. To avoid costly blunders, however, the manager must approach fiber optics planning and implementation in an intelligent, systematic manner.

A strategic approach to fiber optics should include four key components:

- incorporating fiber optic options as an element of long-range communication planning;
- identifying targets of opportunity for incorporating fiber into existing communication systems;
- acquiring expertise through hiring, training, or contractors;
- maintaining staff currency in fiber optics technology through ongoing training programs.

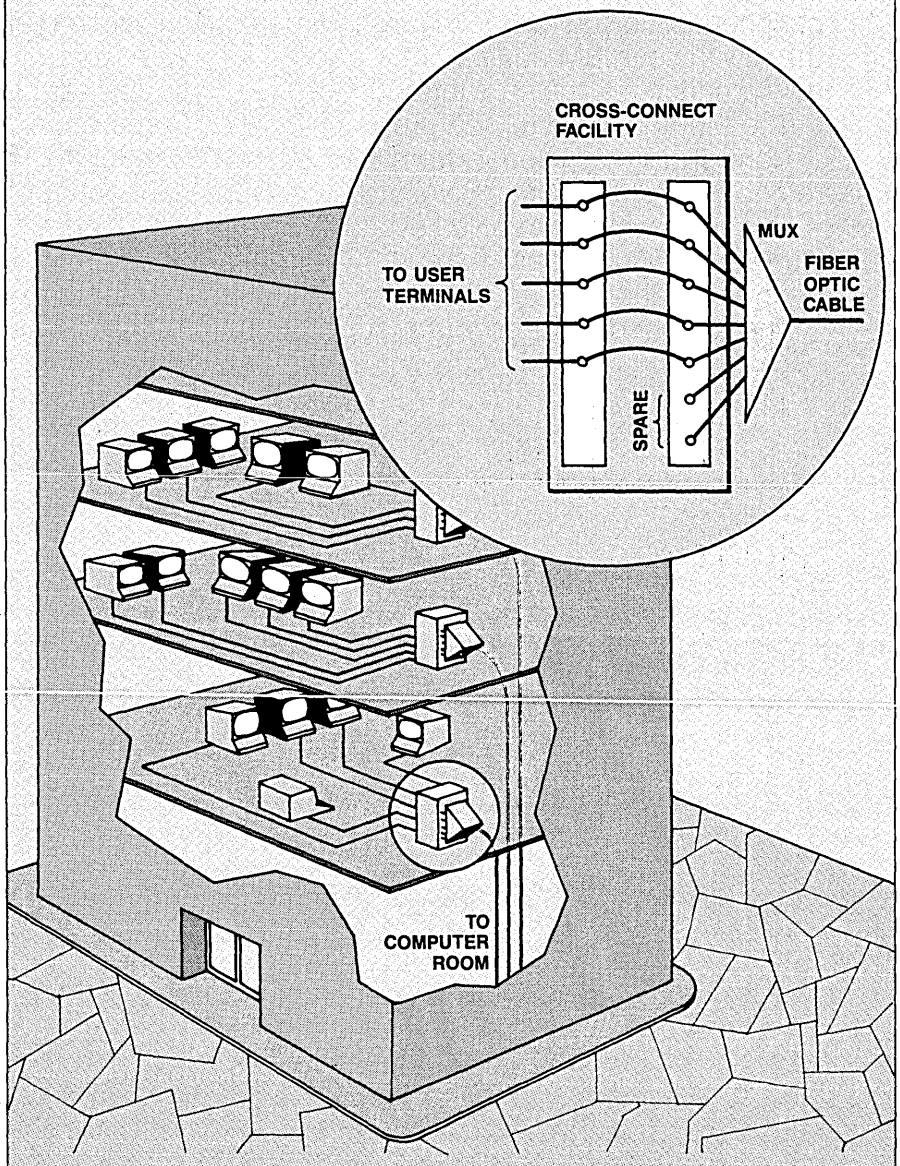
Because the large fiber optic system is typically implemented as an organizationwide communication utility, an ancillary advantage of including the system in the strategic planning process is that the departments responsible for voice communication, data communication, and office automation are forced to coordinate requirements and planning functions.

Planners must be aware of both the strengths and weaknesses of fiber optics. Knowing which applications are not suitable for fiber is as important as recognizing the ones that are. In the next few years, for example, fiber optics will not replace twisted pair as a method of connecting phone sets to telephone systems. There are, however, many targets of opportunity for managers who want to implement fiber and thereby gain knowledge and experience for future applications.

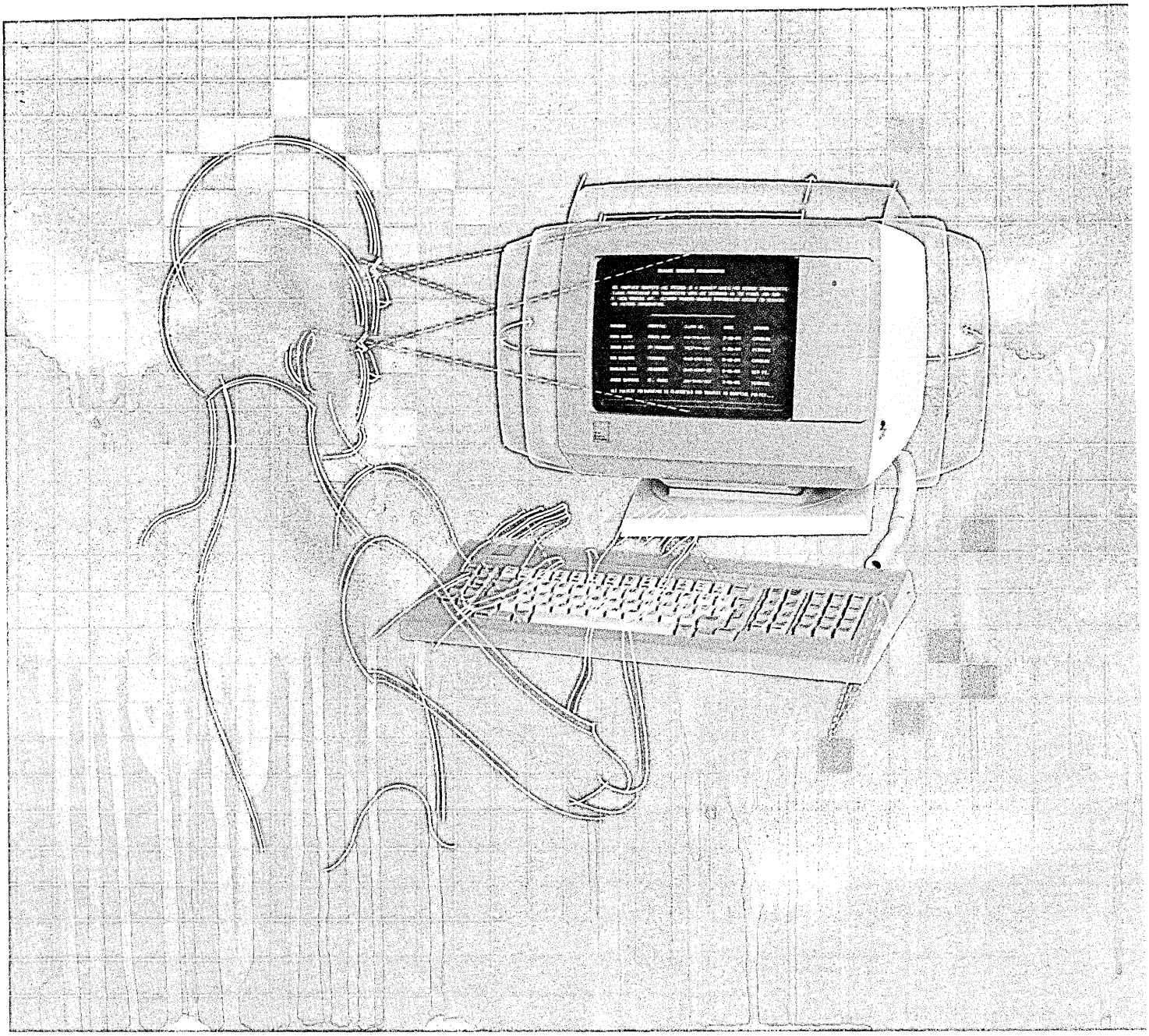
Ongoing network upgrade programs, or a need for interbuilding communication links or even low-speed point-to-point links may all represent a chance to move into fiber optics. The common element in all of these targets is that each could be satisfied through traditional technologies, such as coaxial cable, perhaps combined with multiplex equipment. Fiber optics, however, would probably serve at least as well, and would provide the added benefit of experience. Downside risk can be minimized by selecting small targets and then graduating to larger opportunites. Successful pilot projects will go a long way toward creating a positive impression in the

FIG. 3

INTRABUILDING FIBER OPTIC CABLING SCHEME



Fiber optic cables run to each floor of a building where they are demultiplexed and attached to one side of a cross-connect facility. User terminals are connected to the other side of the cross-connect facility and are bridged to the fiber optic terminations. A new user is simply connected to one of the spare channels; if a user leaves, his previously busy channel becomes a spare.



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Maintenance and operational costs may wipe out the savings from a nonstandard solution.

minds of upper management and toward laying the groundwork for larger projects.

Staff training and the acquisition of expertise rounds out the four strategic components—and need not be expensive. Communication conferences with fiber optics sessions are fertile ground for learning. Staff currency in fiber optics, as in other communication technologies, should be maintained through training seminars, vendor-sponsored classes, and reading. Seminars dedicated solely to fiber optics are not generally necessary nor desirable; they may tend to present fiber optics as being more than just one transport option among several, and place undue emphasis on what is really just one component of a telecommunication network. It will be necessary for some staff members and technicians to become expert in the installation, operation, and maintenance of fiber optic systems. One excellent method of acquiring this expertise is through vendor training programs.

FIG. 4

FIBER OPTICS VS. OTHER MEDIA

	TWISTED PAIR WIRE	BASEBAND COAXIAL CABLE	BROADBAND COAXIAL CABLE	FIBER OPTIC CABLE
Partial bandwidth	1.5Mbps	10Mbps	400MHz	Greater than 150Mbps
Media expense ($/km)	300	1,500-5,000	1,500-5,000	300-6,000
Coupler/ terminal hardware expense	Low	Mod	Mod	High
Installation expense	Low	Mod	High	Low
Cable weight: (kg/km)	50	75-750	150-1,500	30-170
RFI/EMI susceptibility	High	Mod	Low	None
Freedom from crosstalk, echoing, and ringing	Low	Mod	High	Very High
Spark hazard	High	High	High	None
Data transfer reliability	Low	High	High	Very High
Transmission security	Low	Low	Low	High

TWO AREAS FOR LARGE FIBERS

Large fiber optic applications fall into two categories: interbuilding communication and intrabuilding communication. Interbuilding fiber, used in environments where the buildings are separated by a limited distance (from a campus environment up to about 25 miles), is oriented toward point-to-point, high bandwidth applications combining voice, data, and possibly CAD/CAM or teleconferencing. The primary motives are cost reduction, facilities quality improvement, and the flexibility to quickly add lines or offer new services. (Fig. 2 illustrates an interbuilding fiber optic network.)

Intrabuilding fiber optics is oriented less toward identifiable cost reductions and more toward increasing the flexibility and quality of communication facilities. The objective is to simplify communication—by eliminating the need to pull new cable each time a new terminal is installed, and by improving transmission quality. Fig. 3 illustrates an intrabuilding fiber optic cabling scheme.

It is important to remember that fiber optics is just another transmission mechanism (see Fig. 4 for a comparison of fiber optics with other media). No particular magic is associated with a T1 (1.544Mbps) link over optical cable versus a T1 link over coaxial cable or twisted pair. Thus, if the local telephone company is willing to provide transmission facilities, either on a tariffed or untariffed basis, there is no reason for worrying whether the facilities are optical or not. In discussing such facilities with the telco, it is worth noting that the local telephone companies are making concerted efforts to retain their existing customers, especially those that are large enough to consider bypass. Firms including fiber optics in the planning process will have another bargaining chip in their discussions with the telco.

One other factor to consider, especially when high-capacity fiber is contemplated, is that a failure has a drastic effect on the communication system. This kind of vulnerability already exists in many companies because of nondiverse telco routing, but concentrating traffic on private fiber facilities makes the problem more obvious, especially to upper management. Thus, it's important to develop failure and disaster recovery strategies. Organizations using fiber optics for local distribution must assume responsibilities that were formerly the telephone company's, including performance monitoring, network control and operations, troubleshooting, and capacity planning. These functions often involve unexpected network expenses.

Fiber optics, then, is not a panacea. It is, however, a powerful new technology with some unique advantages and some clear-cut applications. Innovative managers who implement fiber optic systems now will gain valuable insight and experience for the future. ◉

Peter G. Balbus is a consultant at Network Strategies Inc., Burke, Va., a management and engineering consulting firm specializing in telecommunication. His client activities focus on strategic planning issues associated with communication technology, management, and policy.

Joseph L. Healey is group manager for voice and local communication systems at Network Strategies, specializing in local area networks and integrated voice/data/video communication.

Paper-thin gallium arsenide solar cells have been fabricated using methods identical to those used for making conventional gallium arsenide cells. The new cells would reduce the weight of a spacecraft and hence the cost to launch it. The new thin cells exhibit an efficiency of greater than 16%. A typical cell is approximately 70 micrometers thick and weighs 0.2 gram. The demonstration proves that Hughes Aircraft Company research scientists can transfer experience, techniques, and processing steps for making conventional cells to the thin cells.

Hybrid integrated optical receivers have been developed by Hughes research scientists for transmitting microwave-modulated optical signals over fiber-optic links. The receivers are part of an effort to find inexpensive links for such applications as phased-array antennas, satellite ground stations, radars, and communications systems. Each receiver consists of a high-speed gallium arsenide Schottky photodiode developed at Hughes and a low-noise amplifier using commercial gallium arsenide field-effect transistors. These receivers are designed to operate at a modulation frequency of 3 GHz with a 1 GHz bandwidth. Their advantages over discrete components include better sensitivity, lower noise, and the elimination of ripples in the frequency response caused by impedance mismatch between detectors and commercial amplifiers.

A family of redundant control units for satellite communication uplink amplifiers has been introduced by Hughes. The new control units, designated the 9300HA series, are designed to provide fully automatic monitoring and switching for redundant operation of two or more high-power amplifiers (HPA). The units consist of one rack-mountable drawer containing an RF-switched, high-power load. They can be operated at C-, X-, or Ku-band, and are compatible with the complete line of Hughes HPAs.

In the last 20 years, over $611 million in savings have been negotiated by Hughes and the Department of Defense as a result of engineering proposals for cutting costs of military systems. Since the inception of the Value Engineering program, Hughes has had 675 proposals accepted in 50 programs. The changes stemmed from advanced technology that was not available at the time the original contracts were signed. They resulted in substantial improvements in quality, reliability, producibility, and life-cycle costs. Savings amounted to 3% of Hughes sales during the period, with the U.S. government's share amounting to nearly $500 million. The Value Engineering program is designed to encourage employees to look at the functions of a product and develop alternatives that cost less, perform better, and improve reliability.

Hughes Missile Systems Group, located in Canoga Park, California, an attractive suburb of Los Angeles, is seeking engineers and scientists for such developmental and engineering programs as AMRAAM, multimode guidance, Phoenix, and IR Maverick. Openings are in radar and electro-optical systems design, systems software and hardware/software integration, analog and digital circuits design, hybrid process engineering, systems performance, and microwave and power supply/transmitter design. Qualified applicants are assured prompt replies. Please send resume to Hughes Engineering Employment Manager, Dept. S3, Fallbrook at Roscoe, Canoga Park, CA 91304. Equal opportunity employer. U.S. citizenship required.

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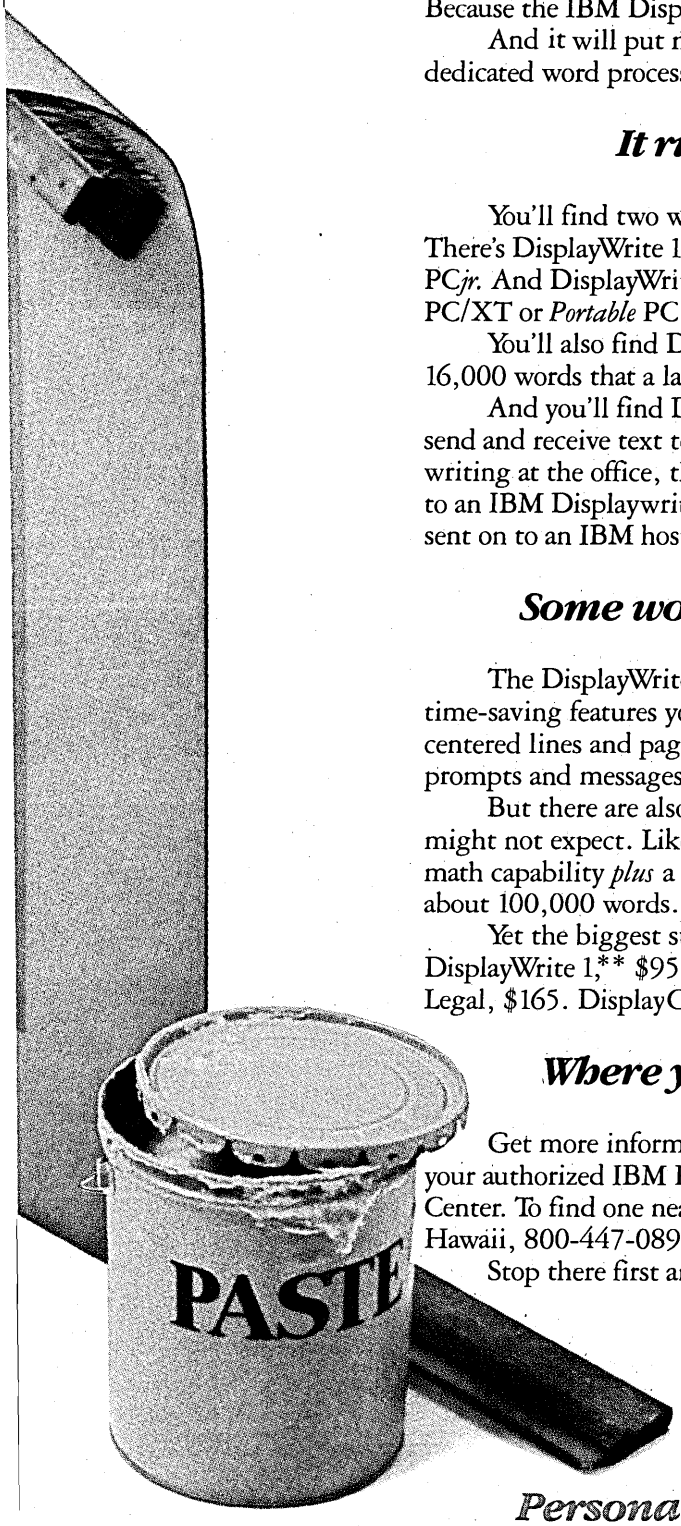

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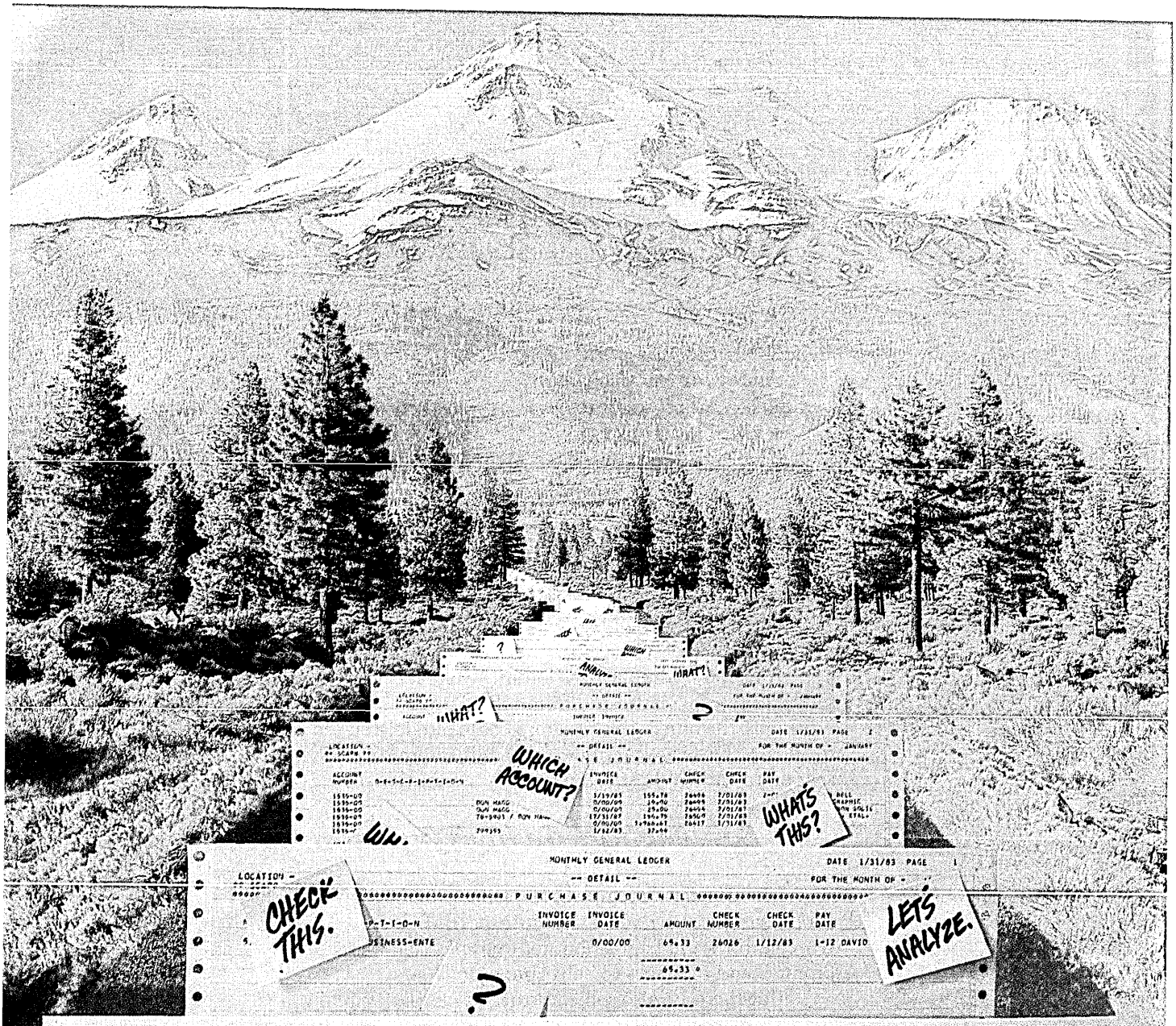

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What's next in programming languages? A computer scientist who knows some history offers some thoughts on the future.

NTH GENERATION LANGUAGES

by Richard L. Wexelblat

Language makes a hard mistress and we are all her slaves. It is difficult to exaggerate the influence she exerts upon our lives yet she is so aloof and mysterious. Anyone who would consort with her, to study and understand her, lays himself open to a severe discipline and much disappointment.

—Colin Cherry, *On Human Communication* (MIT Press, 1966)

I was asked by my friendly neighborhood DATAMATION editor to write an article on what the next generation of programming languages might look like. Instead, I wrote this article. Persevere, however. I do eventually get around to talking about how I would like to communicate my needs to the computer; but first let me give you some background.

A few weeks ago I got a phone call from a friend who was concerned about something happening at a small Midwestern college where he taught part-time. It seems that there was a push to be "relevant," which the college meant to address by introducing a course on fourth generation languages. Now it appears that no one there was sure what a fourth generation language was, but a passing salesman had given them an excellent idea and they were hot to trot.

The salesman had been pushing one of the combined graphics-statistics-analysis packages you read about in DATAMATION ads, and he claimed that the control language for this package was just the fourth generation programming language the college needed. My friend was justly worried that the faculty and (eventually) the students of this college were being taken for a ride and he wanted my opinion on the subject. Here is an edited version of my reply:

"Dear Lance, I was both interested and amused by our discussion of XXX as a "fourth generation language." In my role as editor of *ACM SIGPLAN Notices*, I get to hear a lot about programming languages. XXX is (I am told) a very capable statistical and graphing applications package. As

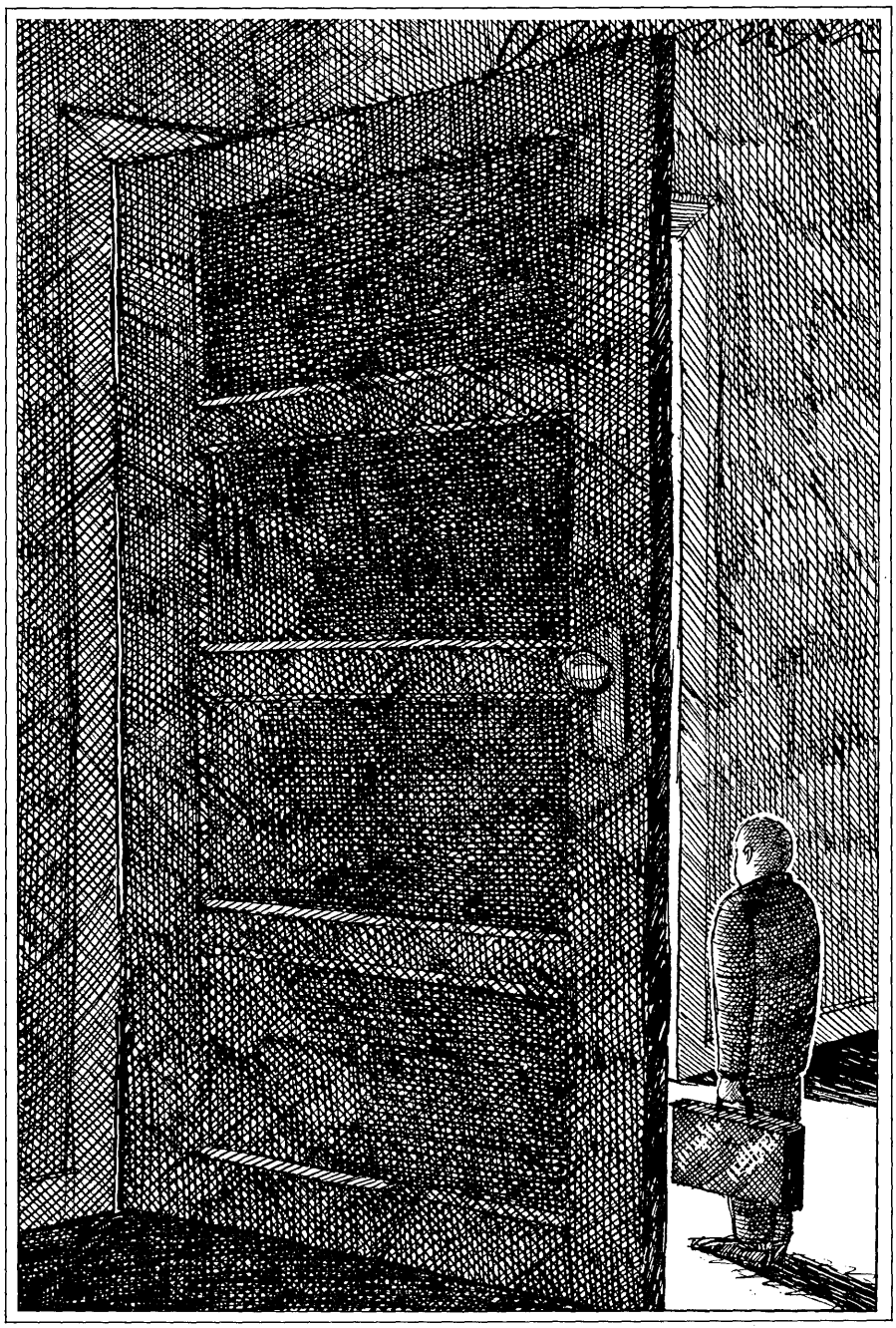


ILLUSTRATION BY ANDRZEJ DUDZINSKI

Although I used to write programs to relax, I find myself rebelling against having to use BASIC or learn C or Pascal.

with most such packages, it has a command language and (again, I am told) this language is good of its type. A command language, however, is by no means a programming language, and if anyone has sold your friends on the idea that it is, they have been sold a bill of goods.

"Let me try to put the question in the proper perspective. FORTRAN (bless its archaic heart) is a programming language. It is prototypical of the second generation of programming languages. Machine or assembly languages were, by the way, the first generation. The people using FORTRAN on your machines cause the programs to compile and run by giving commands in a command language. In the days when I was using FORTRAN on an IBM System/360, I used JCL, a second generation command language. Most timesharing systems today (Unix, e.g.) use what might be called a third generation command language. Many application packages such as XXX, and certain database systems, use more advanced command constructs that might with some looseness be called fourth generation command languages.

"If FORTRAN is a second generation programming language, what then is a third or fourth generation programming language? Well, there is some difference of opinion. Some people think that data and control structures do the trick. By that definition, PL/1 is third generation. Much as I like PL/1, I don't agree with this evaluation. Prevailing opinion seems to be that things like data abstraction and control of asynchronous processes typify the third generation. Thus, Ada and MODULA-2 may qualify.

4TH GEN LANGUAGE EVOLVING

"A fourth generation of programming languages is still in evolution. Prolog (primarily used in Europe) and OPS5 (U.S.) are languages of a new sort. They abstract control to the extreme in that there is no control at all. The languages are rule-based: each statement consists of a condition and an action. If more than one condition is true, then the consequents are executed either in parallel or in random order. It is sometimes held that these languages are derived from Lisp. Not so. They are derived from logic by people frustrated with Lisp's limited ability to do logic programming. Lisp itself, by the way, is a unique flavor of language (as is SNOBOL), completely outside of the first-to-fourth generation sequence I am speaking of.

"Now I will take off my *SIGPLAN Notices* editor's hat and put on another: that of potential employer of programmers for AI and CAD systems implementation. In our AI activities we do now and will continue to need programmers who know or are willing to learn fourth generation languages. If a candidate came in claiming knowledge of XXX as a fourth generation language, we'd politely laugh him or her out of the place. In the CAD area, we would mostly seek people with third generation skills. Again, XXX would be of no use. . . ."

Well, you may or may not be impressed by this little homily. The point is that tags such as nth generation are almost irrelevant. Do you really care exactly what a fourth generation language is? Will it really have advantages over those used today? Let me tell a cautionary tale.

In my youth I experimented with certain drugs, and early became addicted to one known as PL/1. Having started in programming on a machine without floating point, I became deathly afraid of division and took to programming only those tasks that didn't make much use of arithmetic. Today, I am still proud enough to brag that I have never knowingly written a program that uses a floating point divide. Given this aberration, I happily accepted PL/1 since it was the first language of the Algol group I ever met that had built-in support for character strings. In those days I was working on MULTICS and everyone in my extended professional family was using PL/1. Reprogramming the world into PL/1 became my goal. Startrek, Wumpus, plotter graphics, editor, Runoff, all fell victim to my PL/1 habit. When we got our first "glass teletypes," I did the first piece of machine language programmming I had done in years: a channel-level interface to PL/1. I even served as vice chairman of the ANSI group that wrote the original PL/1 standard. In effect, I invested a significant portion of my programming life in PL/1. I know it and like it.

So what?

In fact, I think that my addiction to PL/1 is typical of the addictions of programmers who, having spent years learning the ins and outs of one language or another, are loath to change. The virtues of a new language are almost irrelevant to the massive inertia fighting change. Let's talk about the present generation of languages for a moment. What are they? In alphabetical order: Ada, BASIC, C, COBOL, FORTRAN, and Pascal.

Much as I might wish that one or all would go away, they very likely won't. Tony Hoare, a professor of computer science at Oxford University, has been quoted as saying that he doesn't know what the language of the year 2000 will look like but he knows that it will be called FORTRAN. COBOL-99 and FORTRAN-2000 will be there. The control and data structures of these languages reflect a common basis of experience. They all have massive problems easily recognized by anyone who is not addicted. They are all (yes, even BASIC) difficult to learn, difficult to remember and use. They all have documentation that is barely adequate (yes, even C). And they are all error-prone (yes, even Ada) because they force one to characterize the solution to a problem in the linear, peculiarly constrained template that matches the structure of the Mauchly (sometimes referred to as von Neumann) Machine.

CHOOSING ANOTHER LANGUAGE

At the moment, since I'm not willing to spend the $500 or so it would take to get a PL/1 for my new pc, I must decide what language to use. I have BASIC, C, and Pascal at my disposal. Although I used to write programs as a means of relaxation, I find myself rebelling at the thought of having to use BASIC or learn C or Pascal. The problem is not (I

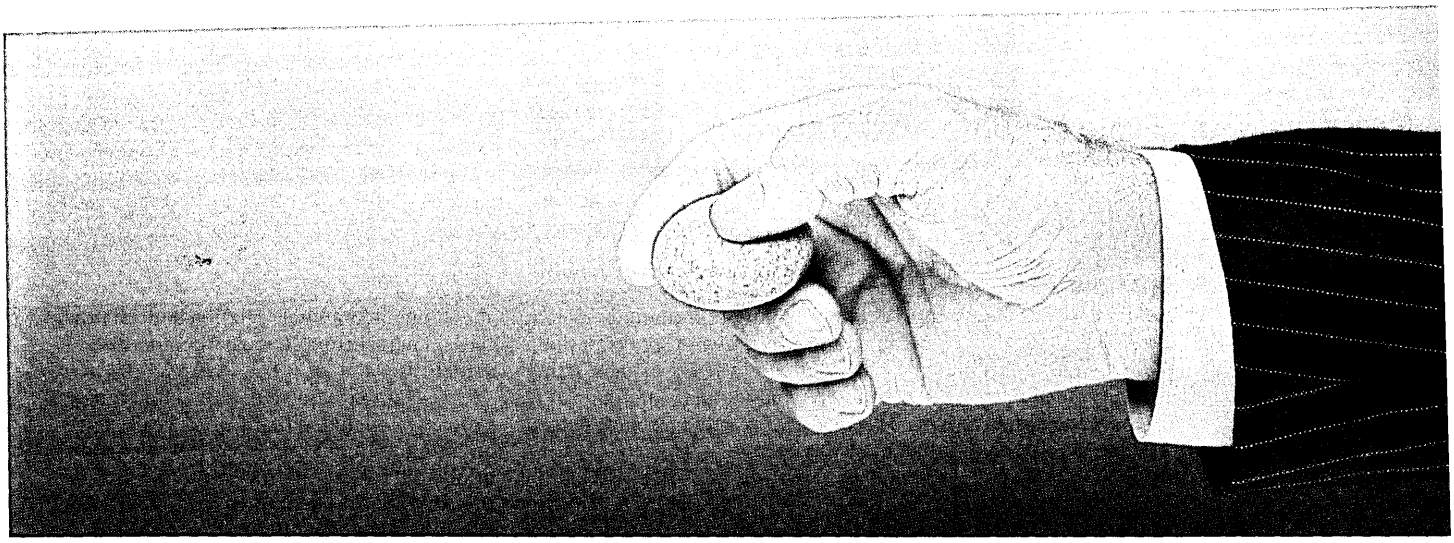
HISTORY REVISITED

One of my colleagues, Anatol Holt, commented after reading a draft of this article that he rejected the basic premise: that the computer can ever solve problems merely by having the proper level of explanation. To him, it was history revisited since he was, after all, there at the start. In the '50s a general asked, "Why do I have to learn to program a computer? If I can order my corporal to solve a problem, why can't I do the same to a computer? It's just a problem of being able to express the problem precisely."

Holt recounted conversations with John Backus and Grace Hopper where the same point of view was taken. Why keep libraries? Just state your algorithm in the proper mathematical formulation and the computer will do the rest. Why train programmers? Just make a language that will allow your analysts and managers to say exactly what is to be done, and the computer will take over from there. Can this be the intent of those who proposed the XXX command language as a fourth-generation programming language?

Ouch! Perhaps history does repeat. Can it be that the arguments in this article are only laying the groundwork for FORTRAN-2000, COBOL-99, and (heaven help us) Ada-2010 and PL/1?

—R.L.W.



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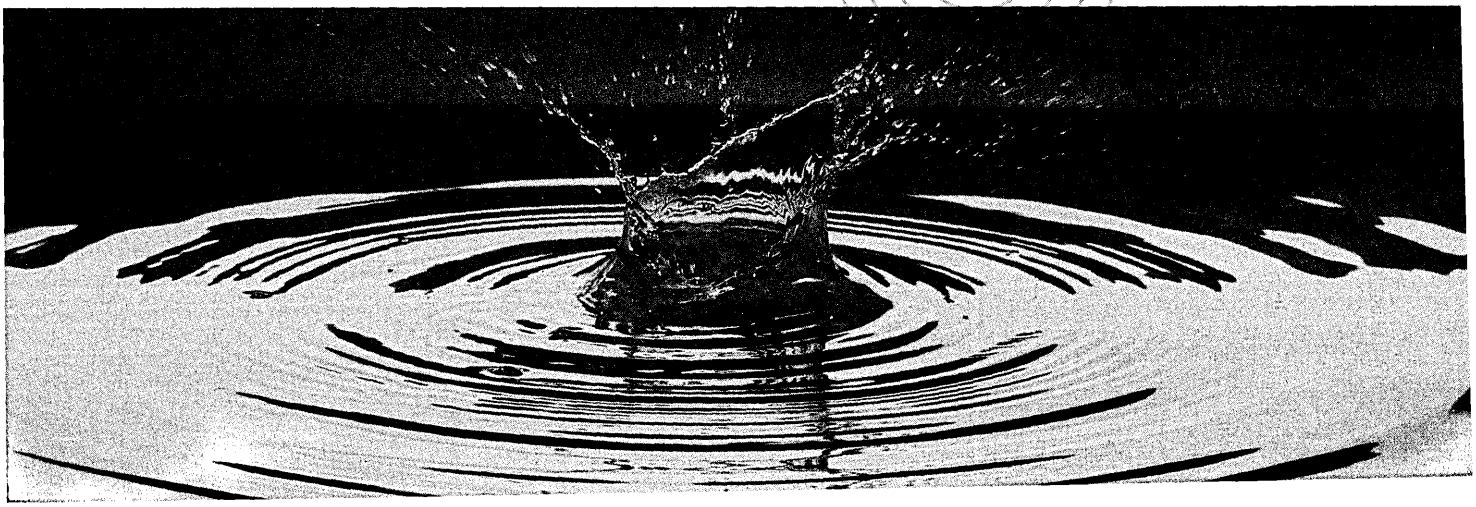

Programming. Programming. Programming. Nuts! Programming isn't the problem, explaining is.

believe) a hardening of the old cerebral arteries; it is an unwillingness once again to expend significant mental energy on a solution that is less than minimally adequate. The fact is that as long as I have to express my problem solutions in the machine's terms, I am wasting my mental powers. Dammit, the machine should either speak my language or meet me half way! I remember a cartoon showing a bearded man speaking to a perplexed couple at a cocktail party. "I can't explain it in layman's language," he is saying. "I don't know any layman's language."

The frustration of having to express myself in another person's terms is a reasonable price to pay for being able to communicate with one who does not share my particular experience or domains of interest. But the computer must—by terms of the agreement whereby I permit it to exist—share my domain of interest. It damn well better learn to communicate with me.

Michael Schneider, my good friend and colleague, characterizes kinds of languages as follows: the third generation makes us work for the computer, the fourth generation will help us work for ourselves, the fifth generation ought to do the work for us. Good idea, but it's still up to us to create this new generation of communication media.

How do we get beyond the mental block of our own making—the block that writing programs is the way to get the computer to do something for us? We talk about programming, about programming languages, about logical programming, about rule-based programming. Programming. Programming. Programming. Nuts! Programming isn't the problem, explaining is. Well, I guess I'm the one who's nuts. I subscribe to the school of management that says that if you properly explain the problem to your subordinates they will be able to solve it. I try not to instruct those who work for me. I don't want to have to instruct the computer.

It's that simple—or that impossible. Stop thinking about how to state the problem solution and start thinking about how to state the problem itself. Then work on getting the computer to "understand" that problem and come up with a solution. What I want is to combine an expert system for problem solution with an expert system for reuse of stored solutions. How will the computer ever be able to handle a problem whose solution components are not stored? It won't. We're always going to need people who can enter new solution components into this reusable component store.

But for heaven's sake, we've got to stop thinking about programming as if it were an end in itself. Even if programming is the most common means of instructing the computer, it is certainly not the only way. Three of my favorite books (or sets of books) are Don Knuth's *The Art of Computer Programming* (Addison Wesley, 1973), Dave Gries's excellent *The Science of Computer Programming* (Springer-Verlag, 1981), and E.W. Dijkstra's *A Discipline of Programming* (Prentice Hall, 1976). I have read them through and have found many opportunities to refer back to them—at least to the ones that are indexed. Within this trio of works is all that is important in contemporary programming.

But contemporary programming should be more than just the task of specifying correct algorithms. Somehow we must break free—free from top-down, bottom-up, spaghetti structure, control flow .... Just as interpersonal communication works best when free of a priori constraints, so must communication with the computer improve as constraints are removed.

"THIS HERE'S LEARNING"

Many years ago I was involved in a summer program to teach math to disadvantaged kids. The head teacher was a telephone pioneer and one of the early leaders in electronic switching. He began with the telephone and how it works. Over a period of weeks he went through symbolic logic, sets, graphs, and optimization with very little formalism. His objective was to show why it was useful to understand how things worked and then to use this understanding to predict how other things would work. The approach was successful and at the end of the course one of the students was asked why he did so well in the summer course and so poorly in school. "That there's teaching," he replied, "and this here's learning." That's just the point. We have to stop trying to teach the computer to solve our problems and help it learn to do so.

In *The Dragons of Eden* (Ballantine Books, 1977), Carl Sagan speculated about the computer as a kind of cognitive and intellectual prosthetic device for the brain. He metaphorically referred to it as eyeglasses for the mind. I believe he was actually referring to a surgical implant (ugh!). Most eyeglasses sit out front where we can take them off at will. I hope the computer will remain outside, too. Nevertheless, it is the problem of computer as thought expander that our future language must address. According to Abbe Mowshowitz in *The Conquest of Will: Information Processing in Human Affairs* (Addison-Wesley, 1976), the human-computer relationship is now one of parasitism. It must become one of symbiosis.

Okay. If you've read this far, you've probably concluded that I don't really have anything useful to say about the nth generation at all. Well, I don't, but to reward (or punish) you for staying with me, I will say a few words about the fourth. At the moment the rule-based approach seems to be the way to go. You describe the rules that govern the problem area and the actions, states, or events that should come about when the rules are applied. Then you describe the state of the "world" and see what the application of the rules gives you. For example, let us take the problem of putting food away in a refrigerator—configuring the refrigerator as it were. First we ask our expert to state some rules:

- If it's green, put it in the crisper.
- If it's heavy, put it on the bottom shelf.
- If it's round, stand it on the top shelf.

Now we can let the nonexpert get on with the configuration. First, here's some celery. Put it in the crisper. Now a turkey. Okay, on the bottom shelf. Next a watermelon. Oops! All three rules apply. Well, we need recourse to the expert again. Perhaps the additional rule is:

- The heavy rule takes precedence over the green and round rules.

Next in the shopping bag is a basketball. It will probably end up on the top shelf because we did not properly constrain the problem. That's okay for now because obviously there was no attempt to be complete. But the basketball problem is much more profound than it appears. The rules above typify what is sometimes called a shallow model of the universe. The new rule we want requires what is sometimes called a deep model:

- If it doesn't need refrigeration, put it somewhere else.

In a true "knowledge base" many additional rules would be needed to define, for example, what green is, what heavy means in the context of refrigerator shelves, and so forth. The rules needed to define what can be refrigerated and what cannot entail a significant and very deep knowledge of the world beyond the simple packing problem originally stated.

FORWARD & BACKWARD CHAINING

The technique I used above is "pattern-match" driven. It takes the form of forward-chaining. If such and such a pattern can be matched, then do such and such an operation. This is the convention used by OPS5, the language used to implement several production expert systems. XCON (née R1), the system

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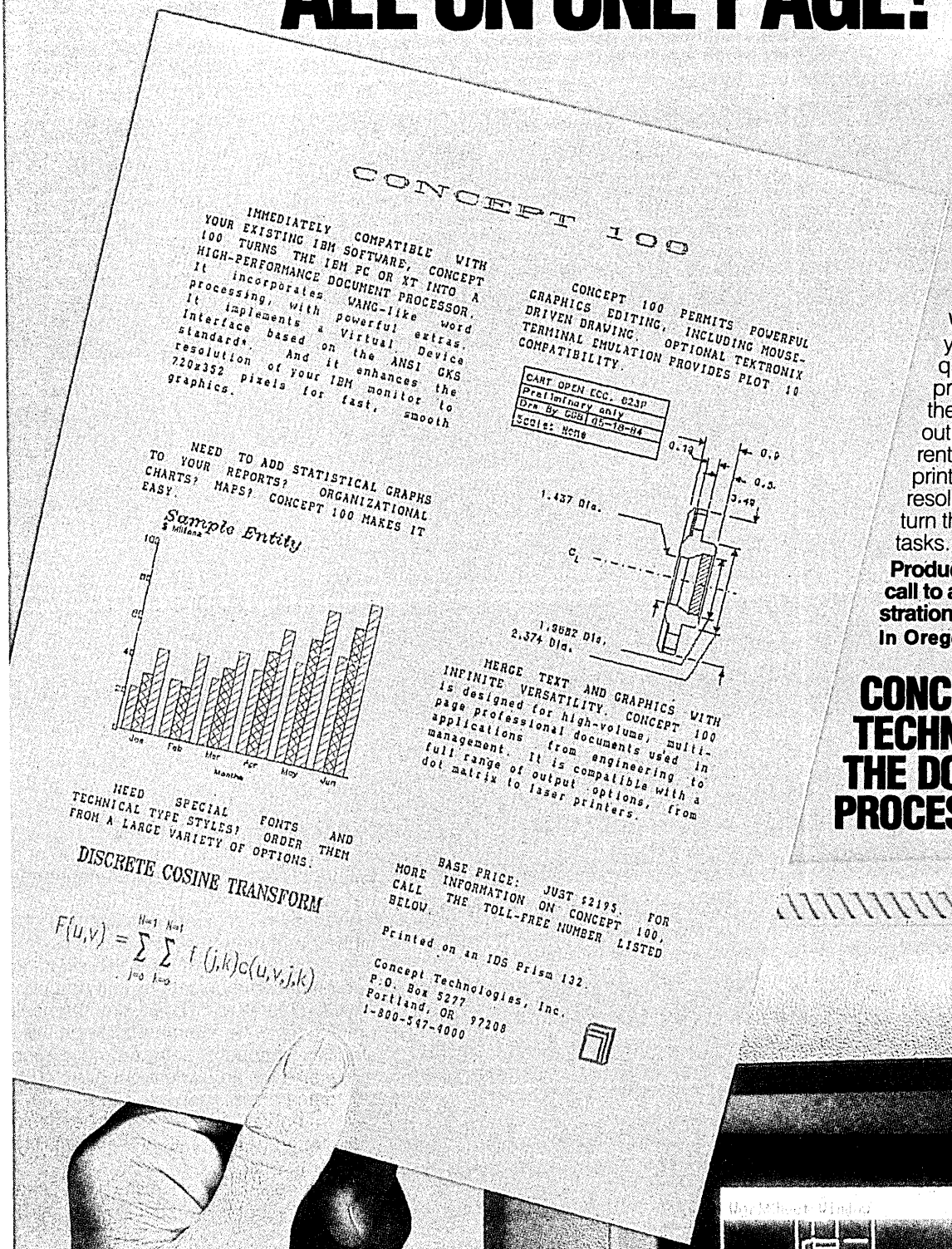

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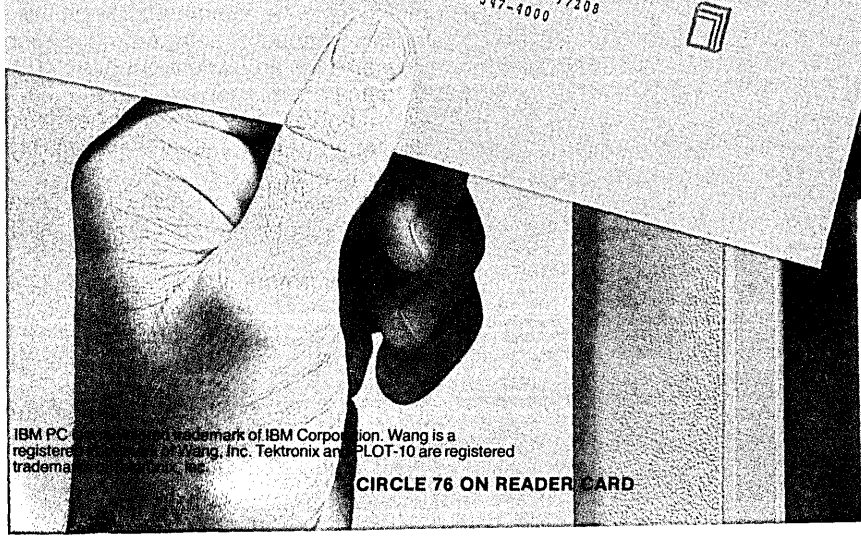

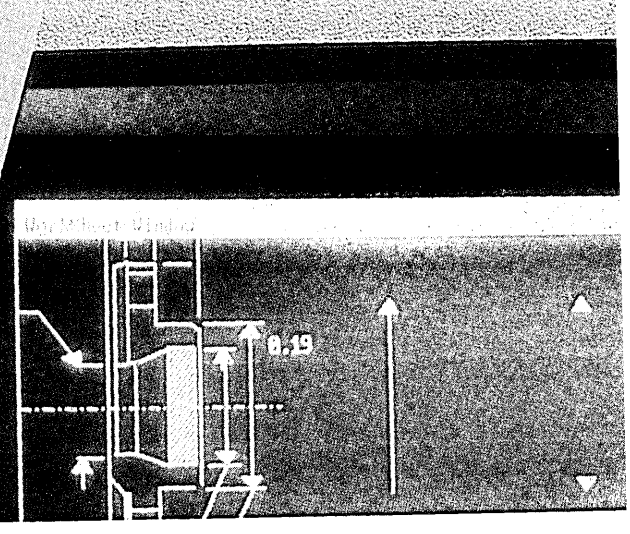

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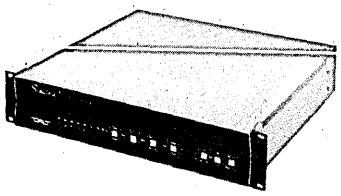

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used by DEC to configure VAXes, is implemented in OPS5. PROLOG, one of a class of systems known as deductive retrievers, uses the backward-chaining technique. With this, a goal is set up—like *fill the refrigerator*. Then the rules are applied by setting up and satisfying subgoals until the original goal is met. To match pattern A, do operation B. Here is part of such a sequence:

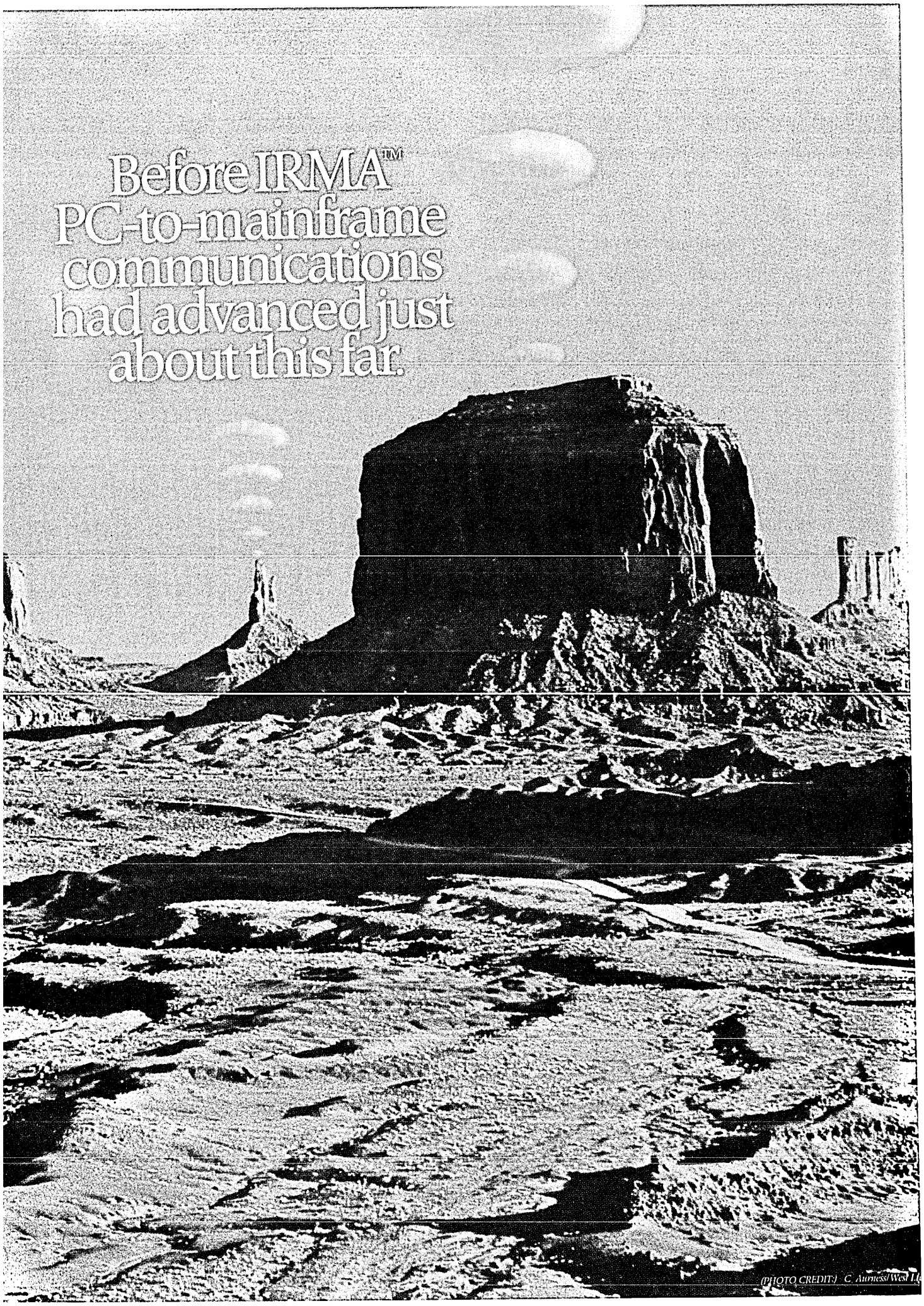
- GOAL: Empty the grocery bags.
- SUBGOAL: Fill the refrigerator.
- SUBSUBGOAL: Fill the crisper (now a rule applies).
- SUBSUBSUBGOAL: Look in the bag for the celery.
- APPLY RULE: Put the celery in the crisper.

Actually this trivial example is unfair to backward-chaining. At least part of the AI community feels that backward-chaining is better suited (and perhaps the only means) to deep knowledge systems. There is a forward:backward-chaining controversy that reminds me of the FORTRAN, COBOL, PL/1 wars of a decade ago.

Well, that's the fourth generation for you. But remember my friend Mike Schneider and his fifth generation: the one where the computer really does the work for us. When we get there, "language" will probably not apply at all. There will be scientific and social evolution, but our human roles and activities will probably be much the same as today. The way the silicon and niobium and gallium arsenide prosthetics support our activities remains to be determined. And the linguistic aspects will be entirely driven by the applications. The computer will be applied in ways and in domains that today we only dream of. But I hope I won't need a gallium arsenide chip in my brain to take advantage of it.

So what language will I end up using on my new pc? Well, I just got my income tax refund, so it might be PL/1. But there are now three implementations of full SNOBOL4, and two of them cost less than $100. And I seem to have heard about a micro-Prolog. . . . ◉

Richard L. Wexelblat received the first PhD ever awarded by a Computer Science Department, according to a survey published by the ACM. He feels that this gives him the right to expound at length on topics such as those discussed here. He is quite as interested in the past of programming languages as in their future. A few years ago he edited *History of Programming Languages* (Academic Press, 1981). Firmly believing that those who ignore history are doomed to repeat it, he will bend your ear on the history of COBOL, FORTRAN, and BASIC at the slightest provocation. He is grateful to ITT for letting him head the Knowledge Based Tools and Methods group at the ITT Advanced Technology Center in Shelton, Conn., and for permitting him to publish this paper. The opinions expressed herein do not necessarily represent those of ITT.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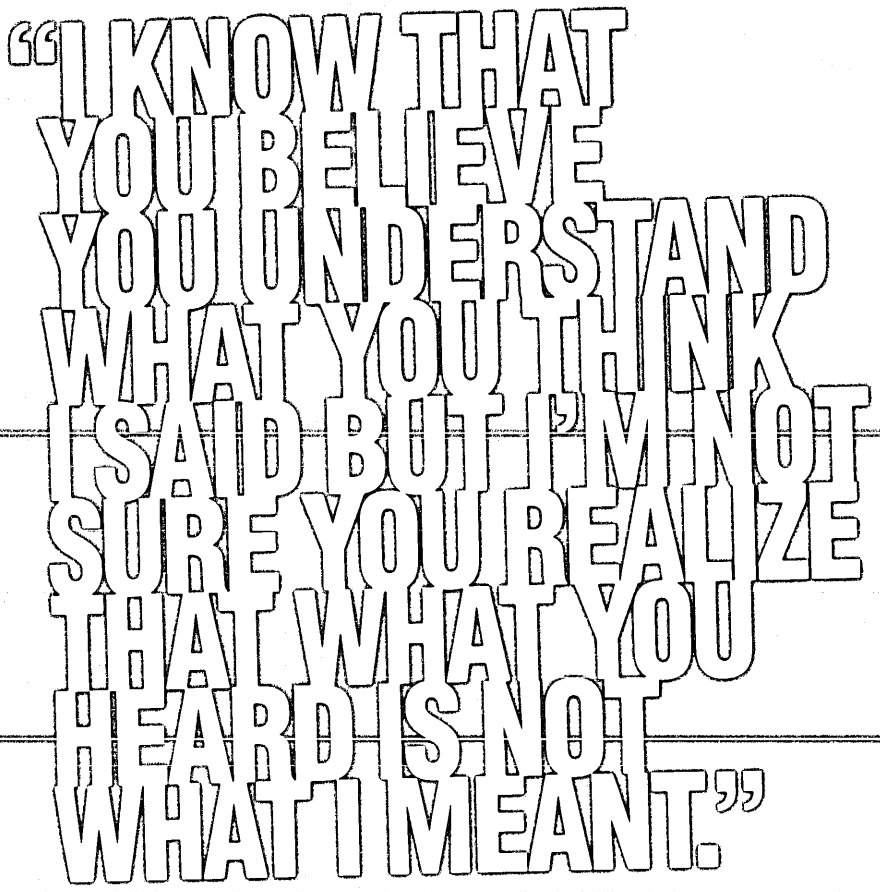

The problem with language is English.

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Recent tests of supercomputers may have delivered a bum rap to American machines. Here's how to read the numbers to get the answers.

UNDERSTANDING SUPERCOMPUTER BENCHMARKS

by Jack Worlton

A lot of attention has recently been focused on some preliminary benchmark data from Japanese supercomputers. Some observers, failing to understand the limitations of these data, have based unwarranted interpretations on them. The press has run headlines like "Japanese Firms Build Two Fastest Computers" and "Defense Official Asserts Japan Has Two-Year Computer Lead." I hope this article will clarify the issues raised by these data. Specifically, it will provide background information on the nature of benchmarking, especially benchmarking in a scientific computing environment. It will present the benchmark data currently available, and will provide some analyses and conclusions from these data.

The reader should first be aware of the limitations of the benchmark data. No statistically valid study of the performance of these computers has yet been completed. Only anecdotal evidence is available at this time. Preliminary benchmark data are time-dependent, i.e., these results are quickly superseded by new results. Small changes in the compiler and the program optimization level often lead to significant changes in measured performance of vector processors like those being compared here.

It should also be noted that there is a fundamental difference in design between the Japanese machines and the Cray X-MP, to which they are being compared. The Japanese computers are single-processor designs, while the Cray X-MP is a dual-processor design. But so far, all of the benchmark data for the X-MP are for a machine with just one processor, and it has been necessary to extrapolate these data in order to estimate the performance of the full X-MP.

In scientific computation, real-world problems are described in terms of the laws of physics. In turn, these laws are expressed by mathematical models. The models are implemented in algorithms adapted to the architecture of the computer to be used, and the algorithms are implemented in an application program, as illustrated in Fig. 1. (The solid lines in the figure represent the normal processes of scientific computation; the dashed lines represent the additional activities pertinent to benchmarking.) A program developed for a supercomputer is often adapted to that specific computer's architecture in order to achieve very high performance. When a new computer is considered for use in this environment, it must be tested (benchmarked) to determine how it would perform. The type of testing depends on how the site plans to make use of the new computer.

There are three generic approaches to transporting programs to a new computer system. They should determine how a computer is benchmarked.

- Type A: The dusty deck approach makes no changes to the source code but relies solely on what the compiler and other system software can do to optimize the source code for the new computer. This minimizes conversion costs but penalizes the performance obtained.
- Type B: The reprogramming approach modifies the application program to assist the system software in the conversion process. This increases conversion costs but produces higher performance.
- Type C: The rethinking approach modifies not only the application programs but also the algorithms and the mathematical models on which the application programs are based. This is the most demanding approach and yields the highest performance.

Thus, how a site intends to use a new system should decide how the benchmarking is done. The Type A site should make no changes to source codes; the Type B site should make only application-program changes; and the Type C site should do radical restructuring of the mathematical models, algorithms, application programs, and system libraries.

All benchmarking efforts are constrained by practicality, of course. It may take as many as 10 person-years of effort to fully convert a large application program (perhaps 100,000 lines of source code) to a new computer architecture through rethinking the methods from scratch. Therefore, practical benchmarking is done by creating a subset of the work load that retains the essential characteristics of the set of working programs.

WORKLOAD BROKEN DOWN

Through workload characterization the key programs that characterize the work load are selected, and the fraction of the workload each represents is determined. Because the programs themselves are too large to use, subsets of these programs, called kernels, are then extracted from the full programs. These are then converted to run on the target machines. Then, using the workload fractions as weights, subsequent runs are timed and compared.

By definition, then, a computer benchmark is a program or a section of a program that is executed for timing purposes. This method of testing computer performance has several advantages.

- The kernels are tractable. Being relatively short programs, kernels are easy to use and understand.
- The kernels are real. Actual program sequences are used rather than instruction counts or hypothetical instruction sequences.
- Kernels can be used as standard tests. Certain sets of kernels have become widely available, and they therefore can be used to compare the performance of many computers.

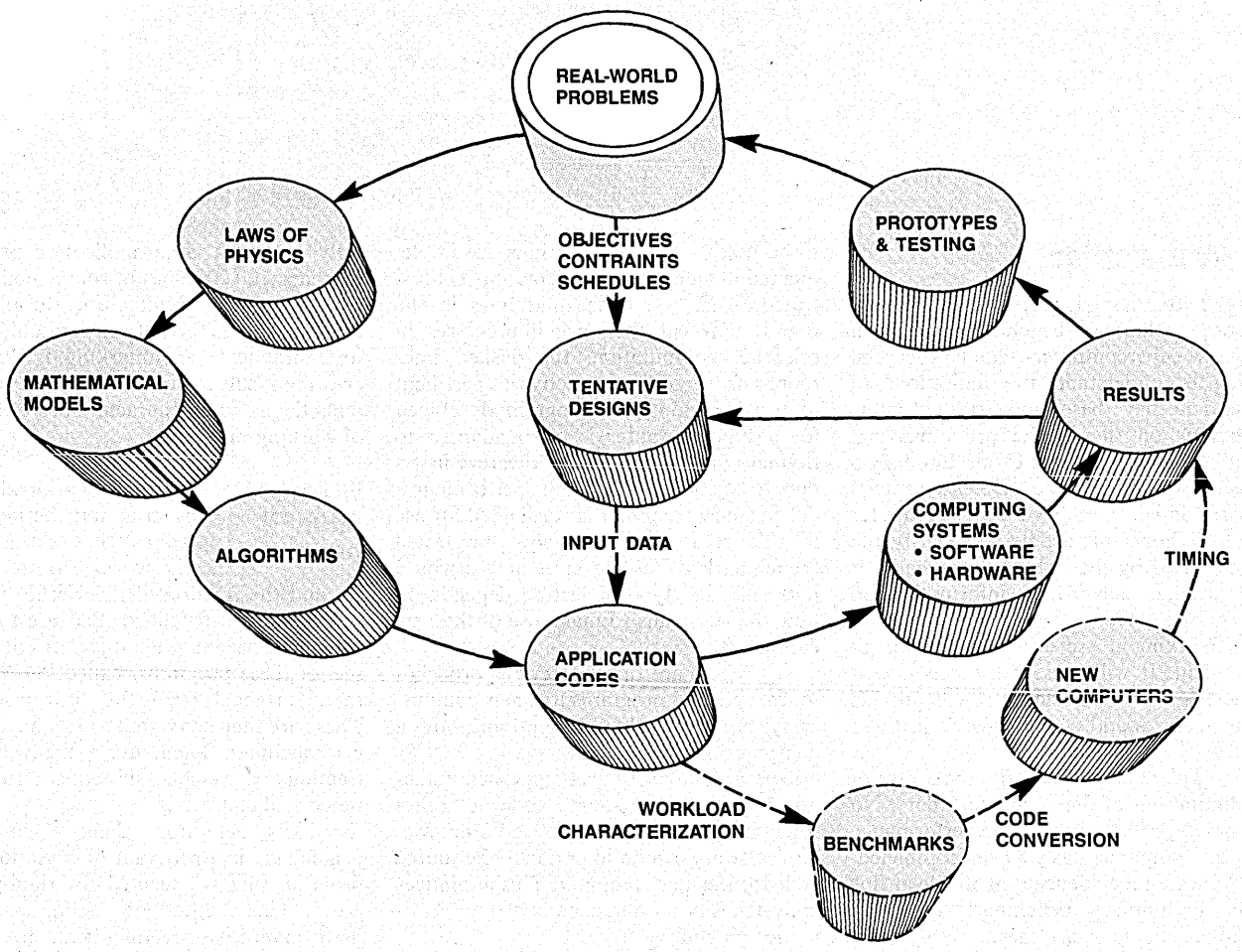
Nevertheless, the benchmark method also has its disadvantages.

- Kernels may be too "easy" in that they may miss important limitations (bottlenecks) of the target machine—limitations that the full program would expose. Memory and input-output bottlenecks are obvious examples. Benchmarks may be so small that they easily fit into main memory without calling on, say, disks or other levels in the storage hierarchy.

How a site intends to use a new system should decide how the benchmarking is done.

FIG. 1

A MODEL OF SCIENTIFIC COMPUTATION



• The sets of kernels are rarely statistically weighted representations of the workloads of interest. For example, the 14 Livermore kernels used in some of the benchmarks reported below do not each represent exactly 1/14th of the Livermore workload.

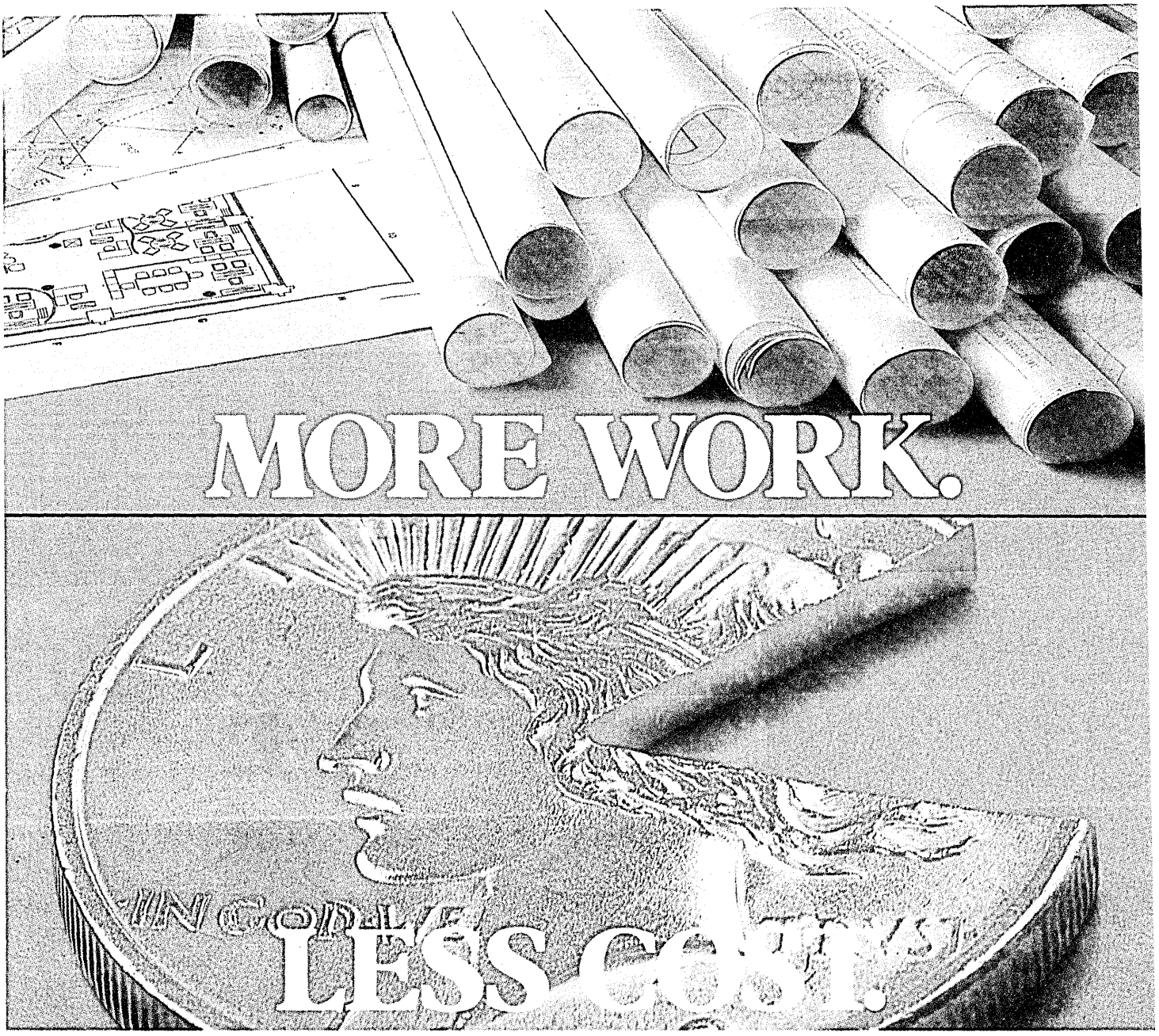
• Kernels are often obsolete. Most kernels are based on the physics, mathematical models, algorithms, and application programs developed for computers of generation N; those that will be used for generation N+1 are of greater interest. A scalar benchmark run on a vector processor may not demonstrate adequately the performance of the vector processor; a vector benchmark developed for a vector processor of generation N may not demonstrate adequately the performance of a vector processor of generation N+1; and a uniprocessor benchmark may not demonstrate adequately the performance of a parallel processor.

The kernels used in the benchmarks have many of these advantages and disadvantages, so it is important to be wary of apparently simple interpretations of these, or indeed any, benchmark data. Benchmarks provide a useful first step in estimating performance and guiding further studies. But as procurement interests deepen, benchmarking must be followed up with increasingly detailed workload characterization and execution of full programs on the target machines.

The key problem in the use of benchmarks is assuring comparability. The criteria for comparability are site specific and depend on whether the site plans to use the dusty deck, reprogramming, or rethinking approach to program conversion. If a given benchmark is executed on two machines, and that is all that is known, what can be said about the relative performance of the two machines? Not much.

SOME IMPORTANT QUESTIONS

If we are to obtain comparisons that are valid in even the most elementary sense, we have to ask several questions: Were any changes made to the mathematical models or algorithms for any of the machines being compared? If so, were the changes equivalent across all the machines tested? Were any of the kernels optimized on any of the machines by modifying the source or object code? Were the optimization levels comparable? Were the configurations comparable? Also important, are the memory capacities of the test environment the same, and will these be the same in a production environment? Were the peripherals comparable? Were the compilers comparable? Were compiler direc-



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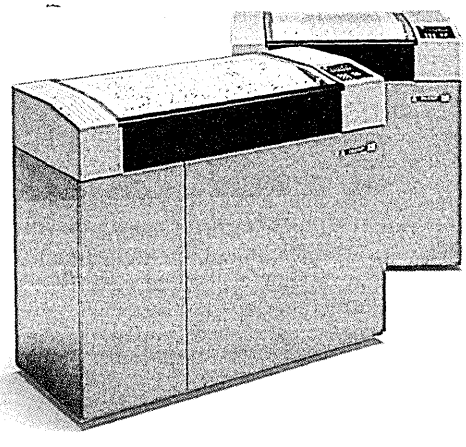

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The key problem in the use of benchmarks is assuring comparability.

tives inserted in some programs to aid the compiler vectorization but not in other programs?

We can summarize the minimal steps that should be taken in benchmarking when kernels are to be used.

- Step 1: Conduct a workload characterization study. The output of this study should be the rates, R_i, that are characteristic of the programs in the workload, together with their workload fractions, f_i, where the sum of the fractions equals 1.
- Step 2: Select a subset of the programs to represent the whole workload; these should include the programs having relatively large f_i; renormalize the fractions to represent the whole workload.
- Step 3: Select portions (kernels) of these programs to represent the whole programs. This is the crucial step in successful benchmarking.
- Step 4: Time the kernels to obtain the kernel execution rates.
- Step 5: Compute the weighted harmonic mean.

Researchers conducting actual benchmarking studies often fail to conduct a workload characterization study, depending instead on intuitive ideas of the programs that are most important and of what their weights should be. They can also select kernels that are too easy and hence do not adequately represent the complete programs. And they use the arithmetic mean rather than the harmonic mean as a workload measure.

As a concrete example of the difficulty of comparing benchmarks, consider the actual benchmarks in Fig. 2. What can we conclude from this comparison of benchmarks? It would appear that System A is some 24% faster than System B, right? Dead wrong. These benchmarks were executed on the same computer, the Hitachi S810-20. System A data were generated at the University of Tokyo (see Fig. 5) and System B data were obtained by personnel from the Magnetic Fusion Energy Computer Center (see Fig. 3). Clearly, the benchmarks were run under different conditions, so the results cannot be compared without an understanding of these conditions. In this example, the conditions caused the performance ratios to vary by a factor of more than 2.5.

A further point about Fig. 2 concerns the average of these results. The average was computed using an unweighted arithmetic mean, and the arithmetic mean often gives distorted perspectives of average rates.

Consider the following example. Suppose I want to travel 100 miles, and part of the journey I travel at 5 mph and part at 55 mph. What is my average rate? The average of these two rates appears to be (5 + 55)/2 = 30 mph, but in fact we can't even answer the question without further information: how much distance was covered at each of these rates? If I travel 45 miles at 5 mph and 55 miles at 55 mph, then my average rate would be just 10 mph (= 100/(45/5 + 55/55)), not 30 mph. Just so with averaging computer execution rates: we must use the harmonic mean or run the danger of being wrong by hundreds of percentage points in estimating computer performance.

The weighted harmonic mean, H_m, is computed as follows:

FIG. 2

BENCHMARK COMPARISONS

KERNEL NUMBER		SYSTEM A (MFLOPS)	SYSTEM B (MFLOPS)
1	Hydro excerpt	250.0	228.0
2	MLR, inner product	300.9	239.4
3	Inner product	322.1	211.9
4	Banded linear eq.	91.9	59.2
5	Tri-diag. elim. (below)	10.8	5.4
6	Tri-diag. elim. (above)	10.8	4.6
7	Eq. of state excerpt	254.6	232.7
8	P.D.E. integration	85.0	48.8
9	Integer predictors	226.7	207.6
10	Difference predictors	62.7	49.0
11	First sum	9.8	9.8
12	First diff.	104.1	93.0
13	2-D particle pusher	4.2	4.2
14	1-D particle pusher	7.7	8.5
"Average"		124.4	100.2
Harmonic mean		19.4	14.7

FIG. 3

SOME BENCHMARKS USING THE LIVERMORE KERNELS (MFLOPS)

KERNEL	CRAY-1 CFT '78	CRAY-1 CFT '84	X-MP-1 CFT '84	FUJITSU VP-100	FUJITSU VP-200	HITACHI S810-20
1	62.5	100.0	153.0	187.0	326.4	228.0
2	15.2	41.7	76.6	104.6	178.1	239.4
3	3.3	33.3	95.8	168.0	331.1	211.9
4	2.9	24.3	41.1	73.6	88.0	59.2
5	4.0	7.7	8.7	10.0	10.0	5.4
6	4.6	7.0	8.0	9.5	9.5	4.6
7	80.0	120.0	167.9	190.0	326.1	232.7
8	8.5	55.4	95.7	86.3	90.4	48.8
9	77.3	68.0	163.0	161.5	257.4	207.6
10	3.1	36.0	59.9	50.1	84.8	49.0
11	2.0	2.9	3.1	4.8	4.8	9.8
12	21.3	25.0	76.5	58.8	114.1	93.0
13	2.1	4.0	4.8	6.1	6.2	4.2
14	3.7	5.6	6.9	12.9	13.9	8.5
H_m	4.7	11.1	13.7	18.7	19.8	14.7
HIGH	80.0	120.0	167.9	190.0	331.1	239.4
LOW	2.0	2.9	3.1	4.8	4.8	4.2
RATIO	40:1	41:1	54:1	40:1	69:1	57:1

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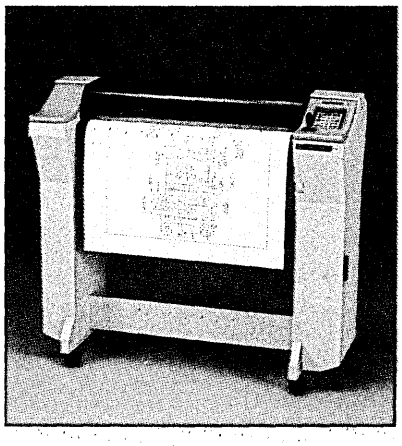

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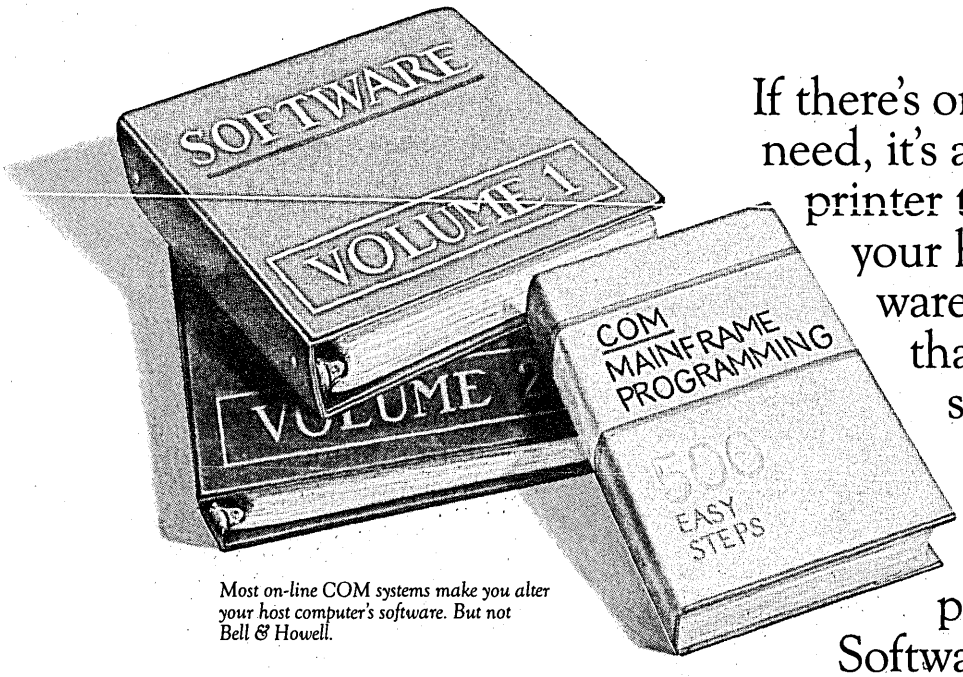

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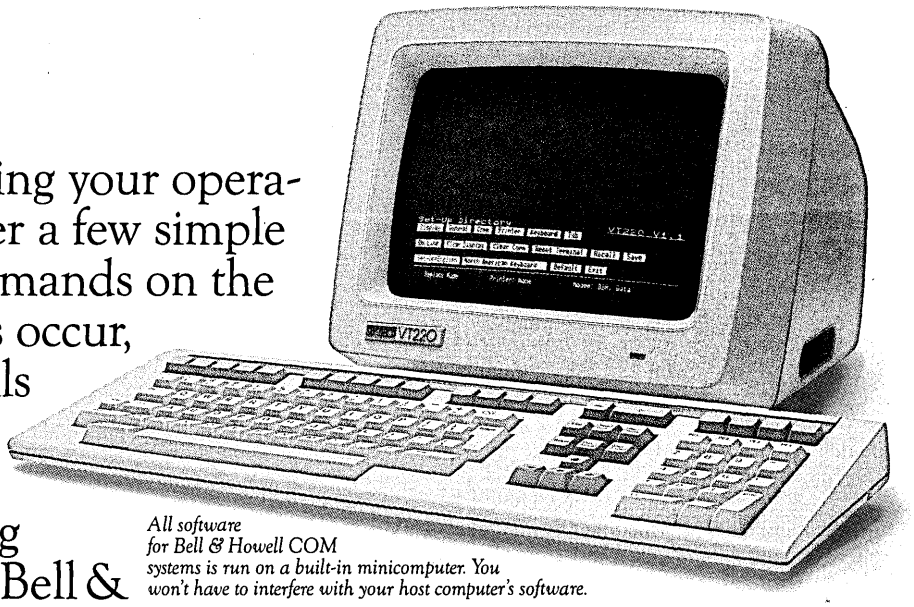

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The arithmetic mean often gives distorted perspectives of average rates.

$$H_m = \frac{1}{\sum_i f_i/R_i},$$

where the f_i are the fractions of the workload corresponding to the execution rates, R_i. If the fractions, f_i, are unknown, the unweighted harmonic mean can be computed using the assumption that all the weights are equal to 1/I, where I = the number of programs we are using:

$$H_m = \frac{1}{(1/I)\sum_i (1/R_i)},$$

In contrast, the unweighted arithmetic mean is computed as:

$$A_m = (1/I)\sum_i R_i.$$

MEANS CAN DIFFER WIDELY The arithmetic mean and the harmonic mean can often differ by large factors. For example, the arithmetic mean of the rates for System A in Fig. 2 for the S810-20 is 124.4 MFLOPS, but the harmonic mean is only 19.4 MFLOPS—the two means differ by a factor of 6.4. The harmonic and arithmetic means are equal only when (a) the rates are all equal, or (b) the time spent executing at each rate is equal.

With these factors in mind, look at some benchmark data for some recently announced supercomputers.

Personnel from the Department of Energy's Magnetic Fusion Energy (MFE) Computer Center at Lawrence Livermore National Laboratory, Livermore, Calif., visited Japan and obtained data for the Livermore kernels on the Fujitsu VP-100 as well as the Hitachi S810-20. (The Livermore kernels are short FORTRAN kernels, a few lines each, that have been abstracted from actual programs used at the Lawrence Livermore National Laboratory. No statistical weighting of these kernels exists as a workload characterization, and no claim is made that they represent the current Livermore workload.) Data for the VP-200 have since been released by Amdahl Corporation. These results were compared to earlier benchmarks on other computers, generating the data in Fig. 3. The study by MFE was carefully controlled: no changes in source code or insertion of compiler directives were allowed.

Based on these data, the workload represented by these kernels would run 1.68 times as fast on the VP-100, and 1.78 times as fast on the VP-200, as on the Cray-1S. For the Cray X-MP-1* these ratios would be 1.36 and 1.45, respectively; no data are available for the X-MP-2.

Cray Research has recently run these same Livermore kernels on a Cray X-MP-1 using the newest version of their compiler, X.14. This is not yet a production compiler, and the reason for including data describing its performance is to illustrate the large variance in benchmark data. The results are given in Fig. 4 for this machine and several others, including some earlier data for the Cray-1 and the X-MP-1 for reference. Here we project the performance of the Cray X-MP-2 as S2 = 1.8. Readers, however, can adjust this column depending on their preferred value of S2, the speedup that full two-processor operation will produce. Because this compiler is not yet a released product, the details of the kernel results are still proprietary and only a summary is available for publication.

It appears from these data that the Cray X-MP-1 will run about 1.78 times as fast as a Cray-1S when both use the X.14 compiler. How much faster the X-MP-2 will

FIG. 4

CRAY RESEARCH BENCHMARK DATA (MFLOPS)

	CRAY-1 CFT '78	CRAY-1S W/X.14	X-MP-1 CFT '82	X-MP-1 W/X.14	X-MP-2* W/X.14
H_m	4.7	13.3	11.0	19.4	35.0
High	80.0	91.8	150.7	164.1	295.4
Low	2.0	4.4	3.1	5.6	10.1
Ratio	40:1	21:1	49:1	29:1	29:1

*The performance of two PEs is projected using an assumed speedup of 1.8.

FIG. 5

BENCHMARK DATA FROM THE UNIVERSITY OF TOKYO (MFLOPS)

KERNEL	HITAC M-280H (UNI-CPU)	HITAC S810-20
1	25.7	250.0
2	12.6	300.9
3	32.4	322.1
4	24.6	91.9
5	5.3	10.8
6	4.5	10.8
7	20.3	254.6
8	10.3	85.0
9	14.6	226.7
10	5.0	62.7
11	6.6	9.8
12	25.9	104.1
13	1.8	4.2
14	2.6	7.7
H_m	6.5	19.4
High	32.4	322.1
Low	1.8	4.2
Ratio	18:1	77:1

*Cray X-MP-1 and Cray X-MP-2 refer to the Cray X-MP with one and two processing elements, respectively.

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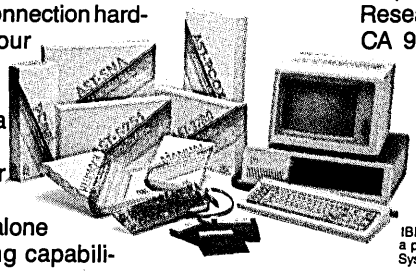

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The best we can conclude is that the VP-200 and the X-MP-1 would run with roughly the same execution rate.

run compared to the Cray-1S depends on the speedup achieved with two processors, and this is application dependent. The harmonic mean for the X-MP-1 using the X.14 compiler in Fig. 4 is about the same as for the VP-200 in Fig. 3, indicating that these computer/compiler systems would give about the same performance on this work load, assuming equal weights for the kernels. The workload fractions corresponding to each kernel would be needed to make a more precise comparison, however.

The University of Tokyo Newsletter for October 1983 published benchmark results from runs of the Livermore kernels made on the Hitachi S810-20, as shown in Fig. 5, along with some data for the Hitachi M-280H with an integrated array processor (IAP). Notice that the data in Fig. 5 are higher than the comparable data for the Hitachi S810-20 in Fig. 3, even though the same kernels and computer were used. According to the newsletter, the loops are the original kernels except for the correction on the clock overhead and accuracy.

In a production environment, programs are usually optimized by identifying and correcting those sections with low performance. To simulate that environment from these preliminary data, the best we can do is to compare (and it is a highly uncertain comparison) the best benchmark data for each computer. This is done in Fig. 6. The figures for the Fujitsu VP-100 and VP-200 come from Fig. 3; the figures for the Hitachi S810-20 from Fig. 5; and the figures for the Cray-1S, Cray X-MP-1 and X-MP-2 from Fig. 4.

FIG. 6

COMPARISON OF BEST PERFORMANCE DATA

	VP-100	VP-200	S810-20	CRAY-1S	X-MP-1	X-MP-2*
H_m	18.7	19.8	19.4	13.3	19.4	35.0
H_m-Norm**	1.41	1.49	1.46	1.00	1.46	2.63
High	190.0	331.1	322.1	91.8	164.1	295.4
Low	4.8	4.8	4.2	4.4	5.6	10.1
Ratio	40:1	69:1	77:1	21:1	29:1	29:1

*Simulated by assuming a speedup of S_2 = 1.8
**Normalized to the Cray-1S with the X.14 compiler

FIG. 7

BENCHMARK DATA FROM PROFESSOR MENDEZ (TIME IN SECONDS)

	VP-200		1-PE CRAY X-MP	
TEST	SCALAR	VECTOR	SCALAR	VECTOR
VORTEX				
I = 500	217.2	34.4	233.6	37.8
EULER				
I = 1000	6.3	4.8	9.0	3.1
I = 8608	NA	41.1	NA	27.9
2DMHD	43.4	2.6	39.2	4.3
SHEAR3	164.4	83.6	190.3	72.7
BARO	1107.8	41.1	756.9	76.3

NA = not available

FIVE BENCHMARK TESTS RUN

Professor Raul Mendez of the Naval Post-Graduate School in Monterey, Calif., visited Japan in late 1983 and ran benchmarks on the VP-200. These tests included five benchmarks run in both scalar and vector mode. Compiler directives were inserted into two of the Fujitsu programs (SHEAR3 and 2DMHD). These directives essentially caused vectorization of some loops that would otherwise not have been vectorized, but the quantitative effects of this action are uncertain. The benchmarks were subsequently run by Professor Mendez on the Cray X-MP and the results were published in the SIAM News in January and March. Subsequently, Cray Research assisted Professor Mendez with the vector versions (but not the scalar versions) of these benchmarks, and those data, which update the earlier publication, are included in Fig. 7. Fujitsu published a paper at the 1983 IFIP Congress describing its work on vectorizing techniques. The advantages for the VP-200 compiler in these and other data are probably due in part to the vectorization methodology described by Fujitsu in its IFIP paper, and in part to the hardware features included in the Fujitsu VP-200 that permit ease of vectorization.

The automatic vectorization techniques used by Fujitsu are based in part on work done in the United States by Professor David Kuck and his associates at the University of Illinois. The special hardware features include a constant stride in vector addressing and vector indexing operations like gather-scatter and compress-expand. The Cray-1 design includes a constant stride and the CDC Cyber 205 includes vector indexing operations, but neither American design offers both features. Professor Mendez's results are shown in Fig. 7. Note that these data are times, not MFLOPS.

Some of these results indicate an advantage to the Cray X-MP-1 and some indicate an advantage to the VP-200. Because so little is known about the optimization of these programs for these computers, the best we can conclude is that the VP-200 and the X-MP-1 would run with roughly the same execution rate. Any advantage of one over the other would be due to the application used in the test.

Based on the data available now, one can make the following tentative conclusions:

- Optimized programs for the Cray X-MP-1, the Fujitsu VP-200, and the Hitachi S810-20 should achieve roughly comparable performance in general purpose computing environments.
- The relative performance of the Cray X-MP-2 will be higher by the speedup achieved with its two processors.
- The vectorization methods used in the Japanese compilers appear to be better than the methods used in the production versions of American compilers. This is due in part to the software vectorization methods used and in part to the data-handling features of the hardware.
- Only site-dependent benchmarking can determine which of these computers will perform better for a given workload. ◉

Jack Worlton is a laboratory fellow at Los Alamos National Laboratory.

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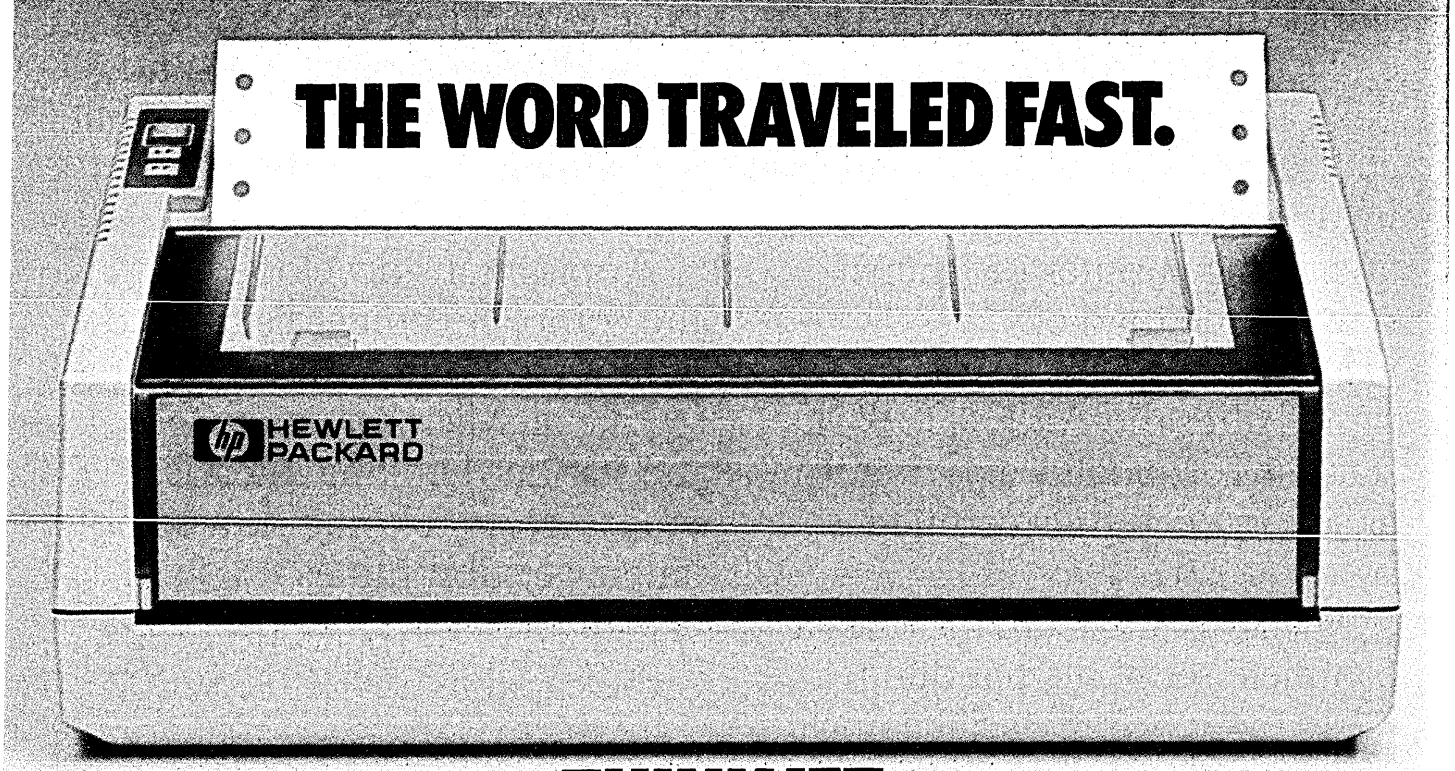

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Hewlett-Packard research has used inkjet technology to make the ThinkJet personal computer printer surprisingly quiet while printing 150 high quality, dot-matrix characters per second for text or graphics. The ThinkJet printer weighs only 6½ pounds and it takes up just a bit more room than your telephone. So, it can work right on your desk. There's even a battery-powered model that lets you print anywhere. And, the ThinkJet printer's ink supply and printhead are designed in one neat disposable unit that simply clicks out when it's time to change.

The ThinkJet printer will work with most popular personal computers, including Hewlett-Packard, IBM,® COMPAQ,™ TI,® or Apple IIe.®

Finally, as quiet, fast and compact as the ThinkJet printer is, it still has one more feature that's going to cause a commotion; its price... $495.00.*

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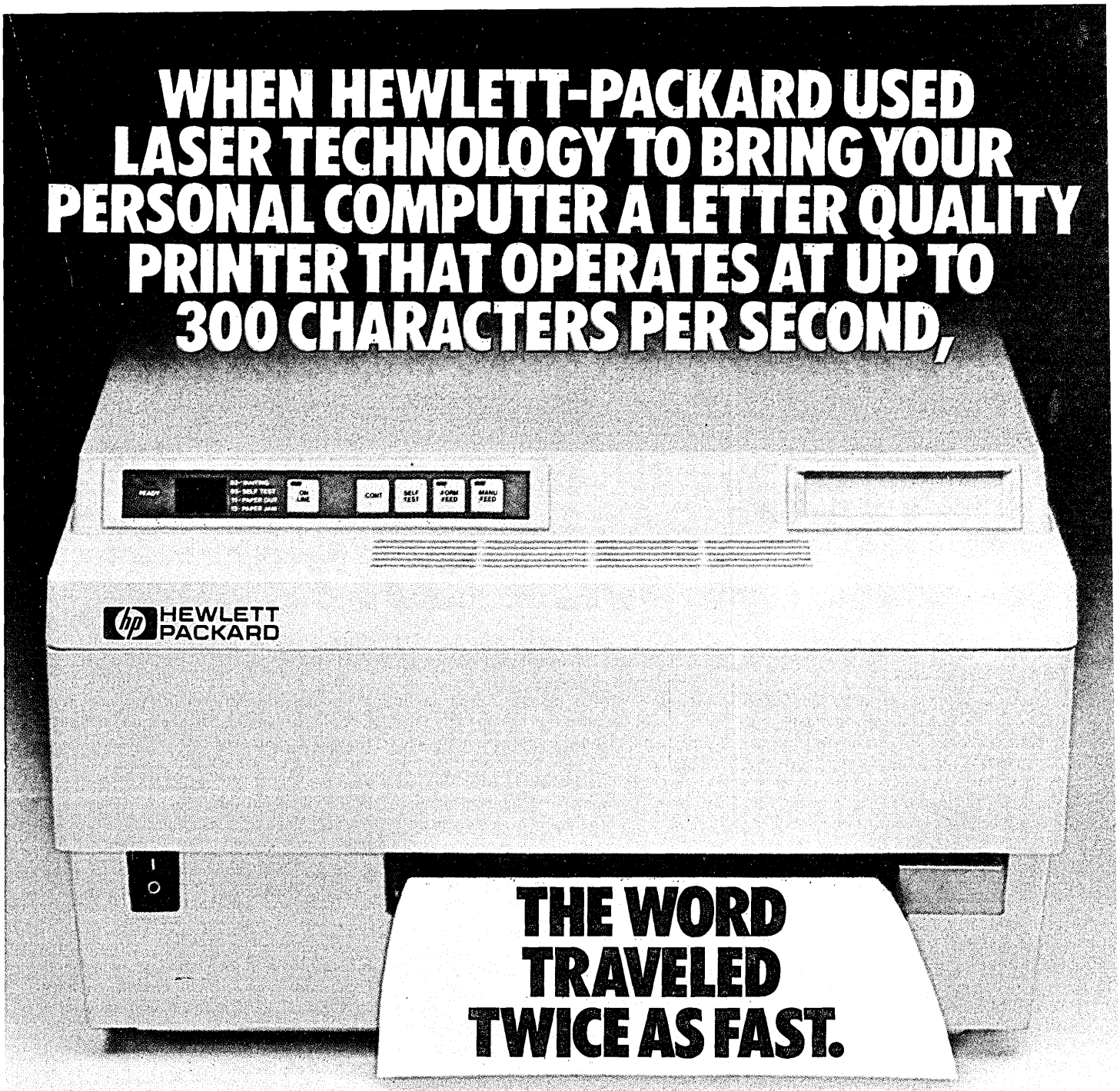

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A new survey of dp managers reveals a more relaxed management style and a desire to hire some "know-it-alls."

WANTED: RENAISSANCE PEOPLE

by Andrew Friedman and Joan Greenbaum

In a recent in-depth survey of 95 significant data processing departments, the managers interviewed showed a keen interest in hiring generalists for programming and systems functions. As one manager put it, "We need Renaissance people, who can think and act with an open mind." Generalists, they believe, will fit better into the newly emerging, flexible team structures in which development and maintenance staff, as well as end users, work together from beginning to end of projects. The managers stressed that generalists rather than "techies," have more to contribute to data processing departments.

While user-involved teams staffed with Renaissance-like generalists might sound like a pipe dream, it represents an ideal toward which many managers are apparently working. Quite a few have already put the ideal into practice.

The managers were interviewed for a survey that was part of a four-year international project funded by the British Economic Social Research Council. Interviews were carried out with top data processing managers and/or project managers of large-scale projects at several hundred firms in five countries. The interviews, often lasting three hours or longer, focused on work organization and management strategies for software development. This article looks at the results of the American sample, drawn primarily from the *Directory of Top Computer Executives,* which encompassed departments from as small as three programmers to those employing several hundred programmers and analysts. Firms were randomly selected from the directory and other similar lists. Interestingly, the majority were application shops where COBOL was still dominant, operating in a mainframe environment (see box on p. 136). Results show:

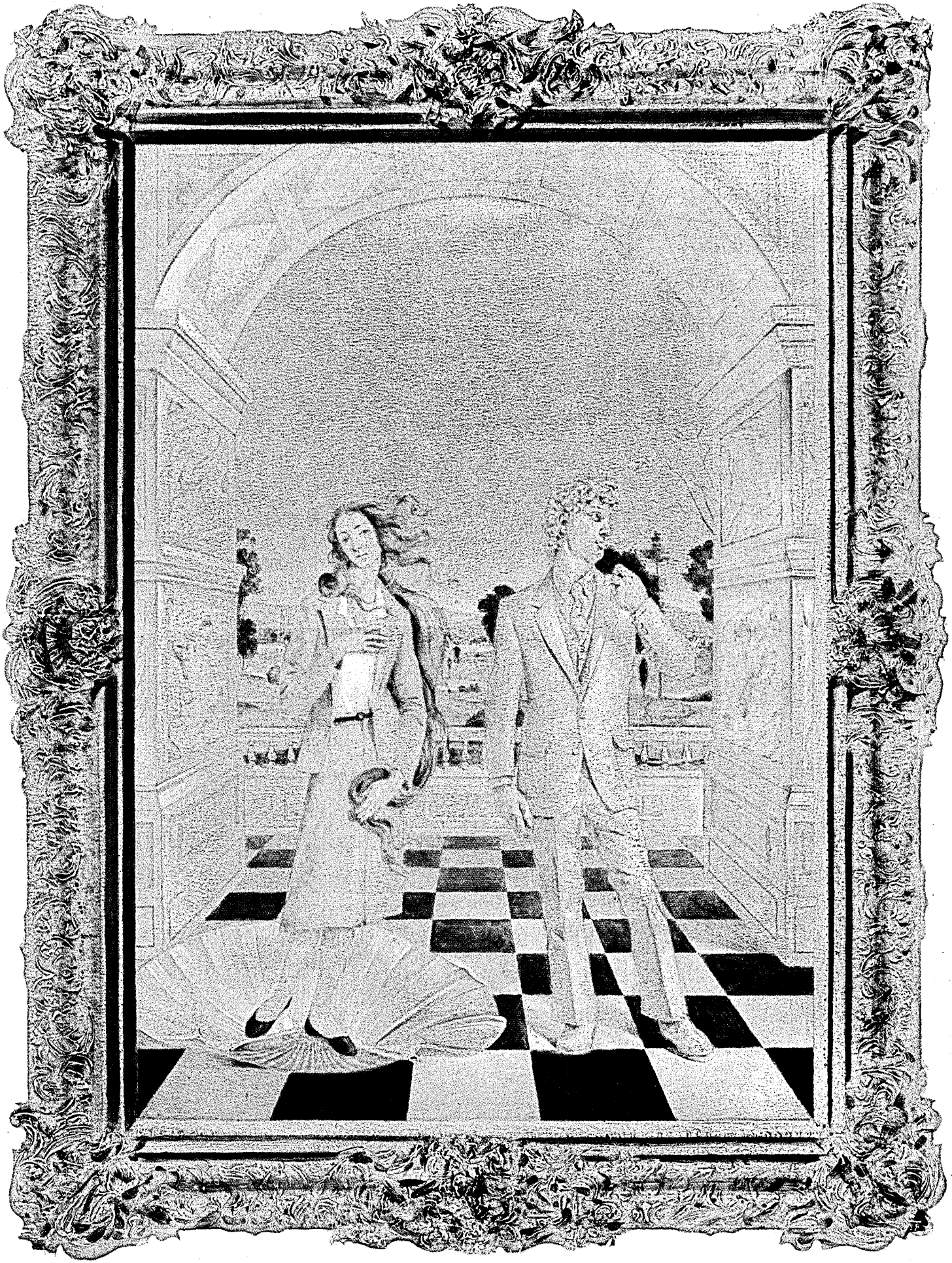
- More than 82% of managers use team or matrix work organization as opposed to the formerly popular large programmer pools. Responding to a question about significant organizational changes over the last five years, a number of managers cited the shift from programmer pools to analyst and programmer teams as a major accomplishment.
- Almost all said they involve users in some or several aspects of software development. While this idea had been given lip service for the past several years, it now appears that users are, in fact, beginning to have their say.
- Formal sign-off procedures with higher management are less frequent than might be expected. Only about 40% of data processing managers said that they use upper management sign-offs to turn a project over to operations, and just half formally sign-off after specifications are complete.
- Demarcations between development and maintenance work appear to be fading away. Fewer than 25% of managers reported that they keep separate departments for development and maintenance functions. Systems and applications, however, are still separate entities, with over two thirds of the firms noting these as distinct departments or groups.
- While time sheets and target setting continue to be recommended methods for evaluating and monitoring software staff, over 90% of the interviewed managers have a strong preference for personal contact to supplement these traditional forms of appraisal.
- Despite the great "GO TO debate" of the 1970s, fewer than 60% of managers in predominantly COBOL shops urge their programmers to avoid GO TO statements. An even smaller number were strongly interested in enforcing any other kind of programming standard such as maximum module size, or standardized module interfaces. The comment of one DPM was typical: "Oh well, we try, but you know. . . ." Another added, "It really makes sense to be flexible about this."
- A bachelor's degree is still the main ticket into programming and systems work, but a large number of managers expressed frustration with the computer science graduates they hired and look with interest to liberal arts or business students. Many indicated that, if given the choice, they would hire from within the company, giving preference to those with demonstrated ability to work well with users and colleagues. Retraining for clerical workers and other people with experience in the company is not uncommon.

VERSATILE TEAMS THE RULE

Small, versatile project teams are the rule for maintenance work as well as new project development. In most firms, project members work on more than one project at a time and, not surprisingly, serve on more than one team at a time. As experience has shown, teams that work well together stay together. About 65% of teams stay together beyond the length of a project; in midsize departments of 10 to 29 programmers/analysts, about 75% of teams stay together longer than one project.

Three quarters of all project teams have fewer than six members. Interestingly, the older title distinctions, such as programmer, senior programmer, and analyst, don't seem important in determining team makeup. The surveyed firms most often lump programmers and analysts together.

ILLUSTRATION BY RICHARD BOBER



Many managers reported that they prefer the term "analyst/programmer" rather than individual titles, since workers function in both ways within the teams.

While the 1960s and '70s saw the rise of the programmer pool concept for large COBOL shops, particularly for maintenance, managers now appear to be pleased that they are moving away from this model. Only about 20% of the sample reported using programmer pools, a percentage that was the same for maintenance and new development work. They felt that teams and matrix structures give them the chance to organize their work force to suit the needs of a particular project, while simultaneously giving programmers and analysts more of a hand in developing or maintaining a whole project. Certainly, the cry of programmers to participate in more aspects of project development is one of the factors moving them out of pools and into more adaptable team organizations.

Formal sign-off procedures at traditional milestones in project development appear to be far less important in practice than they are in theory. When sign-off procedures are used, checking with users carries more weight than reporting to upper management. To a question asking managers to indicate at which points in project development they seek clearance before doing further work (i.e., functional specification, system specification, detailed design, coding and debugging, and testing and operations), the managers responded that they are more likely to check validity with users than they are with their corporate superiors. In either case, however, formal sign-offs are not particularly popular.

Only about half of the surveyed managers said that they formally report to higher management at the end of functional or systems specifications, while 80% of firms check the validity of functional specifications with users before continuing a project. Around 70% of managers reported that they check the validity of a system with users before it is turned over to operations. These reports directly contradict management theories about the need for formal project milestones, yet come as no surprise to managers engaged in the day-to-day details of running a project.

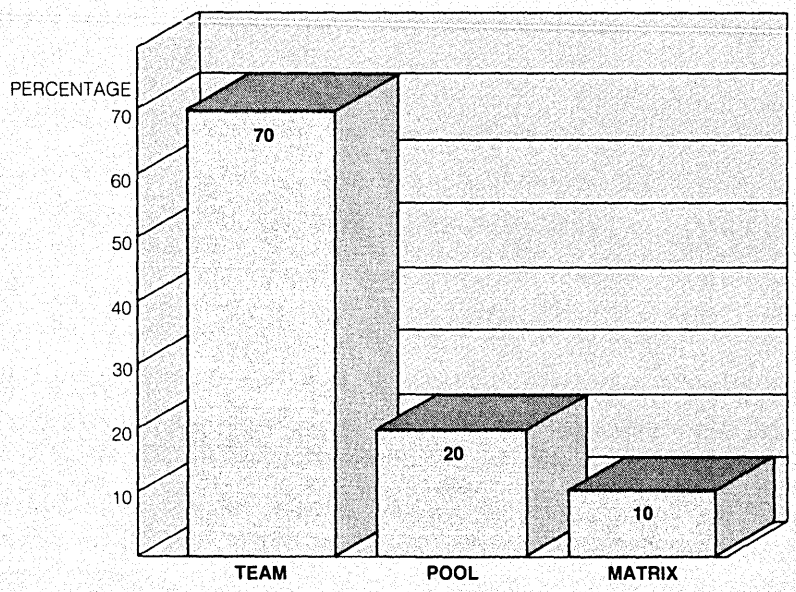
FIG. 1

NUMBER OF FIRMS INCLUDED IN SURVEY BY TYPE AND SIZE (95 FIRMS)

TYPE OF FIRM	NUMBER OF PROGRAMMERS & ANALYSTS IN DEPARTMENT 3-9	10-29	30-49	50-99	100+
Financial Institutions (banks, insurance, brokerage)	8	6	2	5	4
Computer Firms (manufacturers, software houses, service bureaus)	3	5	3	3	1
Public Sector (government)	8	6	5	0	1
Manufacturing (private industry noncomputer firms)	6	2	1	1	2
Services (hospitals, schools, utilities)	7	11	3	1	1

FIG. 2

ORGANIZATION OF PROGRAMMERS & ANALYSTS



(Q. 16) What best describes the organization of your development staff?

CLEARLY MARKED STAGES

Management journals have stressed the need for clearly marked stages in project development and have delineated tasks for different software specialists, but this division of labor no longer appears to be as important as it once was. Working together in project teams, systems analysts, programmer/analysts, and programmers tend to overlap in job function. Similarly, an overlap of project milestones is apparent:

- Fewer than 30% of managers said that they change personnel at sign-off points within a project, signifying the strength of project teams and the lack of clearly marked project milestones;
- Only 10% of firms change day-to-day responsibility between design and coding, perhaps a further indication that teams develop their own internal work organization.

The interviewed managers were remarkably candid. While most programmers and analysts know that "things are not done by the book," the survey is an open admission of a more relaxed attitude toward work organization.

How a petroleum company made its data production flow again.

Like many enterprises today, a major petroleum company was trying to cope with the growing demands on its data processing operation and the problem of frequent data bottlenecks. The company's DP management considered adding more channels, more memory, more high-performance disks, or even a new more capable processor.

Some were too expensive. Others were only temporary stop-gap remedies. Then the company turned to Storage Technology and the Sybercache Intelligent Disk Controller.

A 62% improvement in I/O performance.

Installed on the customer's IBM channel, the Sybercache immediately reduced device service time. Batch jobs that previously took three hours were handled in just under one. A typical five-hour production job was cut to one-and-a-half.

Overall, our customer logged a 62% improvement in I/O service time. And device busy time was reduced by 60%.

A better way to deliver your data.

Our Sybercache bypasses the mechanical performance problems of disk drives. Instead of lengthy delays locating data on a disk drive, our intelligent controller anticipates a data request, pre-fetches it from the backend disk, and stores it in a special electronic memory before the CPU requests it. This way, online response is almost instantaneous and batch throughput automatically increases.

Go with the intelligent alternative.

Sybercache ends capacity vs. performance trade-offs. With it, you load your disk drive to the maximum while you get even faster performance. So don't settle for an I/O service time of 40 milliseconds or more when Sybercache can deliver a fast 3 ms at channel speeds of 3 megabytes per second.

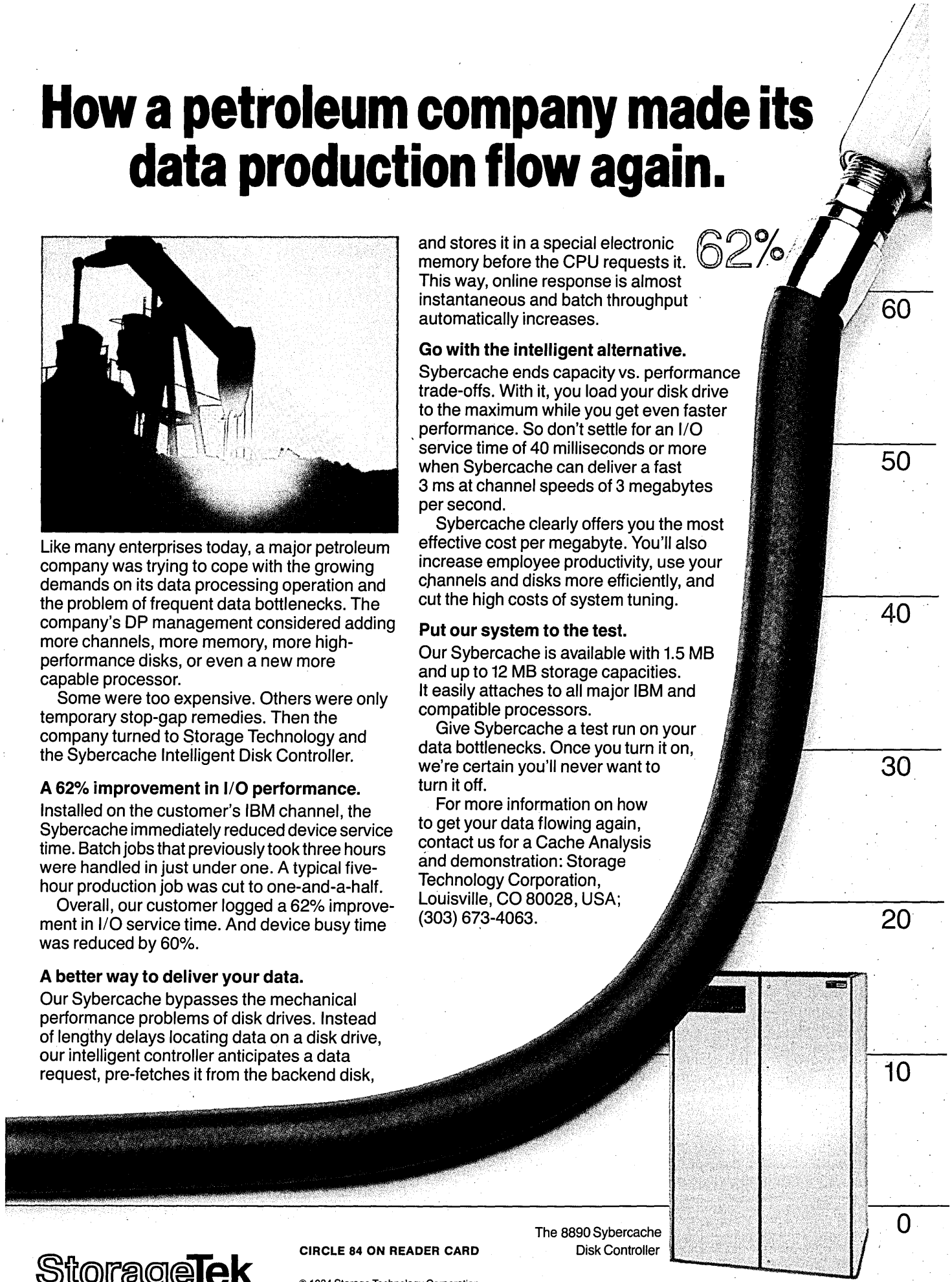
Sybercache clearly offers you the most effective cost per megabyte. You'll also increase employee productivity, use your channels and disks more efficiently, and cut the high costs of system tuning.

Put our system to the test.

Our Sybercache is available with 1.5 MB and up to 12 MB storage capacities. It easily attaches to all major IBM and compatible processors.

Give Sybercache a test run on your data bottlenecks. Once you turn it on, we're certain you'll never want to turn it off.

For more information on how to get your data flowing again, contact us for a Cache Analysis and demonstration: Storage Technology Corporation, Louisville, CO 80028, USA; (303) 673-4063.



The 8890 Sybercache Disk Controller

StorageTek

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The survey is an open admission of a more relaxed attitude toward work organization.

The questionnaire, originally developed for use in the United Kingdom, also asked if managers imposed a set of design and coding on programmers and analysts. Almost unanimously, American managers responded that they do not "impose" standards, probably reflecting the fact that this type of strict enforcement seems to go against the American self-image. Even with further questioning on this point, less than 60% of managers said that they use standards to limit GO TO statements, and a similar number admitted that they require formatted specifications for input/output and program layout. To a separate question asking if there were department standards for program specification, only half of the managers responded affirmatively.

It's hard to say whether standards are indeed enforced without much enthusiasm, or whether it has become fashionable for managers to appear relaxed in their management style. As might be expected, first-line managers and project leaders who are closer to shop-floor practices are more likely than DPMs to expect programming standards. And, it was suggested that strict enforcement was no longer so necessary, since newer programmers have been schooled in structured code and therefore don't need to have their hands held to avoid GO TO situations.

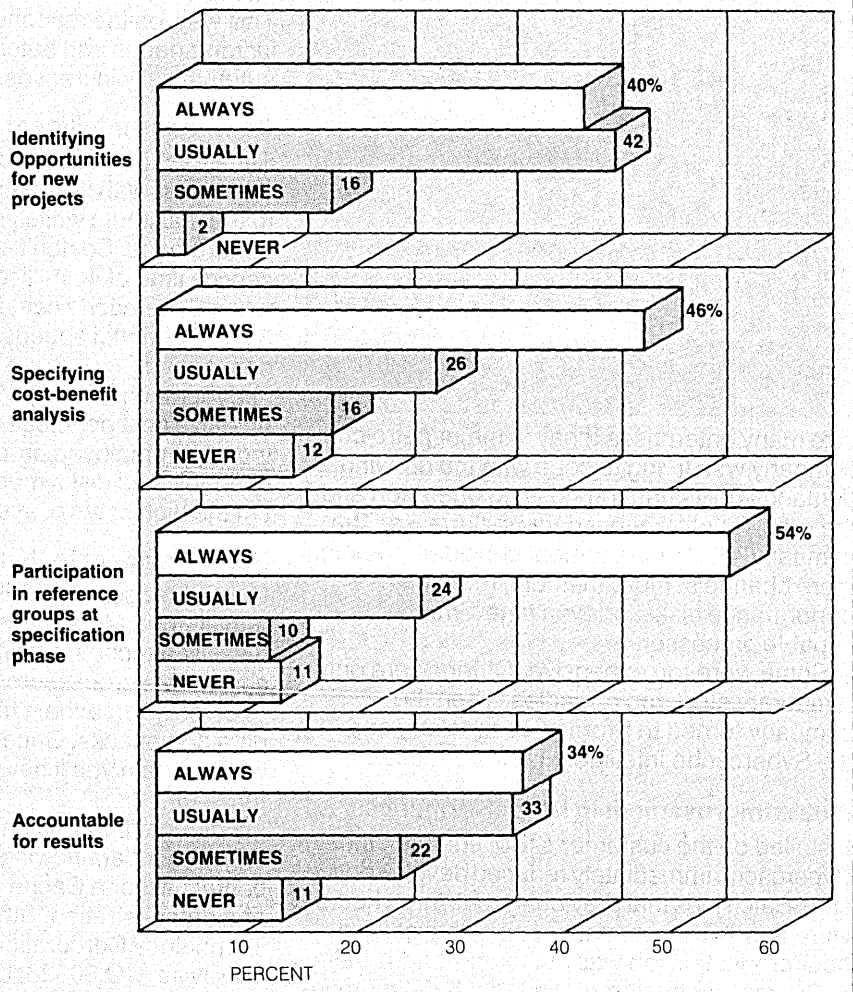
While management journals have spent the better part of the last decade hammering home the enforcement of standards, most software people know that strict adherence to rules is rare. Many managers, however, commented that they would like to see better enforcement of department programming standards. Some went as far as to say that it was a top priority for them, though overall, interviewers got the sense that management theory and shop-floor practice are strikingly different.

Management methods for monitoring and evaluating staff are also varied, but here managers appear to exert more control. Almost all use some recognized procedure for appraising individual performance, such as time sheets, work targets, and formal employee evaluation sessions. About 90% of managers said that they involve programmers and analysts in setting target dates for project phases, although most managers do not let staff pick their own projects.

On the whole, managers prefer to evaluate workers on the basis of how well target dates are met, rather than on the basis of time sheets. Many said that time sheets are merely paperwork, important for keeping upper management happy, but not particularly useful for monitoring the progress of programmers.

FIG. 3

USER ACTIVITY



(Q. 8) To what extent are users normally involved in development of new applications in their area?

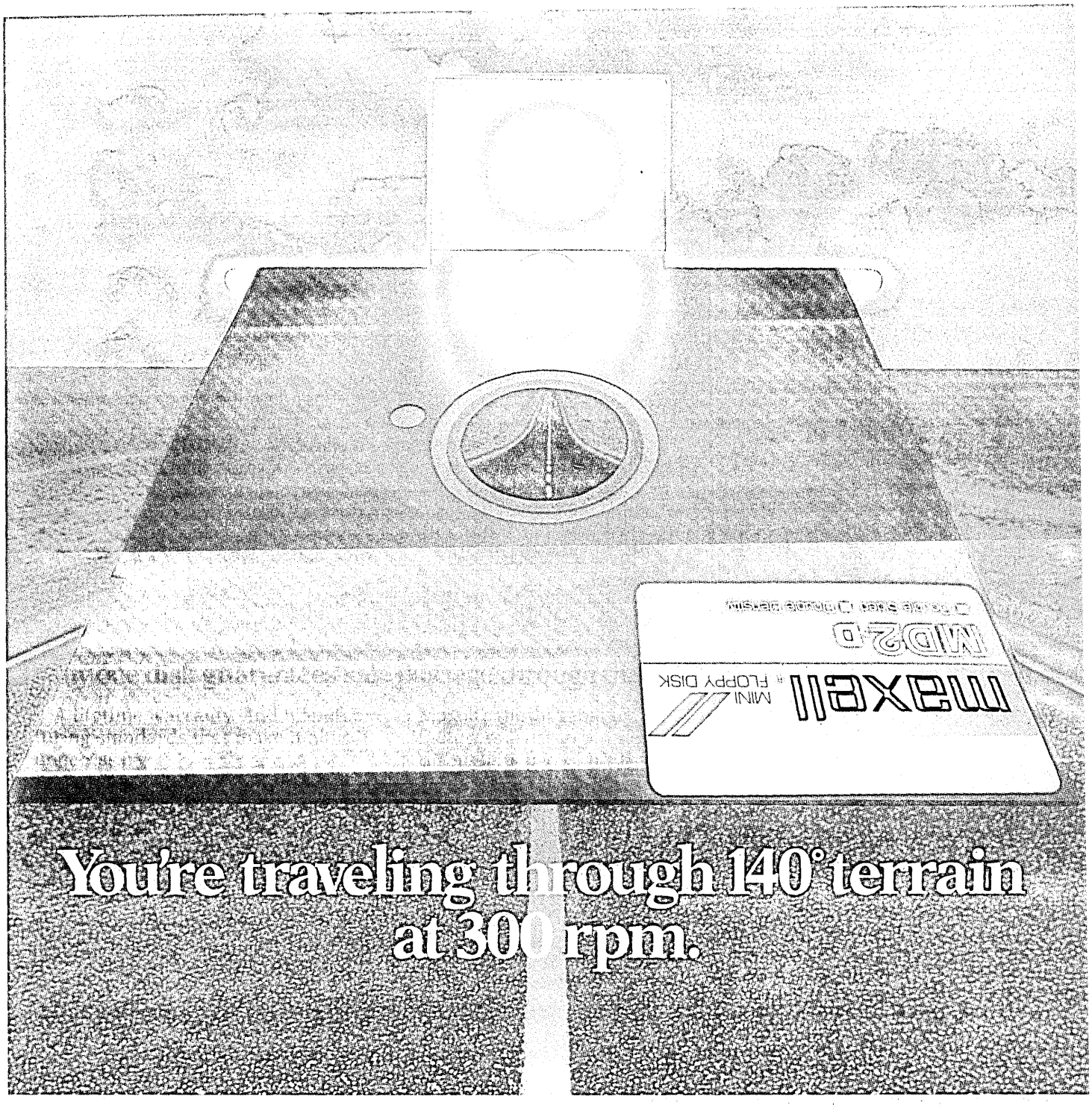
Managers were quick to point out that now, as in the past, "experience and achievement are more important than a degree." Forty percent of the sampled firms indicated that they have hired programmers with less than two years of experience, but most preferred programmers with at least two years of experience under their belts.

Since many managers want to hire people who can communicate well with users, generalists are in demand. One manager explained that he would prefer to recruit "application analysts"—people with business experience who could understand users' needs and envision a whole application.

While a computer science degree is still a big favorite in corporate personnel departments, many managers said that, if given their own choice, they would seek out liberal arts graduates and people interested in problem solving. Two to one, managers prefer degrees in subjects other than computer science. They stressed, however, that hiring technically proficient people is still essential.

LABOR TURNOVER STILL BIG

Labor turnover, particularly among programmers and analysts with two to five years of experience, continues to be an issue. The survey



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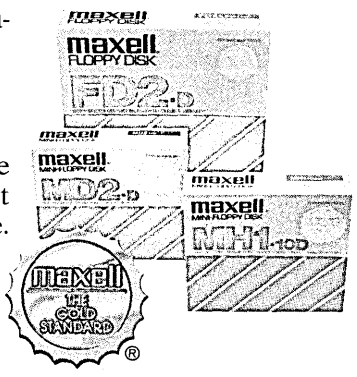
So you can drive a bargain. But in accelerated tests, Maxell floppys lead the industry in error-free performance and durability. Proving that if you can't stand the heat you don't stand a chance.



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At Digital, the first step in engineering every product we make involves a thorough analysis of who will use it, what it will be used for and which features will help make people more productive in their jobs.

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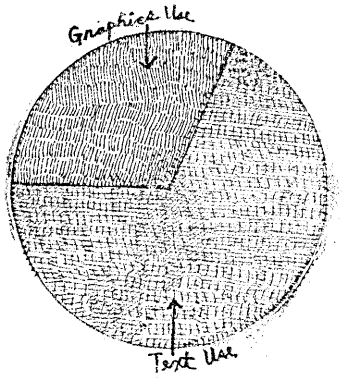
As the newest members of Digital's family of terminals, the VT240, a conversational



text and graphics terminal, and the VT241, with the added dimension of color, continue the tradition of engineering excellence for performance. They offer full VT100™ compatibility to take advantage of a host of offerings already developed. And to meet the needs of the business environment, you'll find a set of standard text features that are either unavailable on other terminals or may have to be purchased at an additional cost.

These features include bidirectional smooth scrolling, split screen, a choice of 80 or 132 columns per line and a double width/double height format. A highly legible 8 by 10 dot matrix character font displays true ascenders and descenders for exceptional crispness and legibility. It certain information needs to be highlighted, you can select from a combination of bold print, blinking and underlining in either normal or reverse video. For your added convenience, there's even a built-in printer port for printing hard copy.

Both the VT240 and VT241 terminals give you the option of erasing selected character positions on the screen for more efficient communications and increased productivity. For those applications that require data to be entered by filling in the blanks of a form, once the data has been accepted by the host, the filled-in information – and only that – can be erased by means of a single command. The form itself remains up on the screen and is ready to accept the next data entry sequence.

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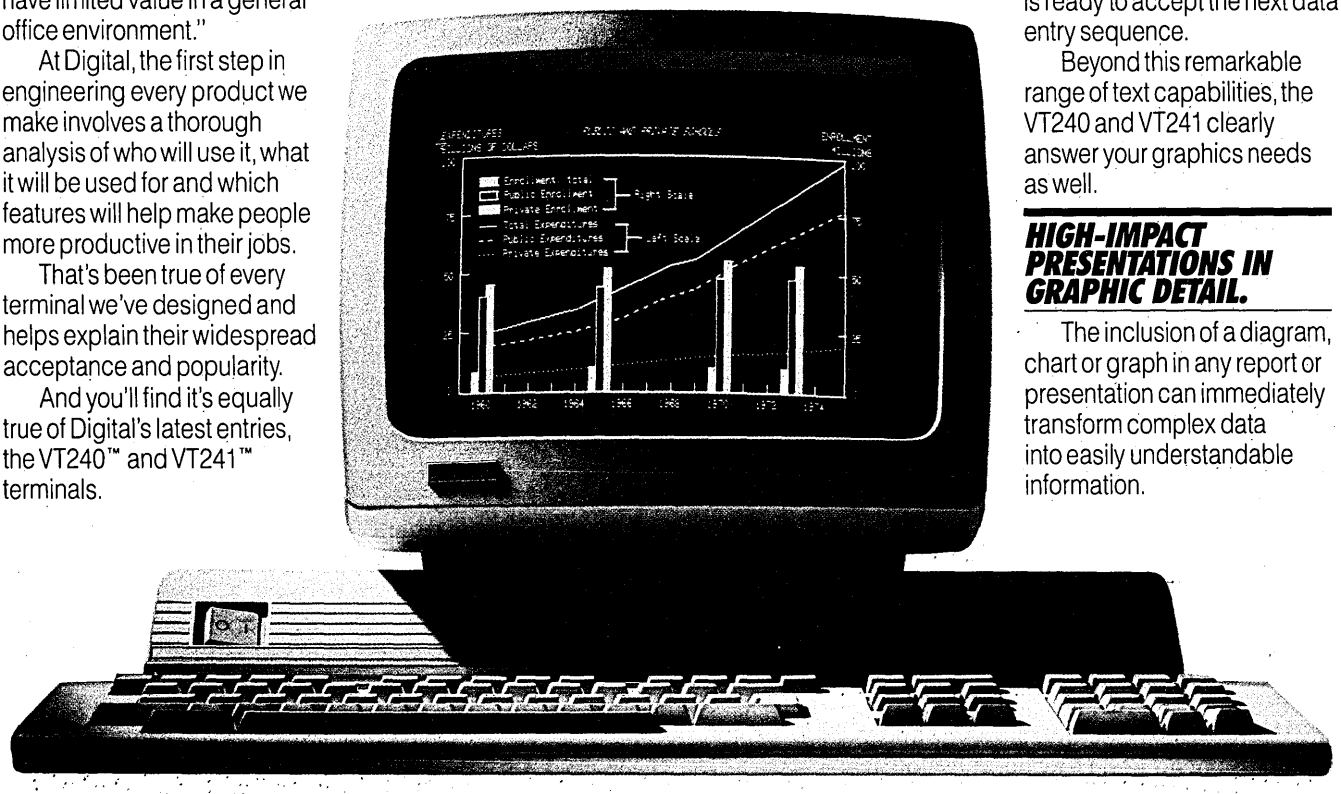
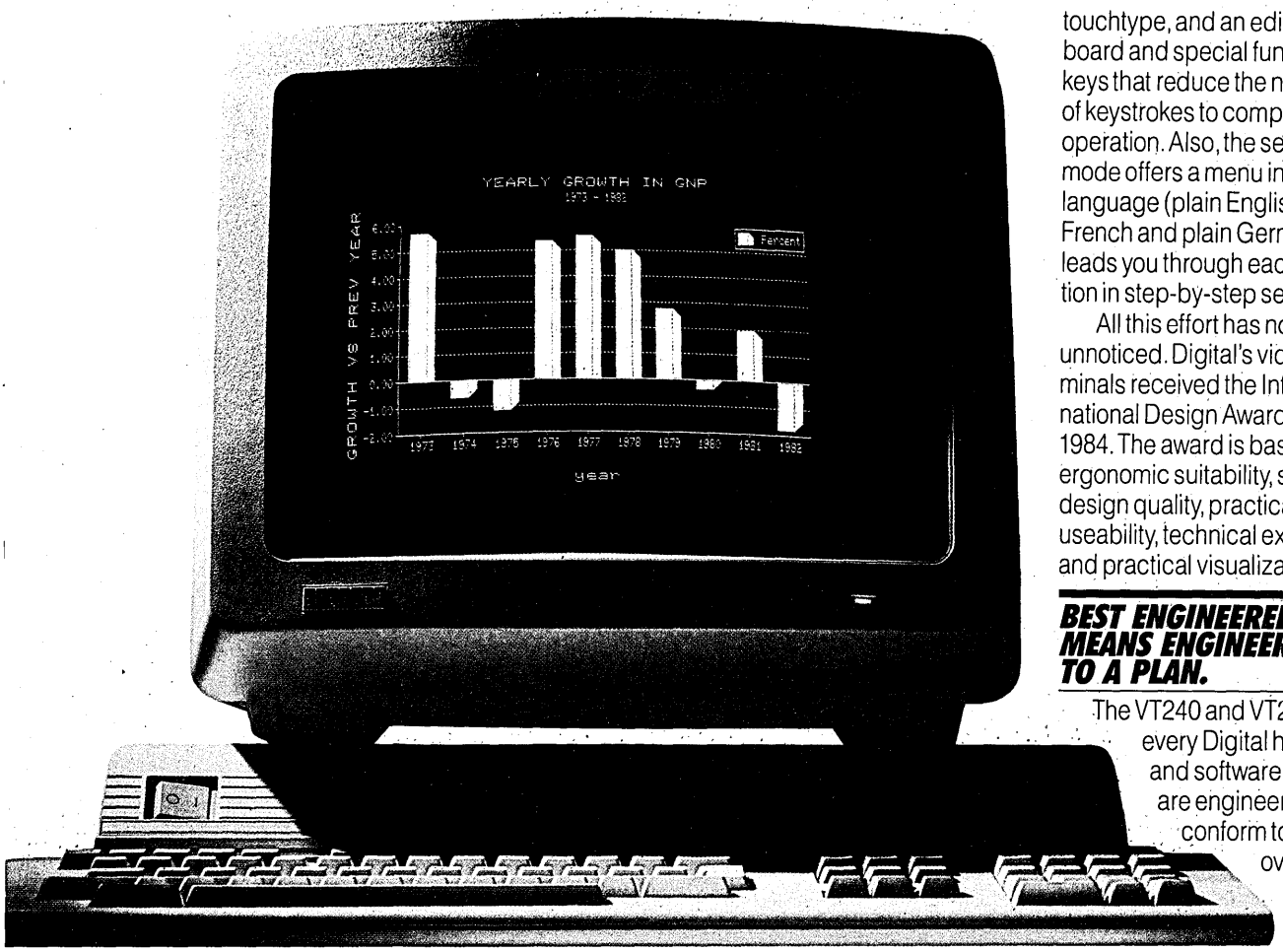
The inclusion of a diagram, chart or graph in any report or presentation can immediately transform complex data into easily understandable information.





touchtype, and an editing keyboard and special function keys that reduce the number of keystrokes to complete an operation. Also, the set-up mode offers a menu in plain language (plain English, plain French and plain German) that leads you through each operation in step-by-step sequence.

All this effort has not gone unnoticed. Digital's video terminals received the International Design Award in 1984. The award is based on ergonomic suitability, safety, design quality, practical useability, technical excellence and practical visualization.

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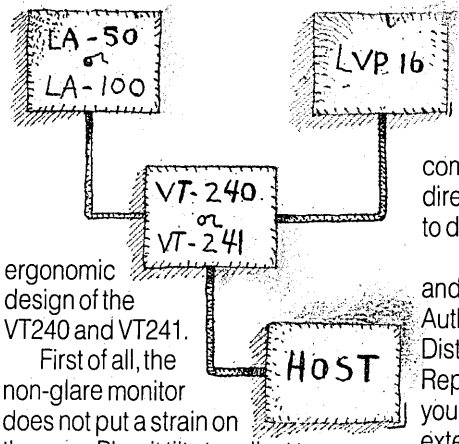

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THE BEST ENGINEERED COMPUTERS IN THE WORLD

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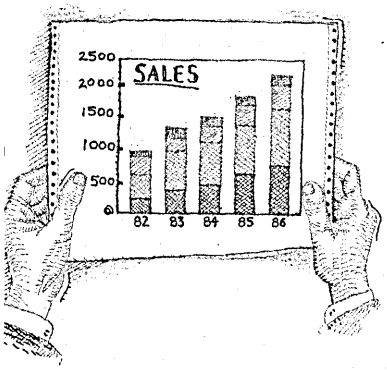
Both the VT240 and VT241 terminals generate bit map graphics in a choice of two protocols – Digital's ReGIS™ (Remote Graphics Instruction Set) and Tektronix 4010/4014.™



ReGIS lets you create and store business graphics as simply as producing ASCII text. With VAX-11 DECgraph™ and VAX-11 DECslide™ software, even a novice can prepare graphs and charts and turn them into slides. Self-explanatory icons let you choose a box, circle, line, polygon, triangle or arc.

The Tektronix 4010/4014 protocol supports the full array of existing 4010 compatible graphics software. Besides, Tektronix Plot 10,™ TELL-A-GRAF™ and DISSPLA™ from ISSCO® and DI-3000,™ GRAFMAKER™ and GRAFMASTER™ from Precision Visuals are also supported.

When you're using third party software, Digital provides you with the total hardware/software solution: video terminals, hard copy with the LVP16™ Pen Plotter and the VAX™ computer.

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Your people have to spend long hours in front of a terminal. It stands to reason the easier they are to use, the more productive the results.

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First of all, the non-glare monitor does not put a strain on the eyes. Plus, it tilts to adjust to the exact viewing angle that's most comfortable to work with. The detachable keyboard is ruggedly constructed, yet light enough to place on your lap. Even the way the keyboard has been arranged boosts productivity.

There's a standard typewriter keypad so you can

There is a major contrast between management's actual practice and the "correct" policy of management theory.

showed that, during the last three years, large firms had a turnover rate of nearly 100% for workers in this experience bracket. With the demand for banking applications, job hopping was most common for programmers and analysts in financial firms. But mangers seemed to be less worried about job hoppers than they were in the past, apparently because the pool of possible replacements is now so large.

Because the supply of graduates far exceeds the current demand, breaking into programming is hard. While there might be a demand for Renaissance-type programmer/analysts, it certainly is not a Renaissance period for entry-level programmers.

In general, managers said that they are pleased that users are getting more involved in identifying opportunities and participating in the specification phase of projects. Many managers indicated that as users get more sophisticated, some data processing woes might ease.

But user sophistication is a double-edged sword. Some managers complained that users have increased input in defining projects, but have not accepted additional responsibility for results. In a question asking if users were held accountable for results, the overwhelming majority of DPMs said that this was rarely the case. The glory or shame that goes with a project's outcome is still the dp department's domain.

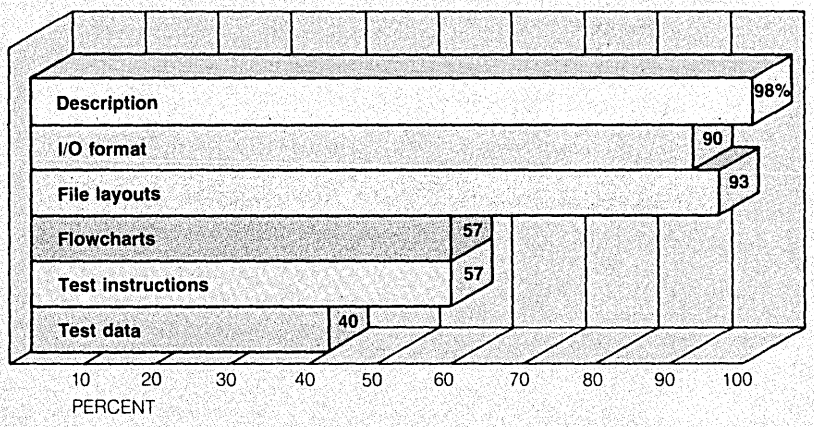
Users are almost always involved in some phase of project development, but the introduction of micros into user departments has cast many DPMs into uncharted waters. As users get micros and begin their own projects, data processing managers are sometimes called in to bail them out. In many instances, managers feel that downloading some current work onto user micros would be a good idea. A number of managers expressed delight at the idea of shedding the drudgery associated with maintenance and enhancement of existing systems, but DPMs are searching for a way to control this process. Indeed, most companies do not yet have policies for dividing work between the data processing department and user areas.

Three major firms in our sample attempt to navigate around this problem by merging user and dp functions into new groups.[1] One large insurance company integrated its claim processing applications for one contract type under the auspices of a combined dp/user management team. A very large bank did the same thing with a number of functions, continuing a trend that has affected banks for several years. And a major computer manufacturer took all of its internal corporate functions and reorganized them into 10-person dp/user teams. These teams combined programmers, analysts, and user-specialists under data processing managers. What is unique in these instances is not the fact that users are involved in dp activities, but rather the way in which user activities have become part of the dp department or group. Whether these become models for moderately sized firms will be worth watching for as users gain pc power.

We see a major contrast in this survey between management's actual practice and the perhaps outdated "correct" policy of management theory. Rather than pursue "direct control"[2] over the data processing

FIG. 4

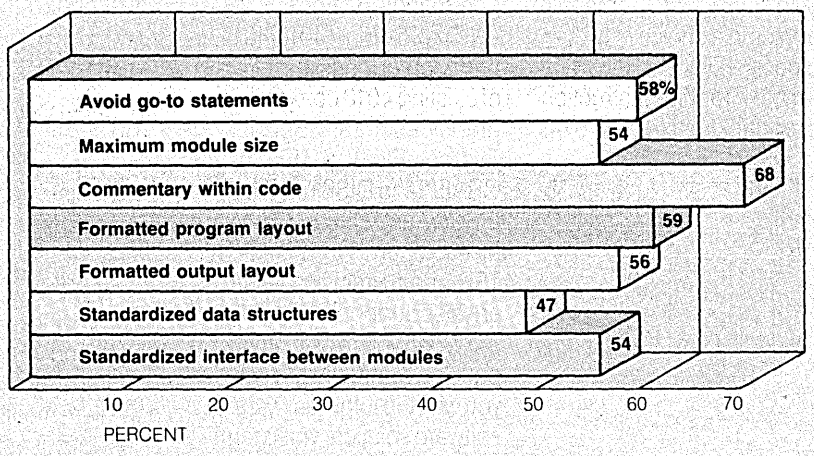
SPECIFICATION STANDARDS



(Q. 28) Of the firms requiring standards specifications, the above represent the percentage of firms including this documentation in their specifications.

FIG. 5

DESIGN & CODING STANDARDS



(Q. 27) Do you impose any (of the above) design and coding standards in your department?

[1]Since the lengthy questionnaire contained some sensitive questions, all 95 firms in the U.S. sample were promised anonymity.

[2]"Direct control" and "responsible autonomy" are terms used in Andrew Friedman's book Industry and Labour. The responsible autonomy style was identified in other work settings.

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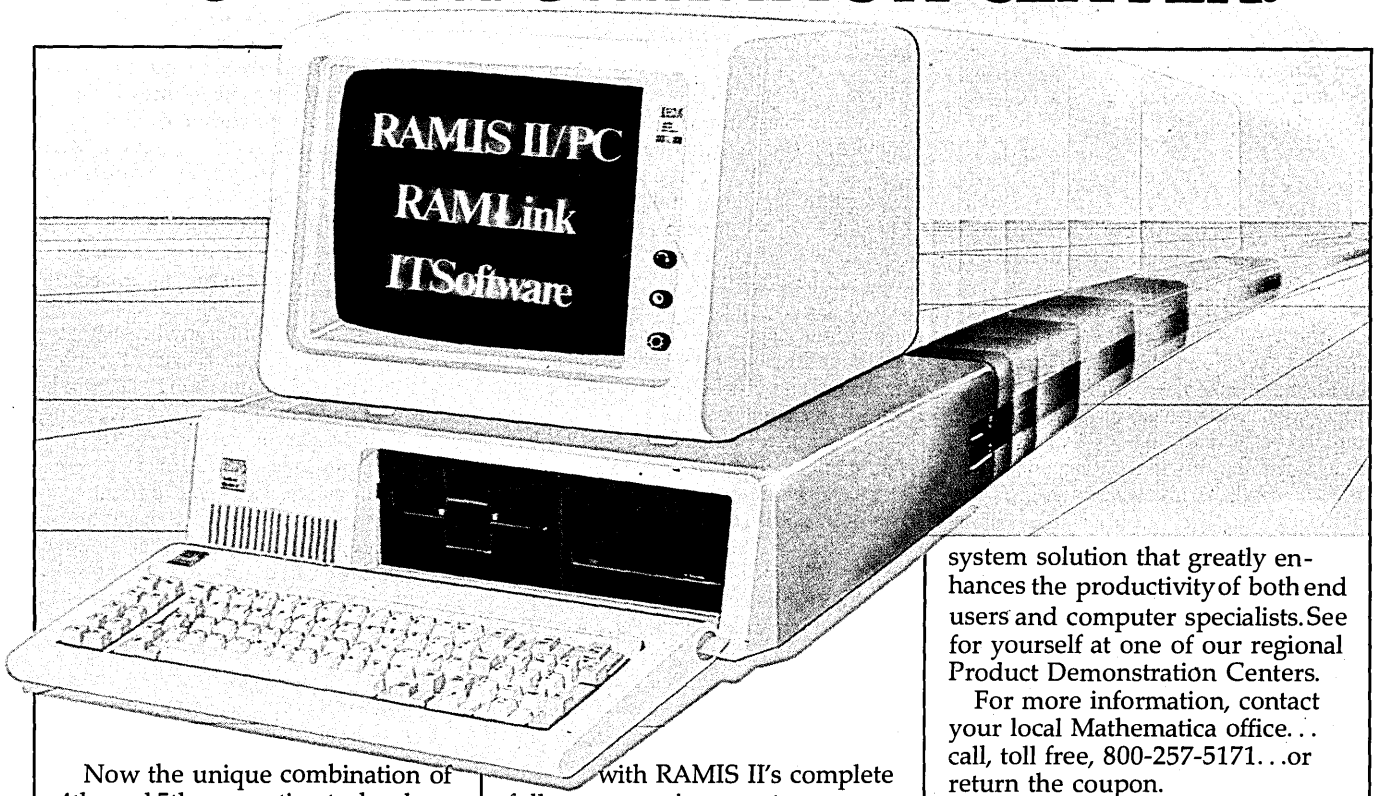

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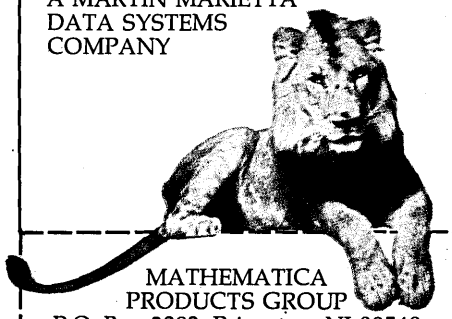

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Sophisticated users will be both boon and bane for the data processing professional.

task assignment, data processing managers have been developing a culture of "responsibility autonomy," in which employees are given considerable responsibility over their work and are expected to perform well over a wide range of work tasks.

DP LABOR DIVISIONS BLURRED

The detailed results of the survey reveal a blurring of traditional boundaries in the division of data processing labor. The emphasis on programmer/analysts as central figures in the organization is interesting: while traditional titles and job ladders still bear much weight, management relies more and more on workers who do some of both. We found, for example, that 95% of the time management expects that the person doing the coding will be involved in writing the specifications as well. Rather than parcel out pieces of work, assembly-line fashion, managers prefer to control task sizes by informal guidelines. Thus, standards like "maximum module size" or "expected lines of code" were rarely viewed as important in shaping the progress of a project.

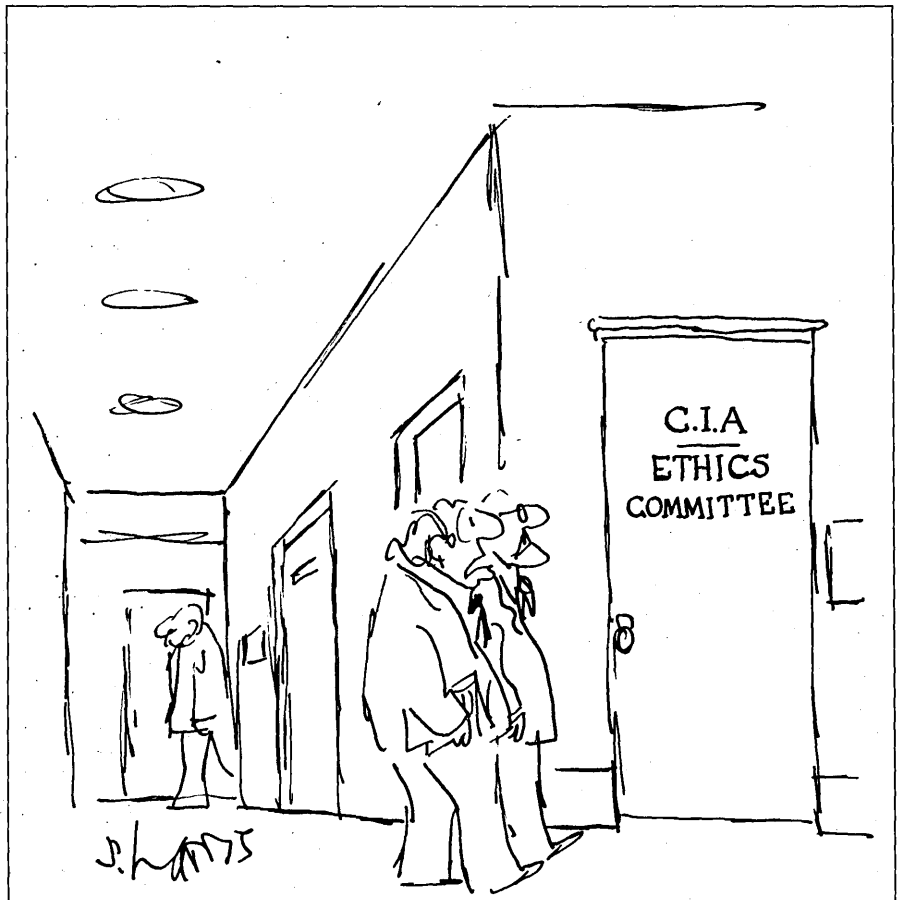
Team organization may offer programmers and analysts more opportunity to see a project from conception through to implementation. Managers believe that there is more assurance that a job will be done well if the participants are more fully involved. Clearly, teams give management the flexibility to move staff around where needed. Seventy-four percent of teams were found to be working on more than one project at a time. This is clearly where generalists and Renaissance people fit in. Amidst a shifting landscape where the only certainty is constant change, programmers who can function as analysts and communicate with users are welcome assets.

User involvement in areas that have traditionally been data processing strongholds is speeding evolution. Both the programmer/analyst structure and team organization are flexible and responsive to the user onslaught. The generalist is yet another figure who can help the data processing department adapt to change. A pattern of informal guidelines and flexible standards is strengthening the image of a data processing work organization that is prepared for change.

From the survey, we see the development of a management culture of responsible autonomy in which flexibility is achieved through careful adaptation. Managers are discarding their traditional watchdog role. They are prepared to exchange direct control of staff and the work process for the flexibility they need in order to retain their balance in the shifting corporate picture.

Within this almost idyllic scene, the shape of future problems is evident. Sophisticated users, with manuals in hand, will be both boon and bane for the data processing professional. Offering users new services, while relinquishing control over some existing prerogatives, will be a difficult parlay. Another problem will be posed by the employee trained in computer science. Technicians geared toward elegant solutions will have difficulty understanding the unstructured problems posed by the new setting.

And finally, new forms of communication will be crucial among expanding data processing departments and new user groupings within the organization. The flexibility that the British Economic Social Research Council study revealed to exist in the organization of data processing departments may, however, save the day. ◉



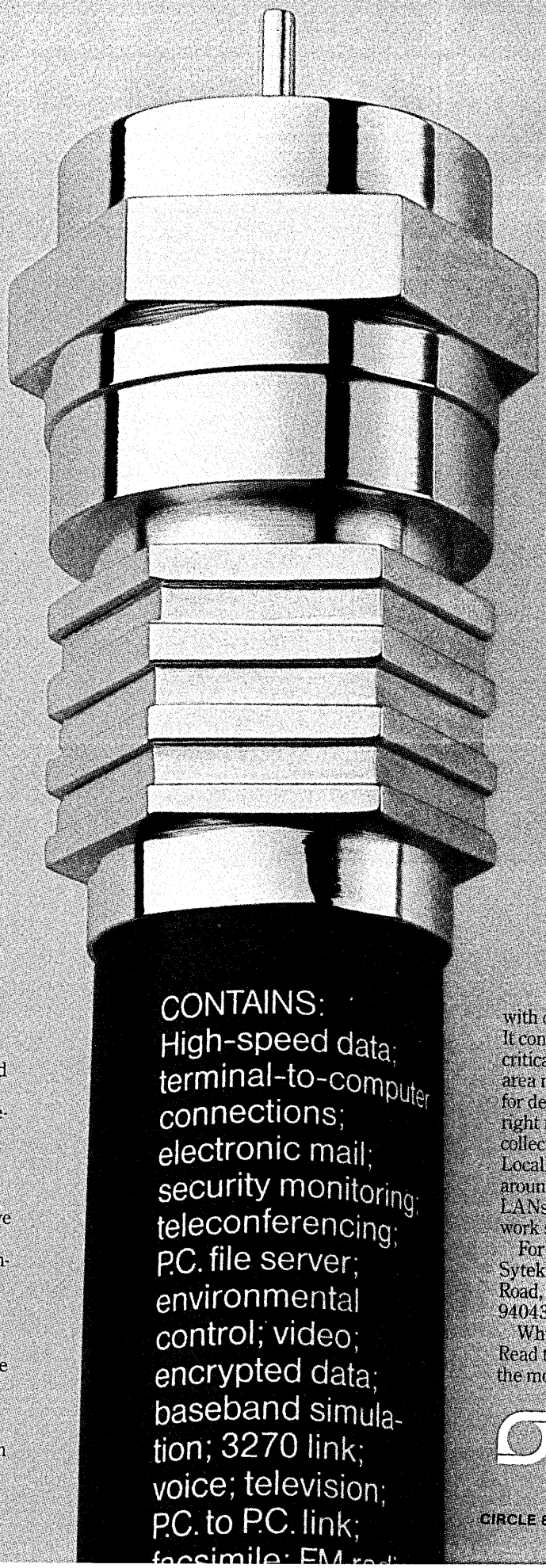
"Say, where the hell did *that* come from?"

CARTOON BY SIDNEY HARRIS

Andrew Friedman teaches economics at the University of Bristol in England. He is the author of *Industry and Labour*, as well as of several articles on work organization in computing. Further inquiries about the survey reported in this article should be addressed to him in England, where he is head of the Data Processing Research Project at the Economics Department, University of Bristol.

Joan Greenbaum is an assistant professor of data processing at LaGuardia Community College in New York (CUNY). She is author of the book *In the Name of Efficiency* (Temple University Press, 1979) and frequently lectures about technology and social change.

The survey was conducted in the summer of 1983 through the International Computer Occupations Network (ICON). ICON project members in New York included Christine D'Onofrio, Persephone Flood, Karen Edwards, Michael Jacobs, and Joe Kirshner. The authors wish to acknowledge the special contribution of Michael Jacobs to the compilation of this article.



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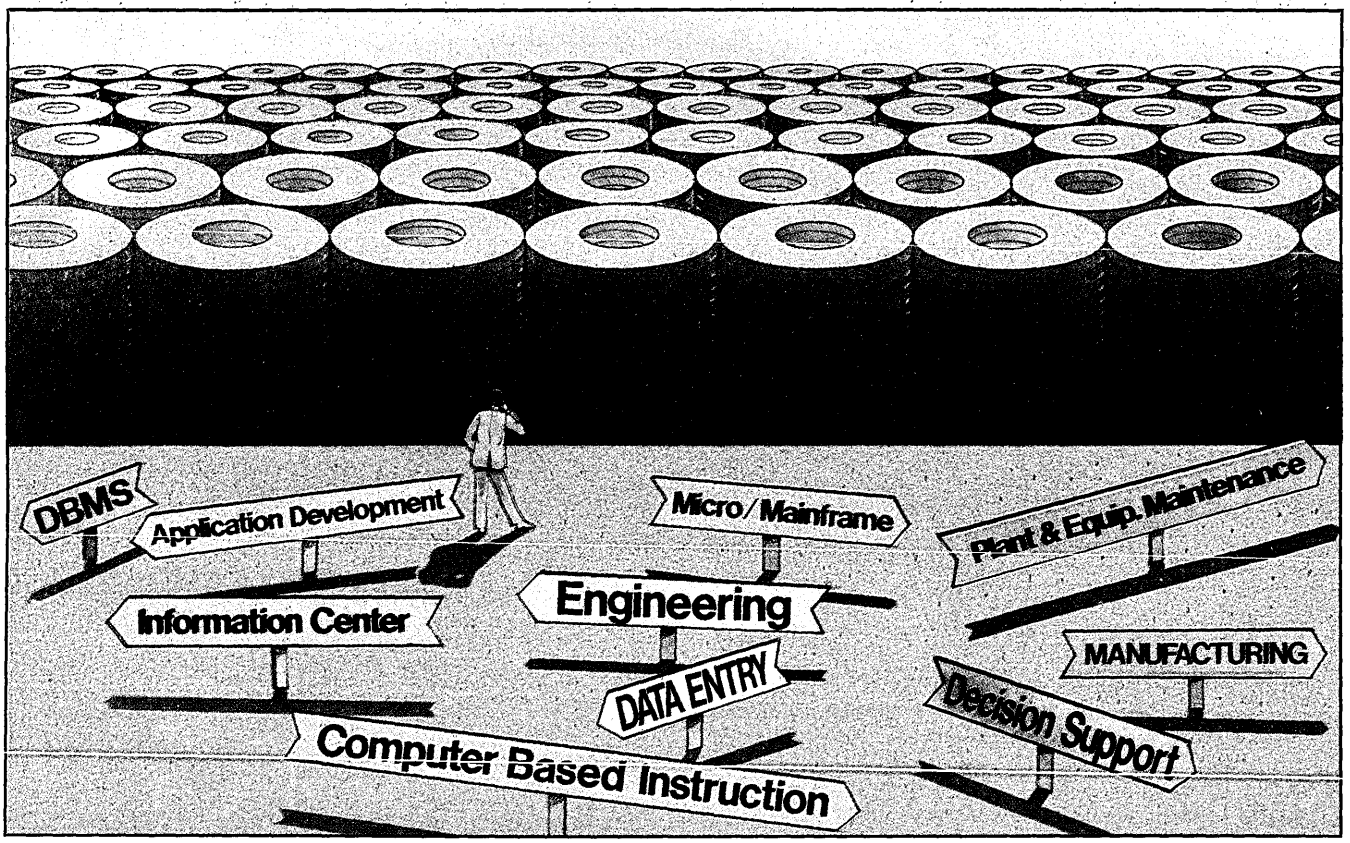

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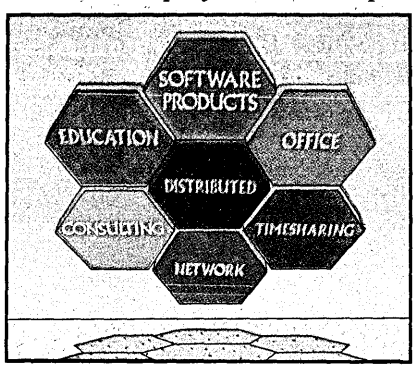

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Uncle Sam is encouraging entrepreneurs to explore new R&D funding realms.

BEYOND PARTNERSHIP

by Hesh Wiener

"We would be in the worst depression the world has ever seen," asserts Dr. D. Bruce Merrifield, assistant secretary of Commerce, "if technological developments weren't creating all the new opportunities that we find surrounding us today.

"But we're obviously not in a depression. GNP isn't going down, it's going up. Even though only 25% of our capital is invested in new, high-growth business, these companies are more than offsetting the 75% of our wealth that is invested in the heavy, smokestack industries that are declining.

"As we complete writing down these older industries in the next few years, we will experience explosive economic growth. The growth will be strong and continuous. We will no longer have the long, 50-year economic cycles we've had in the past because there will never be a 50-year life for anything we manufacture. We will have moved to a world in which inventions last five to 10 years, and in which we will witness the continuous spawning of new business and new industries."

To make the most of this future, America will need new cooperative relationships among companies that now compete. These will not be the traditional partnerships of the past. Instead, there will be organizations that develop technologies on behalf of groups of investors and manufacturers. The resulting technology would then be licensed or sold to various competitors in such key high-tech industries as computers and biotechnology. DOC's Merrifield believes all this will be done with the encouragement of government and the enthusiastic support of Wall Street. The process is, in fact, already under way, through the efforts of prominent people in the public and private sectors.

While at times Merrifield, the government's most visible proponent of new approaches to funding innovation, may sound like a utopian dreamer, his career has been one of creation, not meditation. He is currently the Reagan Administration's assistant secretary for productivity, technology, and innovation at DOC. A Princeton graduate, Merrifield holds a master's and doctorate in physical organic chemistry from the University of Chicago. In the private sector, he headed Continental Group's investments in new ventures. He has, in official capacities, represented America in China and in Israel, and he has advised the government of Jordan on science policy.

Merrifield's movement from the private to the public sector mirrors the movement from government to private industry made by Admiral Robert "Bobby" Inman, the former CIA and NSA chief who now heads Microelectronics and Computer Technology Corp. (MCC). A cooperative of 15 U.S. high technology companies, MCC is striving to come up with new computer components and architectures. By pooling funds, the owners hope to get a higher yield on development dollars than they would by taking parallel paths, each with much less funding. MCC's shareholders, each of which has invested $150,000 to $200,000, include Advanced Micro Devices, Allied Corp., BMC Industries, Control Data, Digital Equipment, Harris, Honeywell, Martin Marietta, Mostek, Motorola, NCR, National Semiconductor, RCA, Rockwell, and Sperry. Developments at MCC's labs will be licensed by the investors for three years, and after that they will be licensed to the industry at large.

JAPAN AS A MODEL FOR MCC

MCC is modeled, in part, after the cooperative organizations that have been formed by Japanese high-technology companies, with the encouragement of the Japanese government. Their success is attested to by the outstanding performance of Japan's memory chip makers, which dominate the world merchant semiconductor market. Future developments by the Japanese that could advance their influence in computing further may result from another cooperative venture, the highly touted fifth generation computer project. Still another example from abroad, recently cited by Motorola's director of research and development, William G. Howard, is the European consortium that designed and built the Airbus. Howard's remarks came at a Control Data conference on cooperative research ventures.

Also on hand for the conference was MCC chief Inman, who warned that such cooperative pacts continue to run the risk of antitrust action in the U.S. Inman said that the Justice Department had in fact been keeping a close eye on MCC's activities. Under U.S. law, there are limits to cooperation among competitors. But so far, Inman reported, no violations of law have been found, and furthermore none were expected as a result of the joint investment in research being made via MCC.

A different type of research funding organization has been set up by E.F. Hutton and Planning Research Corp. Formed last year, Hutton/PRC Technology Partners has raised $25 million in capital to sponsor promising companies—but not startups, according to Bill Gorin, a financier at Hutton working on the sponsorship program. "We look at companies with a track record," he says. So far, its investments have been in the computer industry.

The DOC's Merrifield envisions joint ventures being formed that have characteristics of both MCC and Hutton. Pools of investors, including both companies and individuals, would put funds behind several innovative projects, he explains. While some of these projects would not work out, others would. Because the payoff in successful high-tech ventures is usually quite significant, the successes would, in theory, more than offset the failures. But more than that, such R&D ventures would attract capital that's currently not available to entrepreneurs and innovators. Thus, the ante would be raised in the world technology

EUROPEAN CONNECTIONS

"If you can't lick 'em, join 'em." That's the policy followed by many ambitious European companies seeking to ensure their future by forging links with the U.S. and Japan—their powerful rivals in the international marketplace. Europeans regard these collaborations as a way to keep pace with technology and as a way to survive in their comparatively small home markets in the face of fierce competition from U.S. and Japanese vendors.

Deals between Philips and Control Data and between Olivetti and AT&T International on Unix in Europe attest to the growing popularity of international alliances. Yet even before the team-up trend became a trend companies such as Bull of France had strong connections across the Atlantic. Honeywell, whose first stake in the French firm dates back to 1970, continues to have ties to the company, despite its nationalization in 1982. Those ties are mainly in the mainframe realm, where Honeywell takes care of the large-scale DPS 8, while Bull focuses on the DPS 7 medium-range system. A new dimension will be added to this deal when Japan's NEC integrates its S1000 machine into the Honeywell/Bull line.

Bull's manager of development and cooperation, Jacques Zyss, is blunt about the effect such links have had on his company. "Our development capability and technical expertise," he admits, "depend on our collaborations with other companies." Yet Zyss emphasizes that "Bull remains an industrial company committed to producing hardware."

That has always been the attitude of another European company well known for collaborating its way out of trouble—Britain's ICL. Since its near collapse in the early '80s, ICL has hitched up with a variety of firms including Fujitsu for chip technology, Mitel for PBXs, Perq for workstations, and Rair for personal computers. These deals were designed to fill gaping holes in the company's product line. This does not seem to be the purpose of its recent deal with AT&TI, which will provide ICL with the hardware and a U.K. gateway to its Net 1000 service.

"There is a high rate of change in the technology used by all the industry," comments ICL's technical director Mike Watson. "The bigger companies, even a market leader like IBM, have had to strike collaborations because each technology requires a different management style. We believe partnerships and joint ventures are an essential part of the strategy of any information technology company."

The Europeans are also looking for partners on their own soil. There is in fact more willingness among Europe's technological titans to cooperate with each other to counter the cooperative cartels set up by the Japanese and Americans. Linkups at both the European and national levels, particularly in research, are adding a new luster to the continent's industrial relationships.

Industrial cooperation has indeed become a way of life and survival throughout Europe. Saddled with a trade deficit of around $12 billion, European companies and governments are pooling their resources in a bid to strengthen their homegrown industries and give them a fighting chance in the international arena. On a European level there is the European Commission's Esprit (European Strategic Program for Research & Development in Information Technologies) project. After much delay, Esprit finally got the funding go-ahead earlier this year and research proposals are now being reviewed. These research projects into new technologies will be conducted jointly by European companies, universities, and research organizations. Esprit will cost the EEC and the participants a cool $1.3 billion.

Similar moves are also under way on national levels. The U.K. already has its own government-backed research initiative called the Alvey scheme, and the German, French, and Dutch governments are considering following the U.K.'s lead.

This new Europeanism is not just a political issue either. Twelve European manufacturers, for instance, have agreed to implement OSI standards on their equipment to minimize communications compatibility problems between their products. This agreement on OSI is also designed to counter IBM's push with its networking architecture, SNA. That push has recently been strengthened in Europe by a proposed joint venture between IBM and the U.K. telecommunications authority, British Telecom, to set up a company providing SNA-based value-added network services. What's more, West Germany's Siemens, the U.K.'s ICL, and France's Bull have set up an independent research institute in Munich to explore advanced computer technologies.

Of course, there have been other Europacts in the past, most notably Unidata, the ill-fated cooperative alliance formed in the '70s by Siemens, Philips, and Bull. The new liaisons, however, are different from the Unidata scheme, which unsuccessfully sought to resolve incompatibility between the three companies' product lines.

The current European confederations are classified as "precompetitive collaborations," which means that each participant gets the research results that they can then individually use to turn out world-class products. This is not something European firms are famous for, but with a little help from their friends and some solid research behind them, they stand as good a chance as anybody in the volatile international marketplace

—Paul Tate

game, and America, with its vast wealth, would gain a substantial lead in areas where that lead is now threatened or in fact lost. Innovations in the U.S., however, would be licensed worldwide, raising technological standards everywhere. This would give America a leadership, but not a dominant position—a goal that Merrifield feels is unrealistic and inappropriate.

In a paper written over a year ago, Merrifield laid out a scenario that parallels the one planned by MCC. "Let's assume," he wrote, "that [a consortium of electronics companies is formed] that might include IBM, AT&T, Motorola, DEC, CDC, Intel, and others. These companies would not normally be allowed to collaborate. The antitrust guidelines say that no more than 25% of any market is allowed to collaborate in a given consortium. The consortium, therefore, sets up a separate legal entity called a general partner.

"The general partner then identifies what the user group (the consortium) would like to have. In this case, it might be a 4Mb chip. The first thing the general partner does is contract with the 'users' to take or pay for a certain number of these chips, contingent only on the partner's meeting specified cost/performance specifications. The second thing the partner does is to contract with appropriate laboratories to do the work that is necessary. These are arm's-length contractual arrangements that avoid any antitrust implications. The third thing the partner does is to syndicate venture capital investment instruments in the private sector. This investment will be at relatively low risk, since commercial success is guaranteed in advance [if criteria are met] and since the best laboratories in the world are doing the work.

"The general partner can now either license the 4Mb chip technology back to the individual companies [that seeded it] or, better still, it can manufacture it for them on a scale far down the cost experience curve [because all the demand would be pooled for one manufacturing operation]. Alternatively, the partner can license the technology to an individual company for manufacture on a large scale.

PLUSES OF PARTNER PAYOFFS

"One of the key factors is that once the limited partners are paid off, the cash flow continues to come back to the general partner. If the general partnership is set up as a nonprofit corporation, the continuing cash flow is available to fund second- and third-generation projects.

"The role of the government here is

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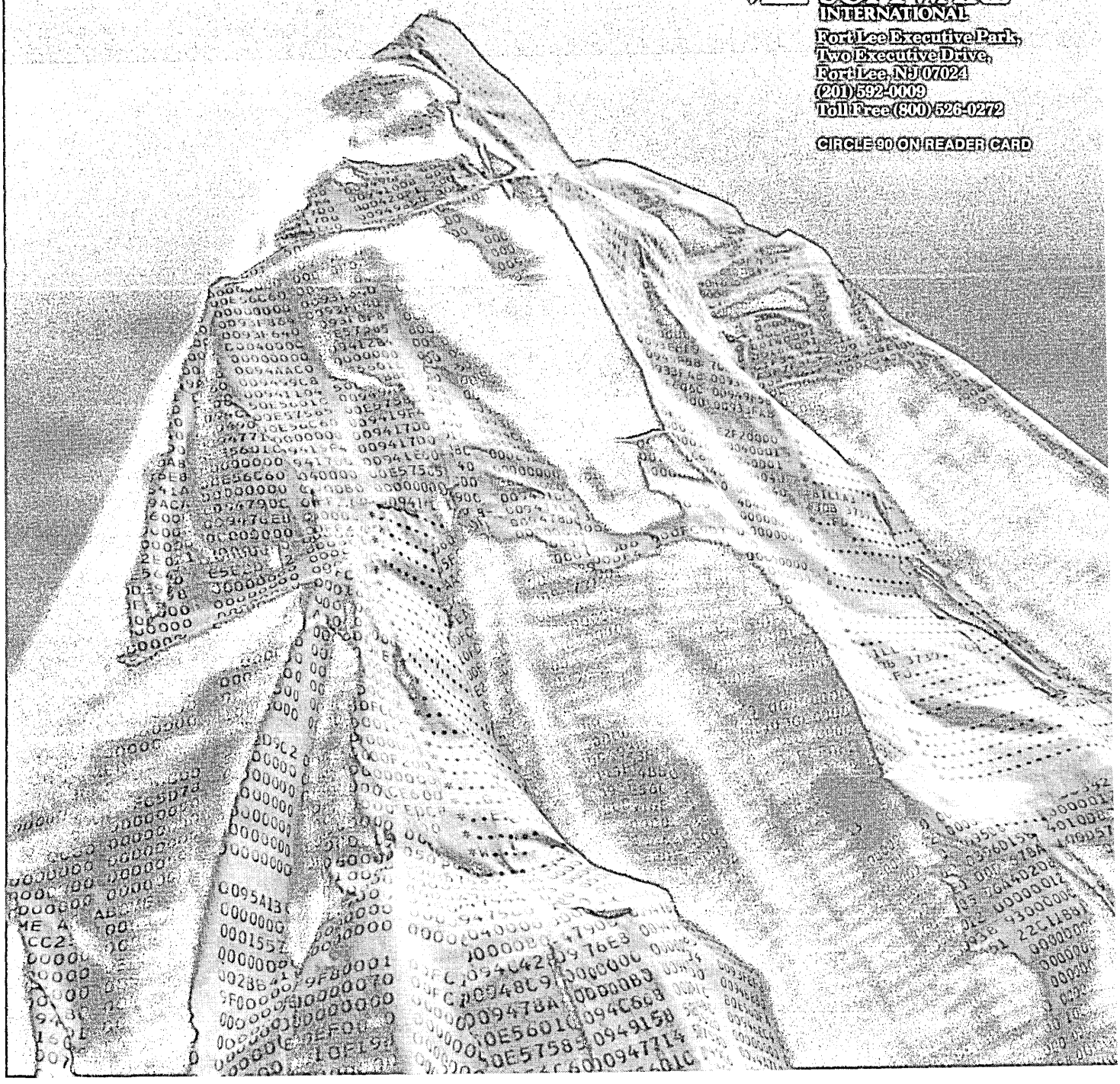


The U.S. share of the world's technology is down to about 50%.

strictly catalytic. It develops guidelines and advises groups when desirable. This is a major thrust of the Department of Commerce."

Merrifield's office has produced more than the usual government pamphlet to help would-be consortia organizers get off the ground. A 100-page outline has been developed that is, in effect, a blueprint for setting up MCC-like joint ventures. It is officially unofficial. That is, the DOC will not assure that every organization built from this blueprint will pass muster before the Justice Department's antitrust army. The legal clearances are, and remain, the responsibility of the partnership.

But there is more that the Commerce Department will do to help push R&D joint ventures forward. Merrifield's office has also devised computer models that assist in the analysis process associated with joint ventures. These models, which may be used by any interested party, help analyze the opportunity various enterprise areas might present to investors. That is, they help measure the risks and rewards of invention in various industries.

"If you've identified what you believe is a good thing from a commercial point of view," Merrifield says, "and you have put together a business plan that you might take to a venture capital group or to an R&D funding pool, you can just go ahead. But if you're not quite sure you've covered everything properly, you might find that there are people here at Commerce who can help out. We can try to put you in touch with others in the private sector who have some of the skills you will need access to. We can help you identify weaknesses in your idea so that you can elevate your plan to the point where it can qualify for funding."

In addition, Merrifield's office is working on a sourcebook that will list 100 small business development centers around the country. This book will be published by National Technical Information Service in Washington, which already publishes the 100-page handbook for prospective partnership participants.

This call for industrial and government cooperation from an administration that represents conservative free enterprise may seem a bit out of place. Nevertheless, Merrifield sees the role of government as "noninterventionist" in the R&D venture context. "Basically, what I'm trying to do," he explains "is get the government out of this thing. We want to develop the private sector expertise to use innovative funding structures."

Merrifield is also concerned about our adversaries abroad. This concern is shared by other people, both in and out of government, who feel that America's future is increasingly at stake as worldwide competition heats up faster than U.S. companies can cope with it.

DROP IN HIGH-TECH TRADE

"A decade ago the U.S. with only 5% of the global population, was generating about 75% of the world's technology," says Merrifield. "But now, that share is down to about 50%, and in another decade it may be only about a third."

This decline, according to the assistant secretary of Commerce, is not due to a drop in American R&D spending, but to the explosive technological development that's taking place in other countries that are committed to supporting high-tech industries. Arguing on behalf of the administration, Merrifield maintains that America's problems are compounded by antiquated antitrust laws that hobble efforts to move the country forward.

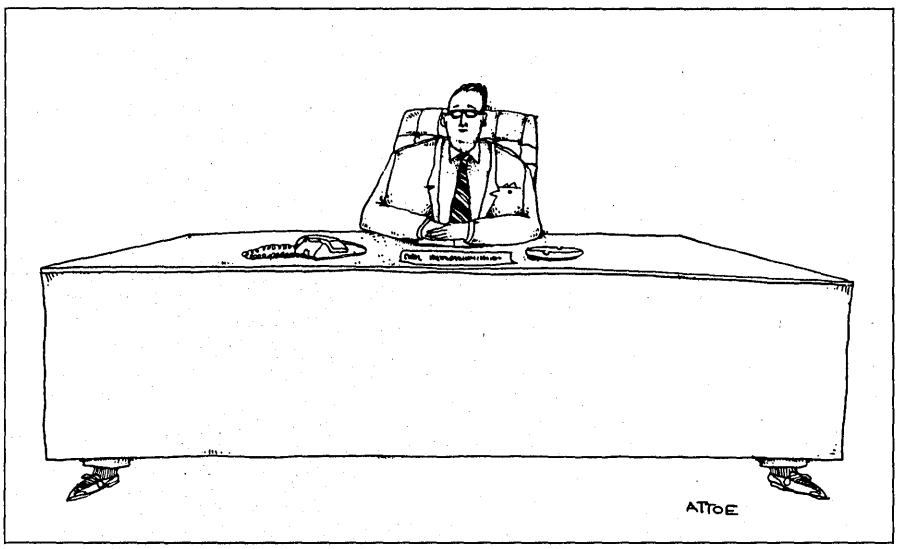
"These are world markets now, and the U.S. doesn't have the whole game any longer," he insists. "As the life cycles [of factories and their products] are compressed, it is almost inconceivable that any entity could dominate any area of business very long [the way it might have been done in the past]. If such domination occurred, it would be under the legal patent monopoly that is allowed under the Constitution. As long as there is seething development of new technology that continually obsoletes projects and processes, antitrust laws developed in an era when products lasted 30 years won't work."

There is, as Merrifield emphasizes, no absolute requirement for joint ventures. "If an individual company has the resources, the cash flow, and the competence to carry on a new development all by itself, it should. But others should be aware that there is an opportunity now to pool resources and go beyond the thresholds of individual companies."

For investors, backing a few selected technologies—advanced semiconductors, for example—may be riskier than putting money in diversified companies with independent opportunities. "There can be considerable risk," confirms Hutton's Gorin, "but only to the extent a company's future is based on a particular product." This is why Hutton has avoided one-product companies, while similar efforts being organized by Merrill Lynch and Prudential-Bache are developing their own guidelines to limit the chances they take with investors' funds. Moreover, the deals have to be structured to provide an upside that balances the possibility of bankrolling a bunch of technological turkeys that never fly.

For projects that fly some of the payoff comes from tax incentives that are provided for investment. Merrifield, however, is quick to point out that these investment funds should not "be thought of strictly as tax shelters," which do not enjoy enviable reputations across the board. "Tax incentives are ways of mitigating high risk," he notes, but they are not to be viewed as an alternative to real profits.

The right risk analysis, Merrifield says, can "increase a venture's chances of success to seven, eight, or nine out of 10 attempts, while today there are indications that only one in 20 takes off properly." ◉



CARTOON BY STEVE ATTOE

Hesh Wiener heads Technology News of America Co. Inc., a New York publisher of an international computer news service and newsletters for computer users.

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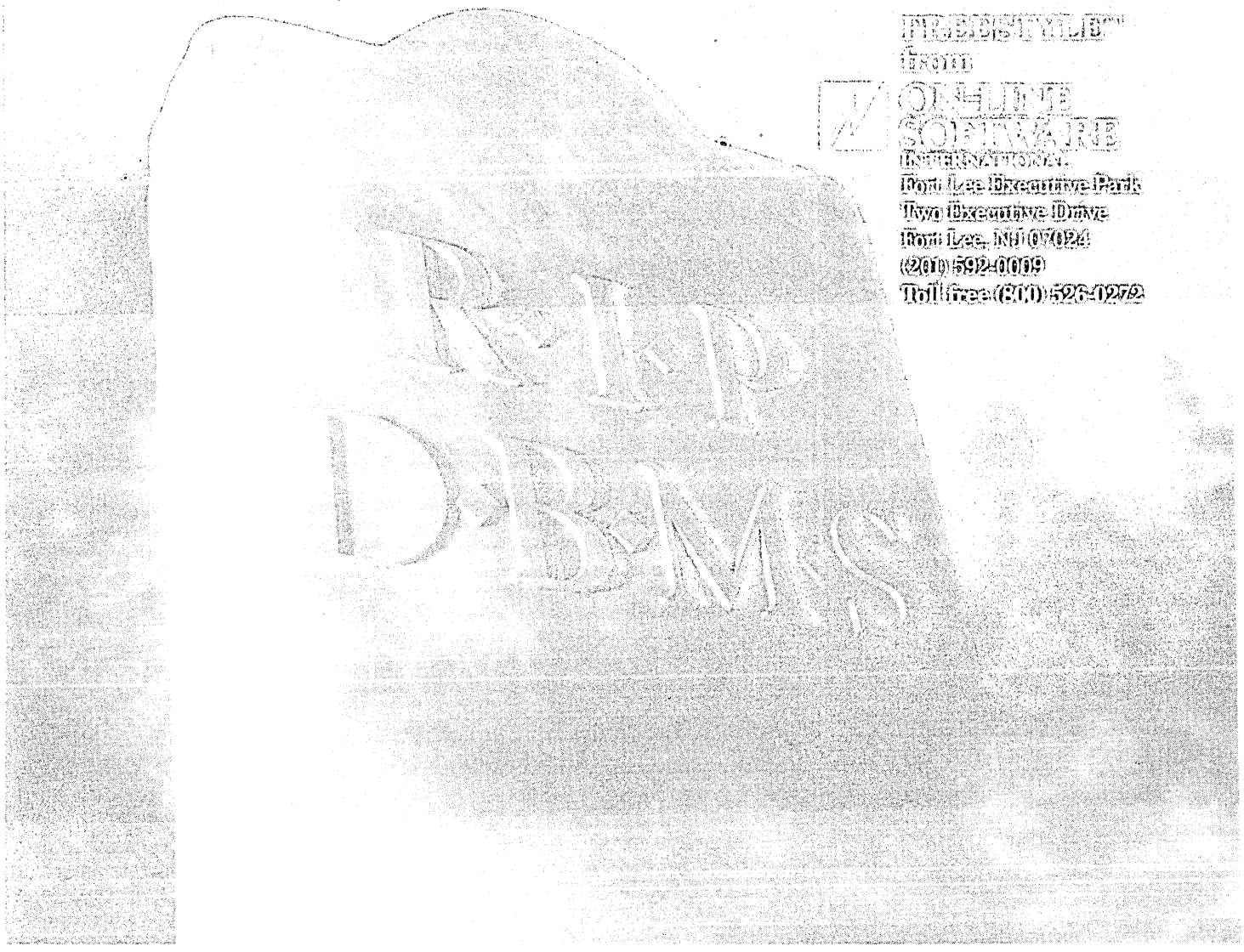

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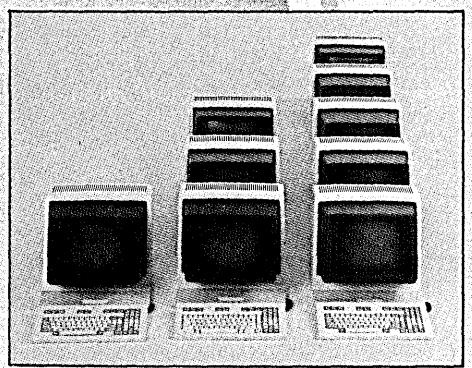

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IBM is the monarch in DATAMATION's ranking of the rulers.

CROWNING EUROPE'S DP ROYALTY

The kings of European data processing saw their empires grow again during 1983, as Europe's dp business continued to shake off the vestiges of recession. The combined revenues in accounting currencies of the DATAMATION Top 25 dp companies in Europe rose a royal 11%, indicating a welcome restoration of strong growth rates after the industry's low point in 1980. Much of this revenue increase is due to a real expansion in the dp business and is not just a result of company mergers and acquisitions—a major factor in the previous year's growth.

That expansion benefited almost every sector of the industry, particularly the telecommunications, software and services, and microcomputer segments. The European business micro market was indeed booming, with shipments worth some $1.7 billion and sales up 52%. This majestic rise of the micro in Europe, however, is not overtly reflected in this year's ranking. The mainframe, minicomputer, and business systems suppliers sticl dominate in the European dp domain. The signs of change are there, nevertheless. The strongest contender in the European microcomputer market is Apple, which pulled in $137 million in European dp revenue last year.

Predictably, IBM remains the undisputed sovereign of European dp, and its power and influence across the Continent is steadily increasing. Far below IBM, the other members ff Europe's dp aristocracy are still battling it out.

Since last year's survey, nine companies have moved up the Top 25 list, while four have slid down. Mergers at France's Bull group helped push the company into the number two spot, despite a $95 million loss last year. Since electronic typewriter sales are now excluded from dp revenues, 1982's top European-owned company, Olivetti, fell to fourth place. French telecom firm CIT Alcatel and West German office equipment supplier Triumph-Adler dropped off the 1983 table completely. The two firms were replaced by the new information technology company formed by Thorn-EMI in the U.K., and Amdahl. The latter reentered the rankings after a year's absence.

The general growth in revenues last year reflects the increasing attention European governments and businesses are paying to data processing. Many Europeans view information technology products as strategic tools that can increase productivity, open up new markets, and encourage economic recovery. Last year, productivity indicators did indeed swing upward in Europe, while interest rates stayed stable at around 8%.

There were still a number of black spots. European unemployment levels remained high and the strong dollar continued to erode the weaker European currencies, although this erosion was less severe than in 1982. Worst hit was Sweden, where the krone dropped 18% against the dollar. The French franc fell 14%, followed by the British pound, which plummeted 14%, and the Italian lire, which was off 11% versus the dollar. The Dutch and West German currencies fared better, with declines of 6% and 5%, respectively. Even though the currency slide seems to be slowing down, it was still bad news for the U.S. companies doing business in Europe. It also took the edge off the results of European companies that had significantly stronger gains in local currencies than in dollars.

Much of Europe's own dp nobility reported sharp rises in revenues and profits in local currencies. Their dollar share of the combined Top 25 dp revenues slipped to 32% last year from 34% in 1982. That loss of domestic market share by European-based companies is about par for the course, according to Morris English, head of the information unit of the Information Technologies Task Force at the European Commission in Brussels. English estimates that Europe had a trade deficit in dp products of some $1.7 billion in 1983. European companies control less than 40% of their home markets, says English, and around 70% of European dp production comes from non-European firms. On a world scale, the situation is equally disturbing. Europe represents just under 30% of the international market for information technology products, yet European-owned firms control only 15% of world markets and this is slipping at the rate of 1% a year.

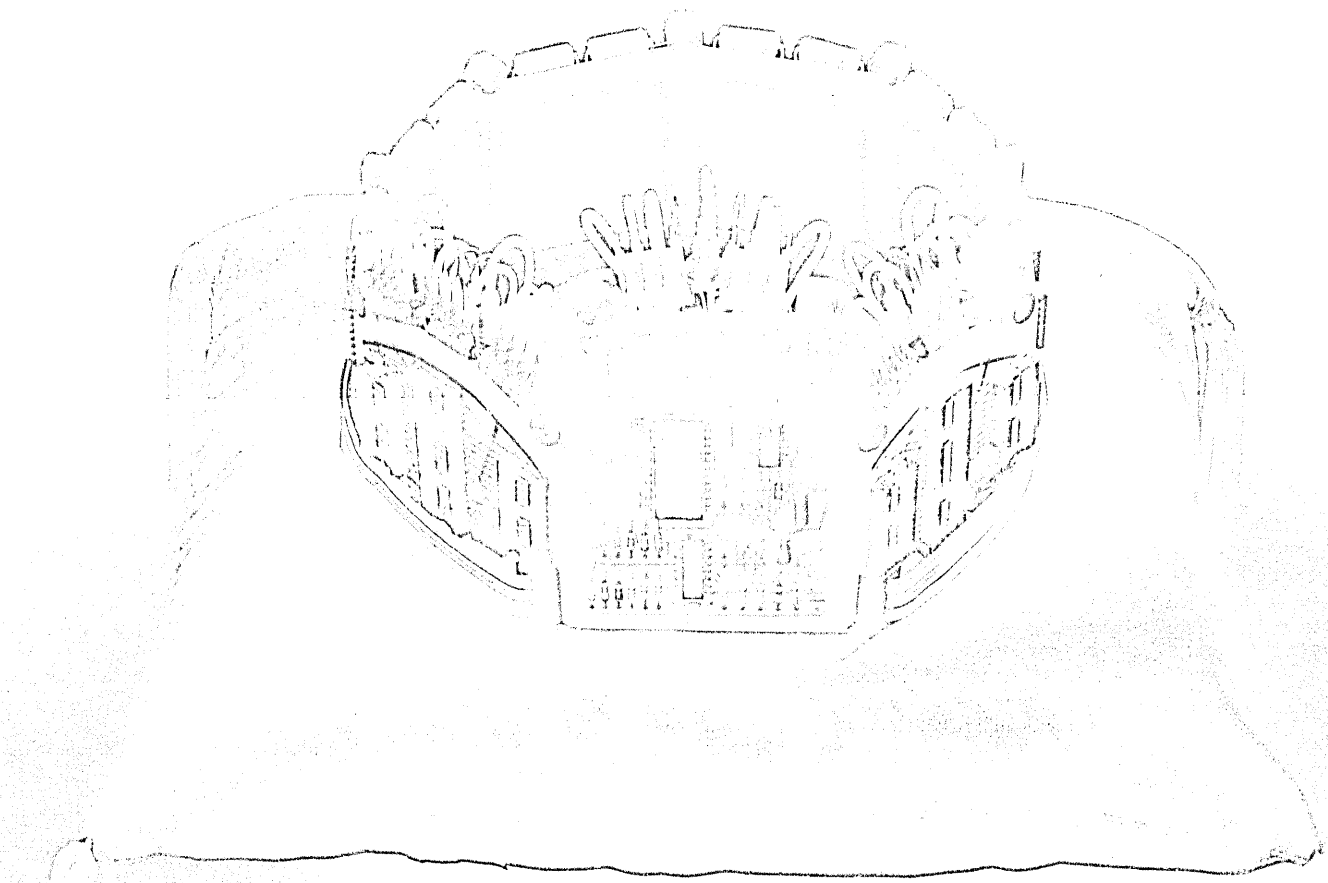
IBM UPS MARKET SHARE

Back home, IBM is not only seven times bigger than its nearest rival but the blue-blooded giant is gradually increasing its market share. In Europe, IBM once again rang up 10% more sales than the previous year, increasing its slice of the Top 25's total revenues. The company's European sales in 1983 represent 42% of the total $25.6 billion earned by all 25 companies. This compares with 40% in 1982 and 38% in 1981. IBM's increased presence in Europe cannot simply be attributed to the trend by buyers to turn to reliable and established names in troubled financial times. It is also a reflection of how the American company's tactical change over the last couple of years, from cautious ruler to industrial warlord, has paid off handsomely.

The exclusion of electronic typewriters from dp revenues for last year hardly affects IBM, whose estimated $85 million dollar typewriter revenue in Europe is only 0.7% of its total sales. Olivetti, however, which brought in $186 million from typewriter sales, was pushed down two places. Triumph-Adler, which entered the survey ranks in 1982 on the strength of its increased office systems and electronic typewriter business, was eliminated from the Top 25 because of the typewriter exclusion.

Three other companies fell in the 1983 ranking. ITT nosedived four rungs, while both Sperry and Control Data plummeted three places. On the way up the Top 25 ladder were Hewlett-Packard, Wang, and Ferranti—all vaulting three places. The new French Bull group moved up two notches, as did Dutch giant Philips. Inching up one rung were Nixdorf, Honeywell Information Systems, Rank Xerox, and Kienzle.

3-D ILLUSTRATION BY KATHY JEFFERS/PHOTOGRAPH BY ERIC STREIFF



Another year of dollar dominance has made it necessary to show the highest growth rates of the DATAMATION Top 25 in both dollars (Fig. 1) and accounting currencies (Fig. 2) to give a fair indication of company performance. Amdahl's massive 40% growth in European revenues puts the pcm at the top of the dollar table. Wang captures the number two slot with a 28% sales hike.

When measured in accounting currencies, Amdahl slips to number two behind Sweden's Ericsson, which holds on to first place again this year. The Scandinavian champion is still growing fast, with 1983 sales up an impressive 42%. Meanwhile, Wang dropped to sixth place, below three of Europe's own best performers—Bull and Thomson-CSF from France, and the newly formed thorn-emi (Information Technology) in the U.K.

Seventeen companies in the 1983 ranking showed growth gains on both the dollar and accounting currency tables, in contrast to only 13 in 1982.

There are 12 European companies on the main Top 25 table, one less than the previous year. Britain claims the greatest number of these with four companies, followed by West Germany with three, France with two, and one each for Italy, Sweden, and the Netherlands.

This year, DATAMATION has expanded the table of the top European owned companies. What this shows is that the Continent's software and services companies, especially the French firms, are rapidly gaining in size and strength. Six software companies, along with Triumph-Adler and Racal from the U.K., now fall just below the $163 million revenue cutoff point for the Top 25.

FIG. 1

TOP REVENUE GROWTH RATES IN U.S. $

RANK 1983	RANK 1982	DP % GROWTH RATE*
1 Amdahl	NM	40
2 Wang	4	28
3 Hewlett-Packard	7	18
4 Ericsson Infor. Systems	1	16
5 Nixdorf	6	16
6 Thorn EMI	NM	16
7 Bull		15
8 Thomson-CSF	NM	14
9 Kienzle	NM	13
10 IBM	8	10

*European revenue, FY 1983
NM: not meaningful

FIG. 2

TOP REVENUE GROWTH RATES IN ACTUAL ACCOUNTING CURRENCIES

RANK 1983	RANK 1982	DP % GROWTH RATE*
1 Ericsson Infor. Systems	1	42
2 Amdahl	NM	40
3 Bull	NM	33
4 Thomson-CSF	NM	32
5 Thorn EMI	NM	29
6 Wang	5	28
7 Nixdorf	4	22
8 Hewlett-Packard	10	18
9 Kienzle	8	18
10 ICL	NM	18

*European revenue, FY 1983
NM: not meaningful

FIG. 3

EUROPE'S TOP 20*

	COUNTRY	DP REVENUE IN $MIL.
1 Bull	France	1,378
2 Siemens	W. Germany	1,376
3 Olivetti	Italy	1,305
4 ICL	U. K.	1,016
5 Nixdorf	W. Germany	922
6 Philips	Netherlands	858
7 Thomson-CSF	France	341
8 Ericsson Infor. Systems	Sweden	334
9 Kienzle	W. Germany	278
10 Thorn EMI	U. K.	215
11 Ferranti	U. K.	203
12 Plessey	U. K.	177
13 CISI	France	150
14 SG2	France	142
15 Cap Gemini Sogeti	France	133
16 Triumph Adler	W. Germany	131
17 GSi	France	127
18 Finsiel	Italy	126
19 Scicon	U. K.	123
20 Racal	U. K.	112

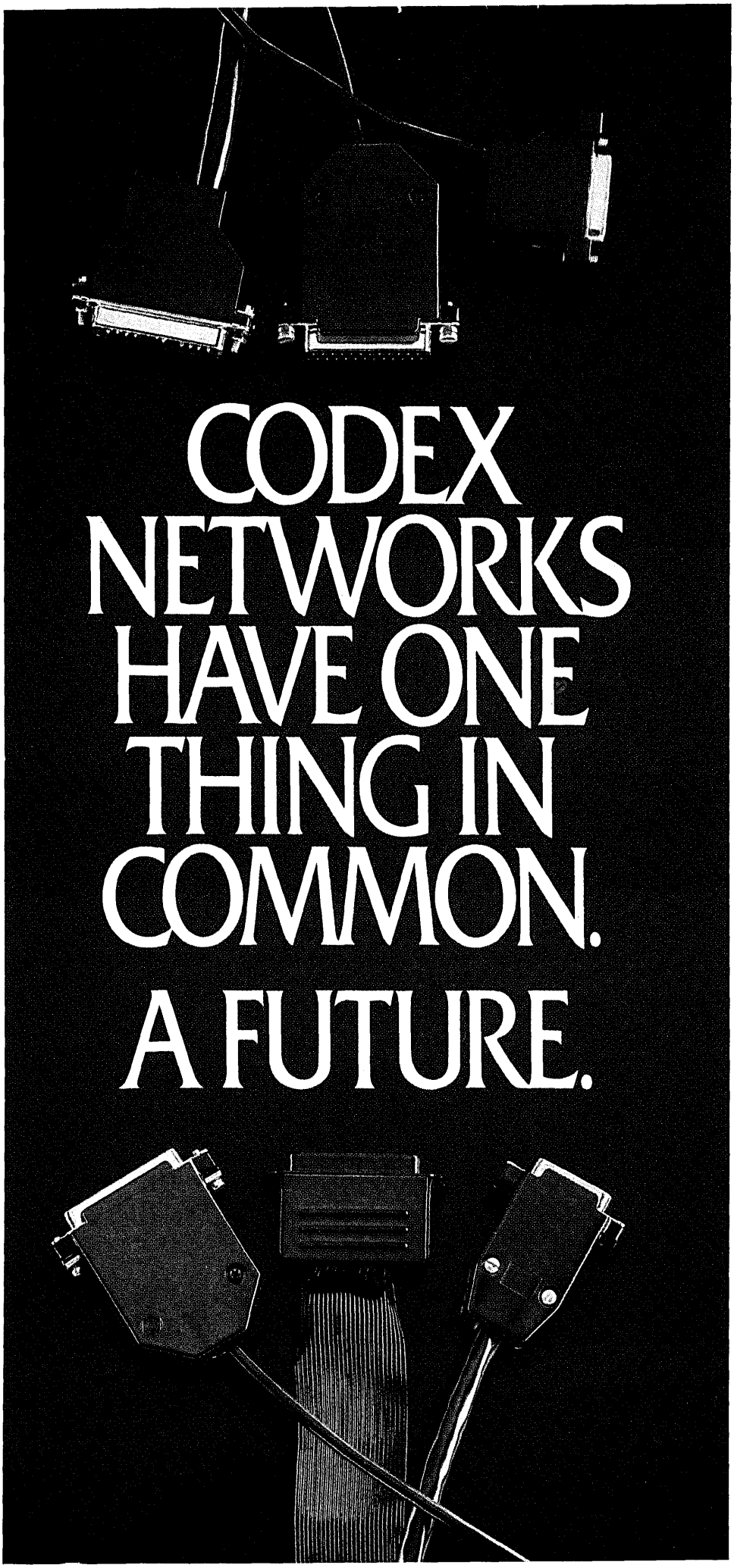
*Companies owned and headquartered in Europe

CISI AIMS AT U.S. MARKET

At number 13 on the Top 20 European-owned table is French software company CISI, an offshoot of the French Atomic Energy Agency. The company posted a 5% increase in European revenue to $150 million last year. Around 80% of this revenue comes from France, although like many of Europe's software firms it is trying to establish itself across the Atlantic. CISI has already set up its own operation in the U.S. and in 1983 it branched out into economic information systems with the acquisition of Wharton Econometrics Forecast Associates Inc.

France's Société Générale de Service et de Gestion (SG2), captures the 12th position with revenues of $142 million in 1983. This software firm also gets the bulk (85%) of its business from its French home market. Italy is also a strong earner for SG2, which has a broad customer base covering Africa, Asia, and South America. SG2's main markets are in financial systems, videotex, and networking. Last year it became a member of a development team for one of the projects of the European Commission's European Strategic Program for Research & Development in Information Technologies (Esprit). The effort is designed to set up a Europe-wide packet switching network for information exchange between local networks.

Ranking 15th is the third of France's top software companies, Cap Gemini Sogeti, which boosted its revenues to $133 million. That increase represents a growth of 11% in dollars and a substantial 29% in French francs. CGS began the year by acquiring another French software house, SESA. The bulk (65%) of the compa-



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DATAMATION'S EUROPEAN TOP 25

1983 RANK	COMPANY	1982 RANK	PARENT COMPANY HQ	EUROPEAN DP REV. CAL. YR. 1983 (IN $ MIL.)	% CHANGE EUROPEAN DP REV. FY 1982/3 (IN $)	% CHANGE EUROPEAN DP REV. FY 1982/3 (IN ACCOUNTING CURRENCIES)	DP REV. DOMESTIC (PARENT CO.) FY 1983 (IN $ MIL.)
1	IBM[1,2]	1	U.S.	10,758	+10.4	+10.4	23,127
2	Bull	4	France	1,378	+14.3	+33.1	*
3	Siemens	3	W. Germany	1,376	+10.0	+17.0	*
4	Olivetti	2	Italy	1,305	NM	NM	573
5	Digital	5	U.S.	1,107	+ 6.9	+ 6.9	2,770
6	ICL	6	U.K.	1,016	+ 2.2	+18.2	776
7	Burroughs[3]	7	U.S.	977	+ 0.7	+ 0.7	2,623
8	Nixdorf	9	W. Germany	922	+15.8	+21.6	516
9	Philips[1]	11	Netherlands	858	+ 9.0	+16.0	*
10	Hewlett Packard	13	U.S.	814	+18.4	+18.4	1,419
11	Sperry	8	U.S.	705	- 7.2	- 7.2	*
12	NCR	12	U.S.	683	- 2.7	- 2.7	*
13	Control Data	10	U.S.	617	-22.3	-22.3	2,900
14	Honeywell[1]	15	U.S.	484	+ 1.3	+ 1.3	1,235
15	Wang	18	U.S.	346	+27.5	+27.5	1,103
16	Thompson-CSF	16	France	341	+14.0	+32.1	*
17	Ericsson Infor Systems	17	Sweden	334	+16.4	+42.2	128
18	Kienzle	19	W. Germany	278	+12.6	+18.3	*
19	Thorn EMI	NM	U.K.	215	+15.9	+29.1	166
20	Rank Xerox[1]	21	U.S.	206	- 2.4	- 2.4	*
21	Ferranti	24	U.K.	203	- 2.5	+11.3	173
22	Amdahl	NM	U.S.	181	+40.3	+40.3	491
23	Plessey[1]	23	U.K.	177	-13.1	+ 0.7	168
24	ITT[1]	20	U.S.	166	-24.5	-24.5	*
25	Data General	25	U.S.	163	+ 3.8	+ 3.8	*

NM: Not meaningful *Not Available [1]Some figures based upon estimates
[2]Dp revenues include all activities [3]Figures for Europe include African revenues
[4]Dp revenues include photocopiers

ny's revenues stem from its local market. It has also been active in exploiting the American arena, as its four U.S. companies accounted for around 25% of its total 1983 revenues.

While Germany's Triumph-Adler dropped out of the Top 25 this year, its revenues still earned it a place (number 16) in the European-owned dp ranking. Its $131 million in sales were predominantly drawn from the small to medium-sized business sector of its home market, while its presence in Italy, France, and the U.K. benefited from money pumped in by parent company Volkswagen.

Number 17 is the fourth French software house to make the DATAMATION table, Groupe Services d'Informatique (GSI). While GSI's $127 million revenues were down 9% in dollar terms, its business grew by 5% in French francs. Software accounts for 95% of the company's sales, with hardware making up the remaining 5%.

Italy's top independent software house Finsiel of Rome fills the 18th slot, with revenues of $12 million. The company confines its business to Italy and showed an 8% growth rate in Italian lire for 1983.

In contrast, it was the European exposure of the U.K.'s leading software and services company, Scicon International, that helped put the firm at position 19. Its $123 million revenue reflected a sterling increase of 14%. Scicon International, a subsidiary of British Petroleum, was formed by the merger of Scicon Consultancy and Scicon Computer Services, and the acquisition of software houses SES in Germany and GFI in France. In fact, France contributed 37% of the company's revenues last year.

At the tail end of the Top 20 European table was the U.K.'s Racal Electronics. Its revenues of $112 million were gleaned from across Europe, although its U.K. operation brought in over half its sales. Racal, whose principal business is data communications products, is now trying to increase its offering in the office automation and expert systems markets.

While each of these European-owned companies is hoping to increase its share of the burgeoning European dp market, each also faces stiff competition from a growing number of strong foreign competitors. Ironically, the future success of many of these European hopefuls is now tied closer than ever to the performance of overseas firms.

LINKUP ROUTE TO SURVIVAL

European companies are finding the best way to survive is to link up with foreign firms in partnerships that offer access to new technologies or new markets. Industrial collaborations such as the agreements between Ericsson and Sperry, ICL and Mitel, Nixdorf and Auragen, and Philips and Control Data are evidence of the team-up trend. Between 1982 and 1983 some 200 cooperative agreements were signed by European companies in the electronics sector. Of these, 50% were with U.S. firms, 20% with the Japanese, and only around 18% with other European companies.

Last year, the most significant transatlantic linkup involved the U.S. telecommunications colossus AT&T International, which is going hell-for-leather to establish a European presence. Following

DP REV. WORLDWIDE FY 1983 (IN $ MIL.)	TOTAL REV. EUROPE FY 1983 (IN $ MIL.)	TOTAL REV. WORLDWIDE FY 1983 (IN $ MIL.)	% CHANGE TOTAL REV. WORLDWIDE FY 1982/3	TOTAL NET INCOME WORLDWIDE FY 1983 (IN $ MIL.)	% CHANGE TOTAL NET INCOME WORLDWIDE Y 1982/3	TOTAL WORLDWIDE EMPLOYEES	YEAR ENDING
35,603	10,758	40,180	+16.9	5,485	+ 24	369,545	Dec.
1,522	1,378	1,522	+22.9	−95	+116	26,000	Dec.
1,376	10,670	15,720	− 7.4	319	− 2	313,000	Sept.
1,637	1,996	2,460	− 0.4	194	+255	47,800	Dec.
4,272	1,075	4,272	+10.1	284	− 32	78,000	June
1,321	1,002	1,321	+ 1.5	60	+107	22,573	Sept.
4,000	977	4,390	+ 4.9	197	+ 67	64,000	Dec.
1,064	922	1,064	+13.1	27	+ 8	17,521	Dec.
1,149	8,757	16,205	+ 0.6	227	+ 40	343,000	Dec.
2,420	1,360	4,710	+10.7	432	+ 13	72,500	Oct.
2,800	1,194	5,076	− 8.9	118	− 47	77,493	Mar.
3,333	842	3,731	+ 5.8	288	+ 23	62,000	Dec.
3,500	830	4,583	+ 5.6	162	+ 5	55,858	Dec.
1,666	1,059	5,753	+ 4.8	231	− 15	93,514	Dec.
1,538	320	1,538	+32.7	152	+ 42	21,700	June
328	*	3,451	−16.6	*	*	65,000	Dec.
458	682	934	+33.0	*	*	19,318	Dec.
316	379	417	+ 5.6	*	*	8,471	Dec.
249	278	328	*	*	*	6,400	Mar.
*	*	*	*	*	*	*	Oct.
222	514	620	+ 5.3	49	+ 20	18,427	Mar.
778	181	778	+68.4	47	+557	6,600	Dec.
287	1,168	1,792	− 2.5	143	+ 3	40,872	Mar.
532	5,835	14,155	− 7.1	675	+ 2	278,000	Dec.
829	164	829	+ 2.9	*	*	15,400	Sept.

its 1982 stake in Irish telecom company Telectron and a joint venture on switching technology with Dutch giant Philips, AT&TI took 25% interest in Italy's Olivetti. This deal, which primarily covers office automation products, is designed to give both companies greater muscle against IBM, especially in Europe.

Japanese companies also regard cooperation with Europeans as the most effective means of entry to the local market. Most of Japan's direct sales operations in Europe are in the areas of components, micros, and consumer electronics. Meanwhile, Japanese mainframes are offered exclusively through local partners. Fujitsu, for example, has ties with ICL and Siemens, and Hitachi sells its systems through BASF and Olivetti.

European dp firms also exhibited a new spirit of Europeanism during 1983. The major mainframers in Europe—ICL, Siemens, and Bull—agreed to set up a joint research institute in West Germany to study advanced processing technologies and share the results of the work. This is the most ambitious industrial collaboration in European dp since the disastrous Unidata project of the early '70s.

These three companies, along with nine others including Nixdorf, Thomson, Olivetti, and Philips, also agreed to adhere to the open systems communications standards determined by the Geneva-based ISO. This move was ostensibly designed to be a counteroffensive to IBM's SNA.

European governments were also anxious to encourage local cooperation, particularly at the R&D level. The pilot phase of the Esprit research program got off the ground last year. Esprit projects will be backed by $1.5 billion from the EEC and industry. One of the most strategic pilot projects calls for the creation of an Esprit Information Exchange System (EIES). Set up by a consortium involving Bull, Olivetti, Siemens, GEC, and ICL, the EIES will link European R&D centers and universities for the exchange of information and ideas. The net will use ISO's standards to connect various types of systems at these sites.

National R&D efforts were also launched last year, starting with the U.K.'s Alvey scheme for research into new technologies. Similar projects in Germany and elsewhere are planned this year. Much of the collaboration focuses on developing new software techniques. This reflects the emphasis European and other manufacturers are putting on building up the local software industry. Europe's software market, which was worth around $9 billion in 1983, is growing at a rate of 11% per year.

The trend toward merging dp and communications was also more in evidence last year. As the traditional distinctions between office machines, word processors, micros, minis, and mainframes blurred, European dp firms continued to revamp their product lines to meet the new challenge. Introductions of PBXs, networking concepts, and on-line services based on new technologies like videotex peppered the industry's calendar last year.

This convergence also made dp companies more aware of what the national telecommunications authorities were doing. In the U.K., the government put its plans to privatize British Telecom on the back burner to avoid interfering with its election campaign. The U.K. PTT neverthe-

The business microcomputer boom has brought both prizes and pitfalls.

less emerged from the initial chaos of market liberalization as a strong competitor in both the dp and telecom sectors. In 1983, it began to offer micros, office systems, and various network services.

PTTS EYE U.K. WITH INTEREST

Other European PTTs, still enjoying their traditional monopolies, watched the U.K. developments with interest. Most of them expect the tide of liberalization to cross the Channel in the not too distant future. Users hope those tides will soon be rising.

Users across Europe have in fact become more critical of the policies of the national telecommunications authorities. The most restrictive PTT, the German Bundespost, continued to come under fire last year for its manipulative market practices, despite its ambitious work in setting up a national videotex system and a broadband network.

In France, the PTT is facing a major overhaul as a result of the government reorganization of the dp and telecom industry. A united Thomson and CIT Alcatel will spearhead the French telecom industry. On the dp front, the government revamp has finally resulted in the establishment of the Bull group. The cornerstone of French dp, Bull consists of CII-Honeywell Bull, Thomson's Sems subsidiary, CIT Alcatel's Transac arm, and the office systems and micro company R2E. This reorganization plus continuing stagnation in the French economy, bred uncertainty among buyers, so business picked up only slightly last year.

Across the Rhine in West Germany, the picture was brighter. German-based subsidiaries and local companies posted healthy revenue gains. The country's dp flagship Siemens, however, is now in some danger of losing its dominant position to the fast growing Nixdorf, whose 1983 worldwide revenues amounted to 76% of Siemens dp take.

In the U.K., business was also good. ICL, Britain's biggest dp vendor, chalked up an 18% increase in pounds sterling. The company seems to be on the road to recovery, although it still has a long way to go before it comes close to IBM's share of the U.K. market.

The U.K. leads the European microcomputer market. At the beginning of the year, there were no less than 100 different pc models being peddled in Britain. Micromania in other parts of Europe has been less intense. But now Germany, the second largest micro market, is rapidly catching up with the U.K.

The business microcomputer boom has brought both prizes and pitfalls. The IBM PC sold steadily but unspectacularly in Europe, while DEC's offerings didn't do as well as those of Apple and Commodore.

Now that business in Europe is picking up, the trend toward micros and communications products is also accelerating. This should open up opportunities for many dp firms doing business on European soil, giving some of the higher flyers a chance to soar into next year's Top 25.

"Would you care to be on my mailing list?"

CARTOON BY MIKE TWOHY

METHODOLOGY

Information for the European Top 25 was solicited through a questionnaire and followed up by independent research by DATAMATION and Logica. For the purposes of this survey, Europe includes Austria, Belgium, Denmark, Finland, France, West Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, and the U.K.

The survey definition of data processing includes the following equipment categories: data communications, peripherals, terminals, software and services, and maintenance and repair. Explicitly excluded are data transmission or "basic" service revenues from specialized common carriers, and standalone electronic and magnetic media for disk and tape drives. All peripherals that attach to a system are included. For computer-based manufacturing systems, like computer-controlled machine tools, only the computer and hardcopy output devices are included and not the machine tool itself.

The main ranking for each company was based on 1983 calendar year revenues (U.S. dollars) from European dp operations. Figures for companies whose fiscal year did not end December 1983 were adjusted using published quarterly figures or estimates. All other figures appearing in this survey relate to the companies' reported results of their fiscal year ending 1983. In the main table, all results have been converted to U.S. dollars, using OECD exchange rate statistics for the appropriate time period. An additional column showing growth rates in actual accounting currencies is included to compensate for the anomalies produced by fluctuating exchange rates.

The rank orders for 1982 are exactly the same as those published last year. Any inaccuracies in last year's table have been corrected and used to calculate the 1982 growth rates. Total revenue figures for Europe and worldwide refer to the parent company, where appropriate. When the parent company itself is not strongly involved in dp, the principal company has been considered as independent.

Several companies such as ITT and Plessey did not provide complete information for the survey, and estimates were therefore made on the basis of published information. ◉

DATAMATION's European Top 25 survey was prepared by Logica, a London-based company that provides international market studies and reports to computer and telecommunications suppliers.

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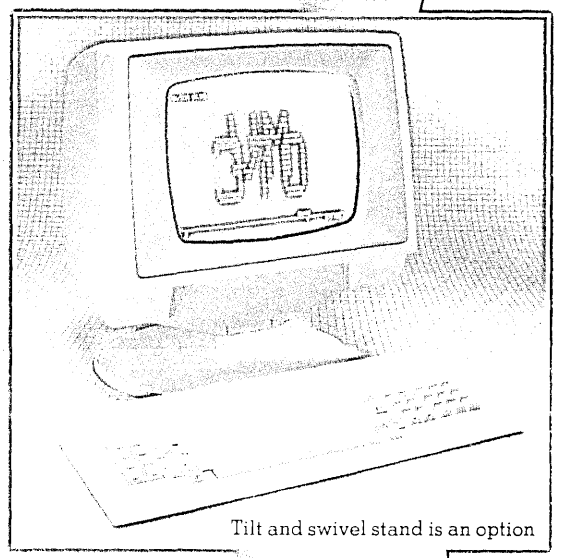

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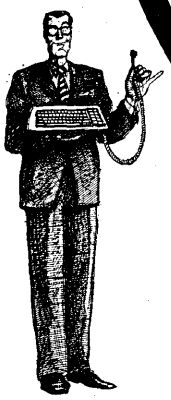

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A MAT finish gives an old tool new reliability and maintainability.

NEW LIFE FOR FORTRAN

by Gerald M. Berns

When John Backus and his small IBM group designed FORTRAN in the early 1950s, they could not have guessed how extraordinarily successful their product would be. Because of its simplicity, power, and broad flexibility, FORTRAN in 1984 is still preeminent among all the "scientific" programming languages. It has been used for many types of applications, not just scientific ones, and is—with COBOL—one of the two most widely used applications programming languages in the world.

Over the last 30 years, much has been learned about programming language features that help to produce maintainable and reliable software. Many of these lessons have come from the experience of the FORTRAN community. New programming languages have been and are being developed that embody the latest concepts of computer science. But because of the vast body of programs that would be affected by any change, the existing elements of the FORTRAN language are essentially fixed. Except for extensions, the FORTRAN 77 standard is not very different from FORTRAN 66. Thus, the present body of FORTRAN programs cannot benefit directly from what has been learned.

The Maintainability Analysis Tool (MAT) has been developed to rectify this situation. A product of Science Applications Inc., Palo Alto, Calif., MAT is a diagnostic and documentation program that analyzes FORTRAN source program modules. (We use "module" to mean a compilable entity, such as a subroutine or a function; a program consists of one or more modules). MAT runs on a DEC VAX-11 computer system under the VAX/VMS operating system, but can also process modules written for any computer in FORTRAN dialects 66 or 77. MAT analyzes complete sets of FORTRAN modules at once and processes each of them in order. While it reads and parses each module, MAT extracts the module's entire interface to the outside world. With this information, it builds and augments its global interface definition. From the local information obtained by parsing each module as a compiler does, MAT detects and diagnoses the local discrepancies (violations, problems, abuses, misuses, errors, etc.) and clutter (unused elements) contained in the module. In addition, MAT detects and diagnoses interface discrepancies by comparing each module's global interface to the interface information MAT has accumulated.

In this way, MAT brings back to the FORTRAN community diagnostic information about its own programs. This information is based on what has been learned from the community's own experience about the weaknesses and vulnerabilities, the internal and interface discrepancies, and the clutter of FORTRAN programs. MAT can analyze the FORTRAN 66 and FORTRAN 77 dialects and the much larger dialect that is DEC's VAX-11 FORTRAN. MAT therefore can analyze a very large number of those FORTRAN programs that have been written over the years and are still in use, as well as those currently in development. Its analysis can provide developers and maintainers with specific and otherwise possibly unobtainable information about the weaknesses of their progams.

In this article we discuss the primary features of MAT:

- detection of module internal discrepancies,
- detection of module clutter,
- deteotion of module interface discrepancies,
- detection of problems in the interface as a whole,
- documentation of each module's interface,
- documentation of program structure via call trees,
- documentation of the modules that call module,
- detection of discrepancies in program structure, and
- quantification of module maintainability.

Internal discrepancies. From its inception, FORTRAN has allowed the data type of an element to be defined implicitly according to the first letter of its name. The first rule that many of us ever learned about a high-order language is that "I - N means INteger." Even today, FORTRAN allows an element name to be used in an executable statement without first being defined in a type statement. That is, the local variable AI0 may initally appear in a statement like AI0 = 10, and the data type implicitly associated with the spontaneously defined AI0 is the data type associated with the letter "A."

OPENING THE DOOR TO ERROR

The FORTRAN characteristics of implicit data types and spontaneous definitions probably stem from the designers' desire to make data typing the definition of elements as easy as possible. But these facilities also open the door to error. Accepting spontaneous definitions of elements means that such keying errors as wrong, transposed, dropped, or extra characters, all result in legal names. For example, errors in keying AI0 as A10, AlO, AO, and AI will result in defining these new names.

Thus, a statement like

```
IF (A10 .EQ. 0) ...
```

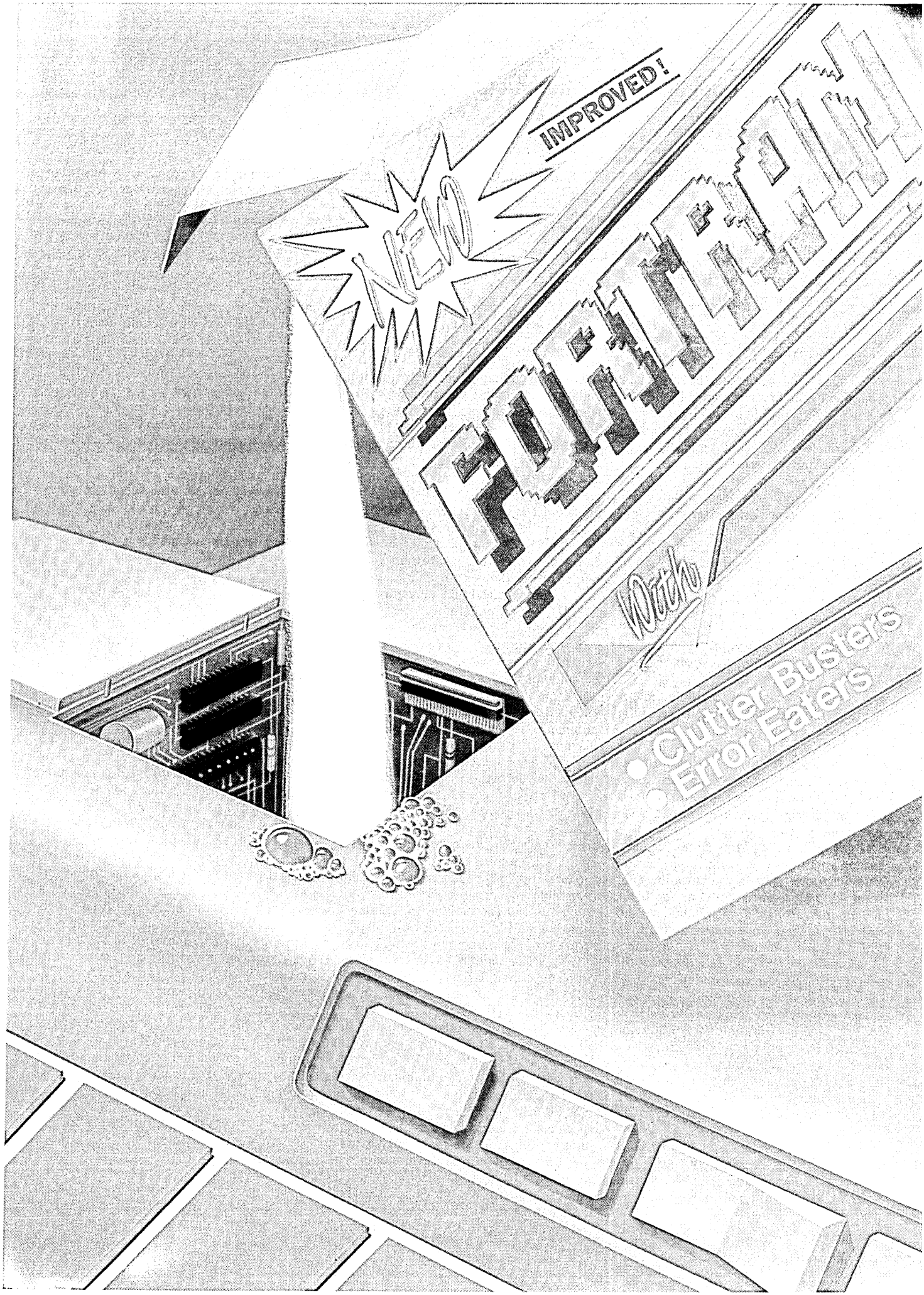
spontaneously defines A10 and is a legitimate use of FORTRAN, even if the name intended had been AI0.

Because FORTRAN has expanded, these facilities have caused even more trouble. FORTRAN 77 introduced the IF-THEN-ELSE structure which, when properly used, can look like:

```
IF (MENU .EQ. 1) THEN
ASKSUB = 20.
ELSE
ASKSUB = 32.
END IF
```

Unfortunately, many programmers have trouble with the construction shown above. We have seen several modules with

ILLUSTRATION BY BOB ALCORN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Watch
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Introducing an error into a common datum may mean that some other module will malfunction.

code that looks like this:

```
IF (MENU .EQ. 1) THENASKSUB = 20
ELSEASKSUB = 32.
```

The intent is clear and the code "looks reasonable," but it is not the IF-THEN-ELSE structure. Even so, the code is perfectly legal! It is perceived by FORTRAN compilers to be:

```
IF (MENU .EQ. 1) THENASKSUB = 20
ELSEASKSUB = 32.
```

This is a logical if statement with an assignment statement attached, followed by an assignment statement. The assignment statements spontaneously define the local variables THENASKSUB and ELSEASKSUB. These are real errors that testing did not detect.

MAT diagnoses all elements that are implicitly data typed. Moreover, for the examples given, MAT also produces the diagnostic, "***Notice: Probable error involving use of local variable: A10 THENASKSUB ELSEASKSUB." MAT diagnoses many other internal discrepancies and contains more than 45 diagnostic messages for this purpose. It also contains a primarily defensive set of 24 FORTRAN diagnostics in case modules contain serious FORTRAN errors.

Clutter. The presence of unused elements in modules, or clutter, is generally considered an insignificant problem because, in the small amounts in which it is thought to exist, it adds only a little "noise" to a module. The facts, however, are otherwise. In about half the operational FORTRAN modules we have examined with MAT, clutter exists in large amounts.

Two aspects of this clutter demand serious attention. One is that some clutter is not just noise: it has a valid meaning. For example, the presence of a common block in a module means that the module has unrestricted access to a data set through which it can communicate to other modules. The module can potentially affect the operation of every other module that uses the common block. The more common blocks a module contains, the broader its access to the program interface. Maintainers carefully approach modules that have access to global data: introducing an error into a common datum may mean that some other module will malfunction, and errors of this type are often very difficult to locate.

CAN BE CAUGHT UNAWARE

Suppose a common block is completely unused by a module. Because the traditional tools (compilers, loaders) do not diagnose unused common blocks, the maintainer can very likely be caught unaware. The maintainer, therefore, approaches the module as if the common block were, in fact, used. That is, the presence of the common block means interface access, even if the presence of the common block is actually clutter. The phenomenon of meaningful clutter would not be as serious if it were not so widespread. After having examined more than 10,000 operational modules, we have found that a minimum of one in seven contains at least one wholly unused common block. Modules with up to six unused common blocks are plentiful, and MAT has found one module with 31 wholly unused common blocks!

The second serious aspect of clutter is its subtle relationship with discrepancies. Suppose MAT diagnoses that the local variable CENTRE is given a value but is not referenced. Examination reveals that its only appearance is in the statement: CENTRE = 0. A clear case of clutter, simply remedied by removing the statement? Perhaps. But if the module contains another element named CENTER, other possibilities are obvious. Suppose instead that a common block, used by the program but not present in the module, contains an element named CENTRE. Then the much more subtle possibility exists: the statement is not clutter and the common block was erroneously omitted.

MAT finds and diagnoses many different kinds of clutter (among them dummy arguments defined but not used) and has 14 diagnostic messages for this purpose.

Interface discrepancies. It is not unusual today for a FORTRAN program to consist of 10, 100, or even 1,000 modules. With the FORTRAN community's broad acceptance of the principle of modularization, there is a strong tendency for separately compilable modules to continue to decrease in size. This further increases the number of modules in a program. Some installation standards call for modules to contain no more than 50 lines of code. Although the virtues of modularization are well understood, little attention has been paid to a problem of modularization: the lack of diagnostic control over the intramodule interface that modularization necessitates.

FORTRAN (and other) compilers usually process each module by itself, with no knowledge of its relationship to the modules with which it communicates, aside from the information contained in the module being compiled. The FORTRAN 77 specification offers few rules about module interfaces. It calls for conformity between the number of dummy arguments with which a subprogram is defined and the number of actual arguments with which the subprogram is called, and it specifies that each instance of a labeled common block should be the same size. But, aside from these requirements and a few others, FORTRAN 77 does not emphasize the subject. Moreover, most loaders do not enforce even these few rules.

The plain fact is that the traditional set of programmer tools offers no protection against errors introduced by misunderstandings and abuses of the interface. Interface errors can be very difficult to locate. Errors that, before modularization, would have been detected by a compiler now become interface problems that traditional tools cannot detect.

Ordinarily, these errors must be detected either manually or by testing. The manual checking of program module interfaces becomes impossible, however, when their number is large, and testing, while expensive, is a nonrigorous mechanism. Modularization, which was introduced to ease maintainability, can actually cause a decrease in program reliability.

SET TREATED AS WHOLE

MAT has been designed to treat a set of intercommunicating FORTRAN modules as a whole with respect to its interface. For example, if subroutine DXTA has six arguments and subroutine READ at line 100 calls it with five arguments, MAT diagnoses subroutine READ with the interface check message, "No. of arguments does not fit interface for Subroutine, Function, or Entry Point at line 100: DXTA." Or another example, suppose the first module to include common block GLOBAL defines it as follows: COMMON /GLOBAL/ A, B, C, J(100), X(10, 10). Common block GLOBAL contains in sequential order three real variables (A, B, and C), an integer array (J) singly dimensioned for 100 elements, and a doubly dimensioned real array (X). For understandability and maintainability each instance of a common block should be defined identically. Subroutine READ, however, contains the following definition: COMMON /GLOBAL/ A, L, C, J(50, 2), X(120) where the second element (L) is an integer variable. Note that in this instance array J has two dimensions but is the same size as in the first instance, and that array X has a single dimension and is larger than in the first instance. MAT produces these diagnostics for subroutine READ:

```
***INTERFACE CHECK: SIZE OF COMMON DIFFERS FROM EARLIER USAGE: GLOBAL
***INTERFACE CHECK: DATA TYPE OF NAME IN COMMON DIFFERS FROM EARLIER USAGE: L
***INTERFACE CHECK: NAME IN
```

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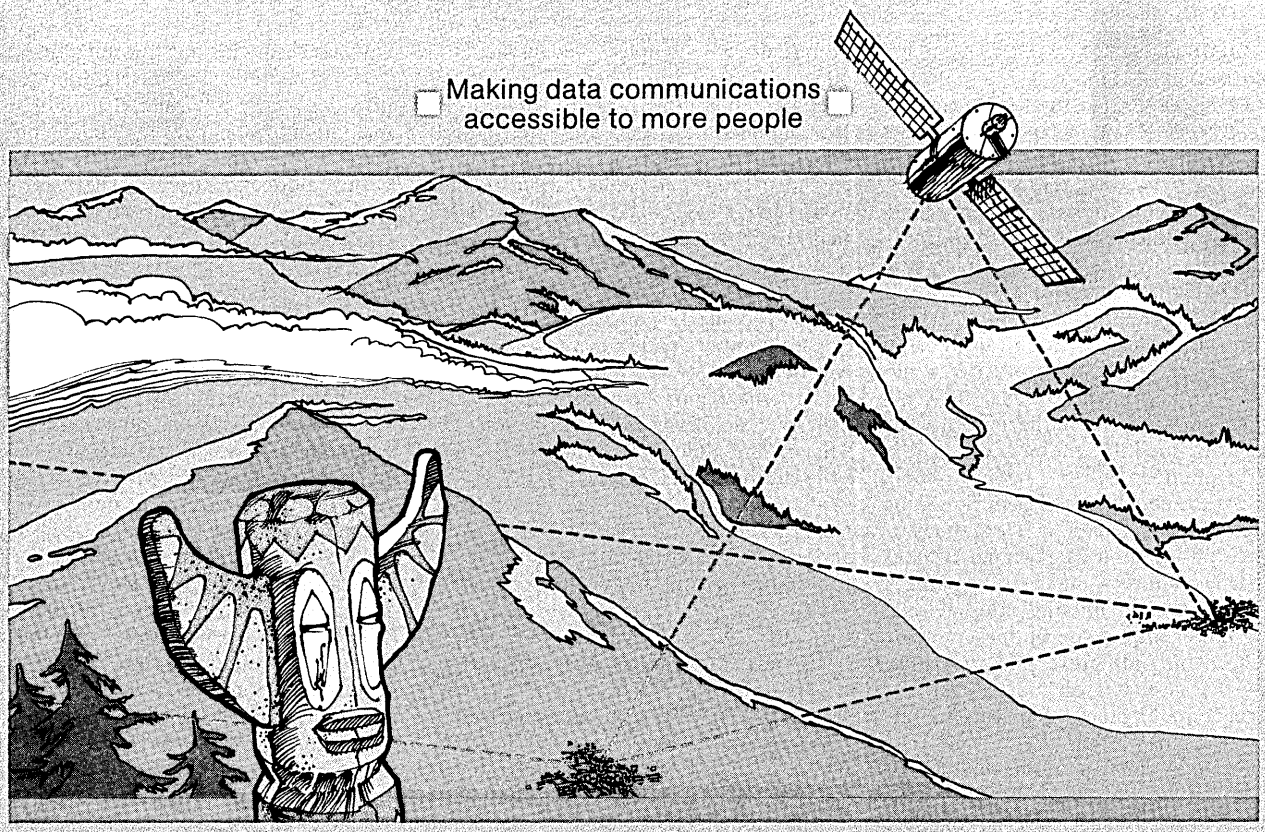

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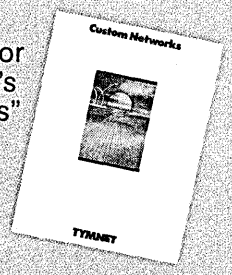

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Modularization, introduced to ease maintainability, can actually cause a decrease in program reliability.

COMMON DIFFERS FROM NAME IN SAME POSITION USED BEFORE: L

***INTERFACE CHECK: NUMBER OF DIMENSIONS OF NAME IN COMMON DIFFERS FROM BEFORE: J X

MAT protects the interface, extracted from the modules themselves, by placing considerable emphasis on its diagnostic analysis. This is because of the interface's importance to programs that consist of large numbers of intercommunicating modules; because both the FORTRAN language definition and traditional tools neglect it; and because adherence to the principle of modularization tends to expand the interface.

At the conclusion of each run, using 35 interface diagnostics, MAT examines its interface information as a whole. It looks for interface clutter—unnecessary parts of the interface—and missing interface elements, for example, subroutines that are referenced but not present in the set of modules. MAT issues diagnostics for elements in common blocks that are used only by one module and suggests that they should be local elements rather than global ones. MAT diagnoses elements in common blocks that are referenced but never given a value and those that are given a value but never referenced.

Documentation: module interface description. Because module documentation is often incomplete, inconsistent, or out of date, MAT produces certain module documentation directly from the "source." Internal module documentation is rarely reliable, and the more modules a program contains, the less reliable the documentation is likely to be. The underlying idea is that the module is the ultimate authority on what it contains.

Some of the most important information produced by MAT is the description of each modules's interface to the outside world:

- its alternate entry point names;
- the Include files used;
- the common blocks present;
- the subroutines called;
- the functions used;
- the files used, by logical I/O Unit, and the actions performed on each, e.g., UNIT = 7 (OPEN, READ, REWND, CLOSE); and
- the presence of the pause or stop statement (because each can produce output, and pause normally requires a user response).

IMPACT CAN BE ASSESSED

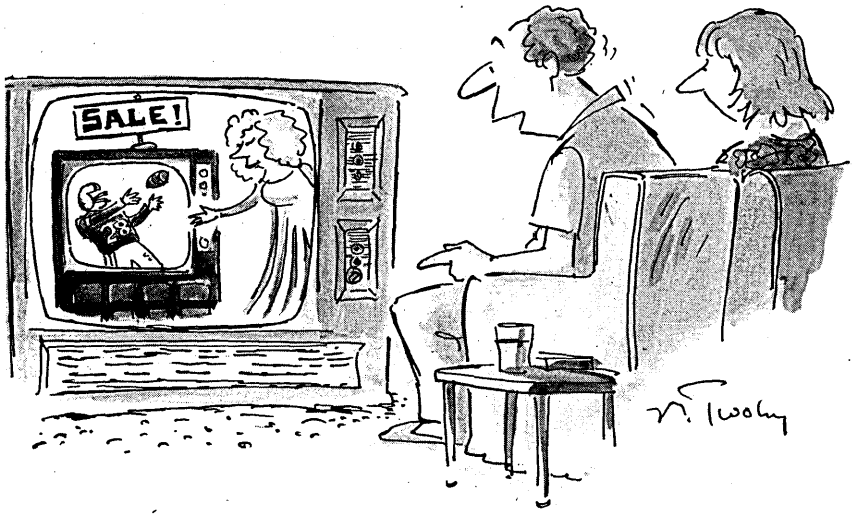
This information enables developers and maintainers of large systems to identify with confidence all the modules that would be affected if, for example, a particular common block were altered. Similarly, the impact on the modules of a change to the man-machine interface or to a particular file can be reliably assessed with this information.

The interface description feature provides a way for internal module documentation to keep pace with changing software, without the cost normally associated with such documentation. The description of each module's interface to the world, including the rest of the program, files, people, and even other programs with which it communicates, is especially valuable because of the lack of coverage that the traditionally available tools accord to this area.

Documentation: program structure. The structure of a program is the hierarchical relationship of its modules to all its other modules. It can be represented by a "call tree," a top-down ordering of the module names that comprise the program. A module at a given level in the call tree is called by one or more modules at levels above it; it may also call modules located below it in the call tree. The call tree normally begins with the main module alone at the top hierarchical level and extends downward through as many levels as necessary. The importance of the call tree as program documentation is that it conveys the structural organization of the program in an easily understandable form. This is especially valuable information when the program is composed of many modules.

The call trees produced by MAT include information that is otherwise very difficult to obtain: accompanying each module's name are two lists. The first list contains the names of all the modules that the module calls. The second list is perhaps more important: it contains the names of all the modules that call it. The significance of this information to developers and maintainers increases as the number of modules in a program increases, and for very large systems, this information can be quite valuable. For example, suppose in a system of 500 modules that functional changes must be made to subroutine CALC. It now becomes very important to locate all the modules that call this subroutine, not only by its primary name, CALC, but also by any of its alternate entry point names, in order to determine what changes must be made to the calling modules. MAT's "called by" list provides this information.

MAT also detects and diagnoses illegal and nonstandard program structures. FORTRAN 77 and most FORTRAN dialects do not allow a module to call itself either directly or indirectly (via a nested sequence of module calls that includes a call to the originating module). Although circular (recursive) calling is illegal, conventional compilers and loaders do not, however, detect this flaw, the probability of which increases along with the number of program mod-



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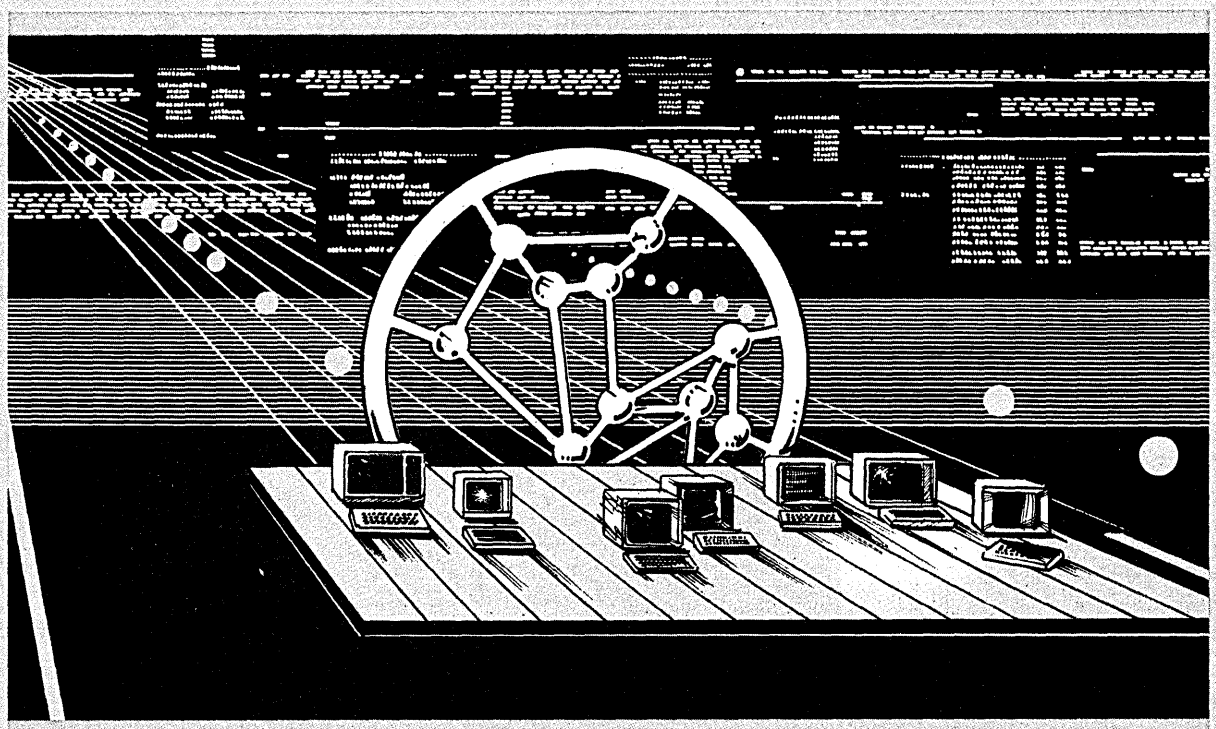

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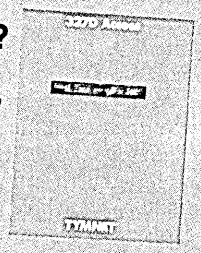

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A program structure that includes circular calling can create serious errors during execution.

ules. A program structure that includes circular calling can create serious errors during execution, among them, endless looping. MAT also diagnoses when a program does not contain a main (program) module, when a program consists of just one module, and certain other conditions related to structure.

Maintainability quantification. Module maintainability and module understandability are parallel concepts; the more difficult a module is to understand, the more difficult it is to maintain. The more difficult it is to maintain, the higher its maintainability risk. Because the maintenance staff must ultimately apply themselves to the FORTRAN source module, the approach taken in MAT to quantifying maintainability is to compute maintainability measures directly from the characteristics of the source module itself.

ELEMENTS ASSIGNED WEIGHTS

MAT equates the difficulty of understanding a module to the sum of the difficulties of a module's constituent elements. In turn, these elements are assigned a set of carefully tuned weights and factors according to their attributes. For example, use of a variable in common is given a greater weight than use of a local variable; use of an equivalenced element is weighted in proportion to the number of its aliases; and use of an element that causes a change in its value is weighted more than a use that merely references the element. Executable statement types are also weighted, as are the diagnostics (except "notices") that MAT produces.

The sum of the module's element weights is termed its difficulty index. The difficulty index quantifies the difficulty of understanding, and therefore of maintaining, the module as a whole.

MAT displays the difficulty index as well as a set of three maintainability ratings that are derived from the difficulty index and other data. These three ratings, relative skill, relative difficulty, and relative risk, have 0-10 scales on which zero is best. Relative skill is a measure of the programming skill required to maintain the module and is a normalization of the ratio of the difficulty index to the number of executable statements in the module. Relative difficulty represents the difficulty of maintaining the module and is a normalization of the difficulty index. Relative risk is the maintainability risk that the module represents and is a function of both relative skill and relative difficulty. MAT may produce two sets of these relative ratings for each module: one set for the module as it presently exists and a parenthesized set that approximates what the ratings for the module would be if the conditions diagnosed by MAT were to be corrected.

FIG. 1.

A SIMPLE SET OF INTERCOMMUNICATING FORTRAN MODULES

```
PROGRAM TOP
COMMON /SHARE/ TABLE(1000), A, B
OPEN (UNIT = 10, NAME = 'FILE1.DAT', FORM = 'UNFORMATTED')
READ (10) TABLE
DO 100, I = 1, TABLE(1)
   READ (10) TABLE, B
   CALL CHECK
   IF (B .NE. 0) A = REVISE(I)
   CALL FINISH
CLOSE (UNIT = 10)
STOP
END

SUBROUTINE CHECK
COMMON /SHARE/ TABLE(1000), A
B = ABS(B)
IF (B .GT. 10) THEN
   READ (10) TABLE
   CALL FINISH
   END IF
RETURN
END

INTEGER*2 FUNCTION REVISE (J)
COMMON /SHARE/ TABLE(1000), B
REVISE = J * J - J + 10
RETURN
END

SUBROUTINE FINISH (X, Y)
COMMON /SHARE/ TABLE(1000), A, B
A = X + TABLE(10)
RETURN
END
```

Look at an example of what MAT produces. Fig. 1 represents a program's intercommunicating FORTRAN modules and the kind of code frequently found in them. Fig. 2 contains the report that MAT produces after analyzing the modules of Fig. 1.

MAT's report on each module is a three-part paragraph. The first part gives the file name on which the module resides, the module name, and the maintainability measures and other data. The second part contains the module's interface description. The last part is MAT's module diagnostics, of which there are several kinds. Following the paragraph on each module is the summary interface examination. The program call tree concludes the report.

In this example MAT finds many local problems, but the most serious ones are at the module's interfaces. In modules 2 and 3, MAT not only finds that common block SHARE is a different size from what it is in module 1 (an error according to FORTRAN 77), but it also diagnoses that SHARE has fewer elements than it has in its first instance. In module 3, MAT diagnoses that common block element B differs from the name that appears in the same position in the first instance of the common block. It also finds that function REVISE has a different datatype from that assigned to it by some or all of the modules that reference it; the call tree reveals that the only module that references function REVISE is module 1, program TOP. MAT also detects that common block SHARE is clutter in module 3 and that module 4 references subroutine CHECK with the wrong number of arguments (also an error according to the FORTRAN 77 specification).

In its summary interface analysis MAT finds two common block discrepancies: element A is clutter and element B is unnecessarily in common. Neither the VAX FORTRAN compiler nor the loader diagnoses any problem with this module set.

Since it reached production status in April 1983, MAT has analyzed many thousands of FORTRAN modules written in many different dialects for many kinds of computers. It has identified discrepancies

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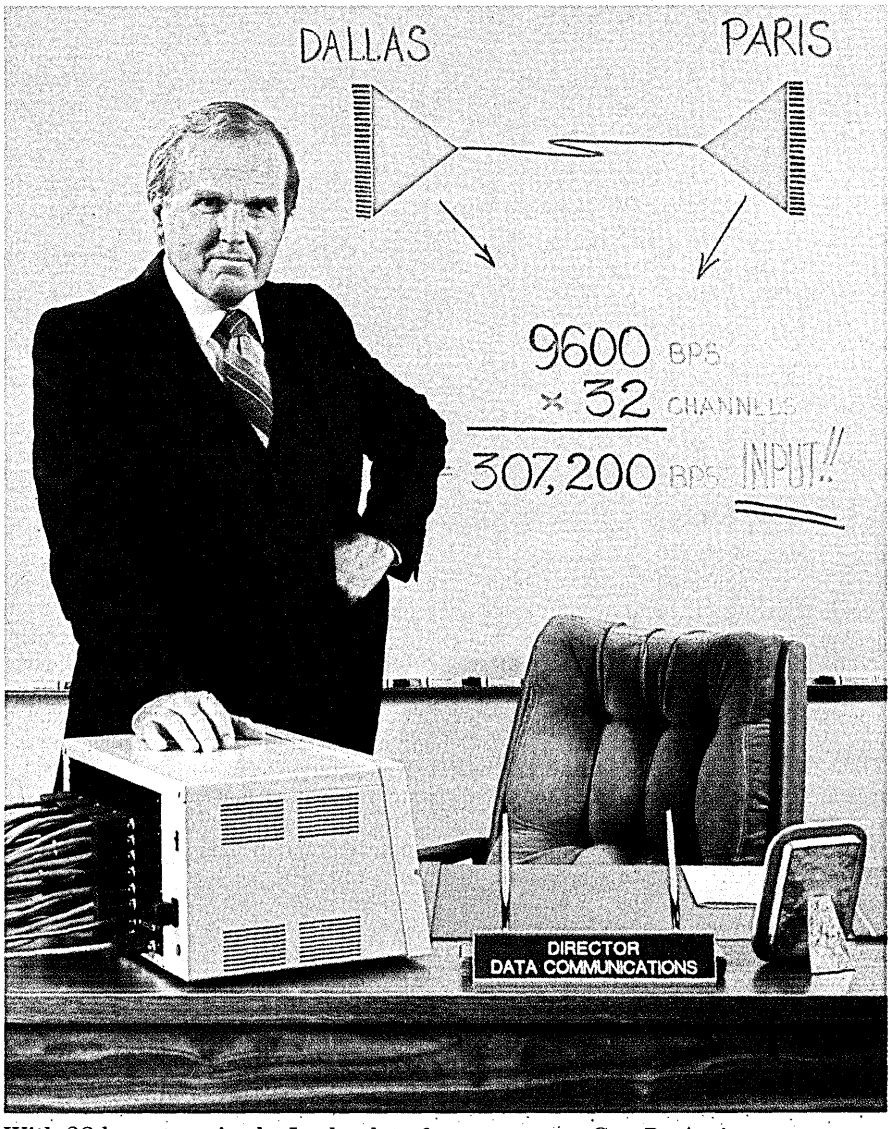

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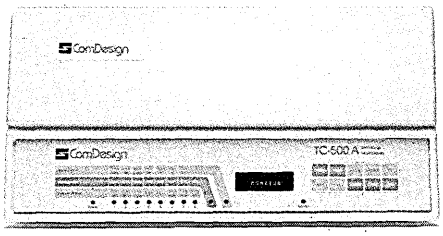

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FIG. 2

A MAT REPORT

```
DIRECTORY FILE: NONE                          MAINTAINABILITY ANALYSIS TOOL (MAT) V7.24   11-APR-84   10:03:41        PAGE   1

 SEQ                                                  -----RELATIVE-----  DIFFICULTY  EXEC  --COMMENT--  DEBUG  LABELS NOT  POOR
 NUM  FILE NAME                  MODULE NAME          RISK   DIFF  SKILL  INDEX RATIO STMTS LINES STMTS  STMTS   IN ORDER   USES

   1 DTM.FOR                     PROG TOP          8( 0)  1( 0) 10( 5)   209  190    11     0     0      0         0         5
     COMMON BLOCKS PRESENT:  SHARE
     SUBROUTINES (AND ENTRY POINTS) CALLED:  CHECK FINISH
     FUNCTIONS (AND ENTRY POINTS) USED:  REVISE
     FILES USED:  UNIT=10(OPEN,READ,CLOSE)
     'STOP' STATEMENT IS PRESENT
     ***POOR USAGE: VARIABLE IN COMMON WITH IMPLICIT DATA TYPE:  A B
     ***POOR USAGE: SPONTANEOUS USE OF UNDEFINED LOCAL VARIABLE:  I
     ***POOR USAGE: ARRAY IN COMMON WITH IMPLICIT DATA TYPE:  TABLE
     ***POOR USAGE: FUNCTION WITH IMPLICIT DATA TYPE:  REVISE

   2 DTM.FOR                     SUBR CHECK        10( 0)  1( 0) 10( 5)   179  298     6     0     0      0         0         5
     COMMON BLOCKS PRESENT:  SHARE
     SUBROUTINES (AND ENTRY POINTS) CALLED:  FINISH
     FUNCTIONS (AND ENTRY POINTS) USED:  ABS
     FILES USED:  UNIT=10(READ)
     ***POOR USAGE: VARIABLE IN COMMON WITH IMPLICIT DATA TYPE:  A
     ***POOR USAGE: SPONTANEOUS USE OF UNDEFINED LOCAL VARIABLE:  B
     ***POOR USAGE: ARRAY IN COMMON WITH IMPLICIT DATA TYPE:  TABLE
     ***INTERFACE CHECK: SIZE OF COMMON DIFFERS FROM EARLIER USAGE:  SHARE
     ***INTERFACE CHECK: COMMON HAS FEWER ELEMENTS THAN IT HAD IN ITS EARLIER USAGE:  SHARE

   3 DTM.FOR                     FUNC REVISE       10( 0)  1( 0) 10( 4)   252  840     3     0     0      0         0         8
     COMMON BLOCKS PRESENT:  SHARE
     ***POOR USAGE: DUMMY ARGUMENT WITH IMPLICIT DATA TYPE:  J
     ***POOR USAGE: VARIABLE IN COMMON WITH IMPLICIT DATA TYPE:  B
     ***POOR USAGE: ARRAY IN COMMON WITH IMPLICIT DATA TYPE:  TABLE
     ***POOR USAGE: WHOLE COMMONS PRESENT BUT UNUSED IN THIS MODULE:  SHARE
     ***INTERFACE CHECK: EARLIER MODULES USE THIS FUNCTION (OR ENTRY POINT) WITH INCORRECT DATA TYPE:  REVISE
     ***INTERFACE CHECK: SIZE OF COMMON DIFFERS FROM EARLIER USAGE:  SHARE
     ***INTERFACE CHECK: NAME IN COMMON DIFFERS FROM NAME IN SAME POSITION USED BEFORE:  B
     ***INTERFACE CHECK: COMMON HAS FEWER ELEMENTS THAN IT HAD IN ITS EARLIER USAGE:  SHARE

   4 DTM.FOR                     SUBR FINISH       10( 0)  1( 0) 10( 5)   224  747     3     0     0      0         0         7
     COMMON BLOCKS PRESENT:  SHARE
     ***POOR USAGE: DUMMY ARGUMENT WITH IMPLICIT DATA TYPE:  X Y
     ***POOR USAGE: UNUSED DUMMY ARGUMENT:  Y
     ***POOR USAGE: VARIABLE IN COMMON WITH IMPLICIT DATA TYPE:  A B
     ***POOR USAGE: ARRAY IN COMMON WITH IMPLICIT DATA TYPE:  TABLE
     ***INTERFACE CHECK: EARLIER MODULE(S) USE THIS MODULE (OR ENTRY PT.) WITH INCORRECT NO. OF ARGUMENTS:  FINISH

INTERFACE EXAMINATION:

     ***INTERFACE CHECK: NAME IN COMMON WAS SET BUT NOT REFERENCED:  A
     ***INTERFACE CHECK: NAME IN COMMON WAS USED BY JUST ONE MODULE:  B
     ***NAME(S) LISTED SHOULD BE CONSIDERED FOR REMOVAL FROM COMMON


DIRECTORY FILE: NONE                          MAINTAINABILITY ANALYSIS TOOL (MAT) V7.24   11-APR-84   10:03:41        PAGE   2


CALL TREES -- HIERARCHICAL LISTING OF MODULE NAMES BY TASK:
(CALLS TO ALTERNATE ENTRY POINT NAMES ARE TREATED AS CALLS TO PARENT MODULE NAMES -- CALLS TO DUMMY ARGUMENT MODULES ARE IGNORED)

TASK NO. 1

LEVEL 0:  1P-TOP ...CALLS 2S-CHECK 3F-REVISE 4S-FINISH ...CALLED BY *NONE*

LEVEL 1:  3F-REVISE ...CALLS *NONE* ...CALLED BY 1P-TOP
          2S-CHECK ...CALLS 4S-FINISH ...CALLED BY 1P-TOP

LEVEL 2:  4S-FINISH ...CALLS *NONE* ...CALLED BY 1P-TOP 2S-CHECK
```

of all types, hundreds of which were found to be errors. FORTRAN modules of all qualities have been discovered, from those for which MAT produces no diagnostics and excellent relative risk ratings of 2 or less to those consisting of thousands of executable statements for which MAT has produced four pages of diagnostics and maximum difficulty ratings.

FEWER ERRORS EXPECTED

Two results have been most surprising. We did not expect that MAT would find so many errors in production programs, considering how heavily tested and used they usually are. Most of these errors have been found in programs that consist of 50 or more modules (MAT has handled up to 1,352 modules at one time, and this is not its limit.) We speculate that the reason may be that people are not able to devote the necessary time to individual modules (coding, checking, debugging, unit testing) when there are a large number of modules contending for attention. Of course, the more modules there are in a program, the more opportunities there are for interface problems. We have seen many of these.

The second surprise has been the large amount of clutter MAT has found in FORTRAN modules, even in production programs.

The users of MAT have been able to find and remove real problems and errors that might not otherwise have been found so easily. In some cases, MAT has located errors that had resisted all previous attempts to find them. MAT has raised the reliability and maintainability of FORTRAN modules and has produced valuable documentation about the modules. The FORTRAN community is now able to counter the language's vulnerabilities and weaknesses, and it can do so for old FORTRAN programs as well as for new ones.

MAT, then, has many uses: it can help enforce programming standards during software development and can aid the task of software maintenance; it can augment unit and system testing and can aid in system integration; and it can perform software verification and validation (internal and independent) with real substance, contribute to program and module documentation and, hence, to configuration management. ◉

Gerald M. Berns is a technical director of Science Applications Inc. and is associated with several projects there, including the internal QA program, the Cruise Missile Project, and the MAT development program. He has written extensively on the subject of error management and resource management.

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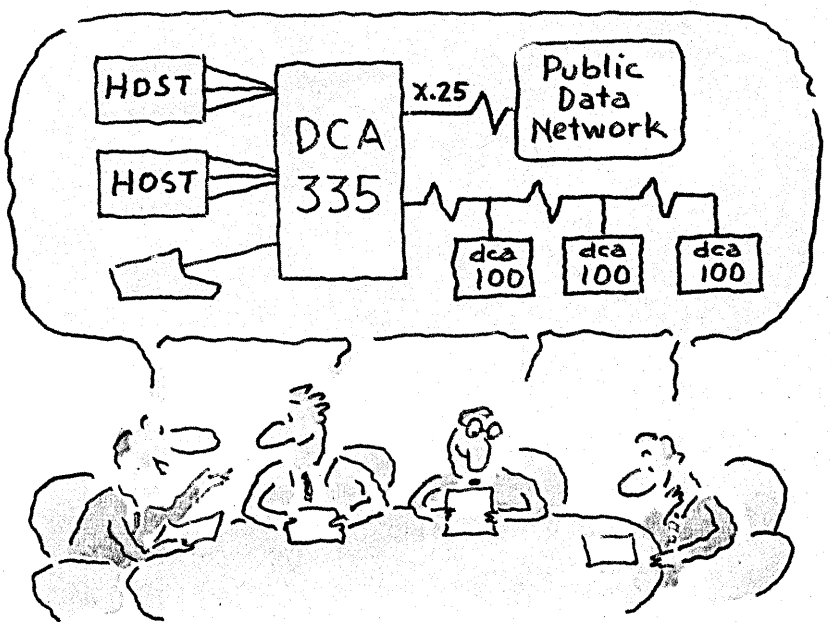

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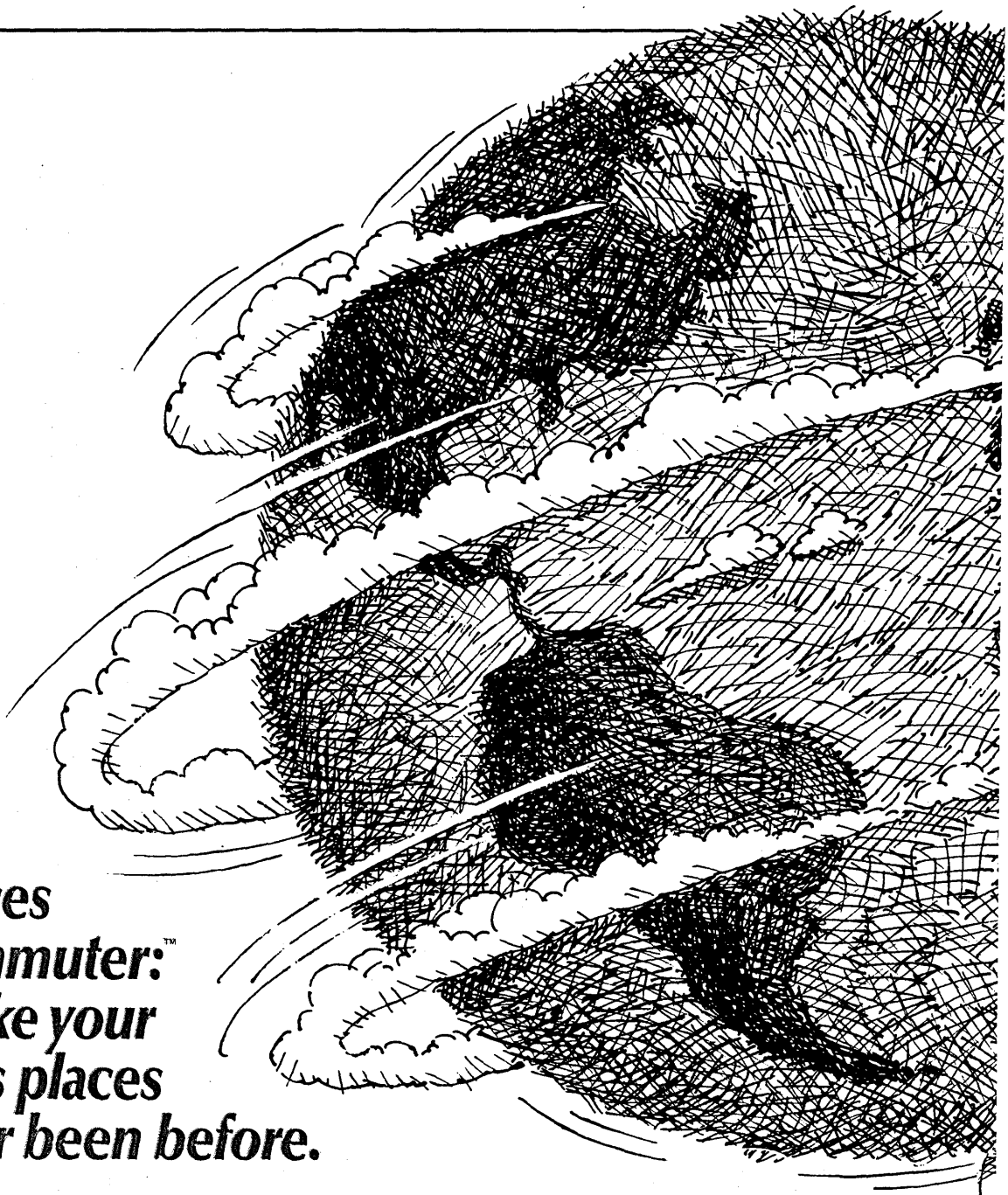

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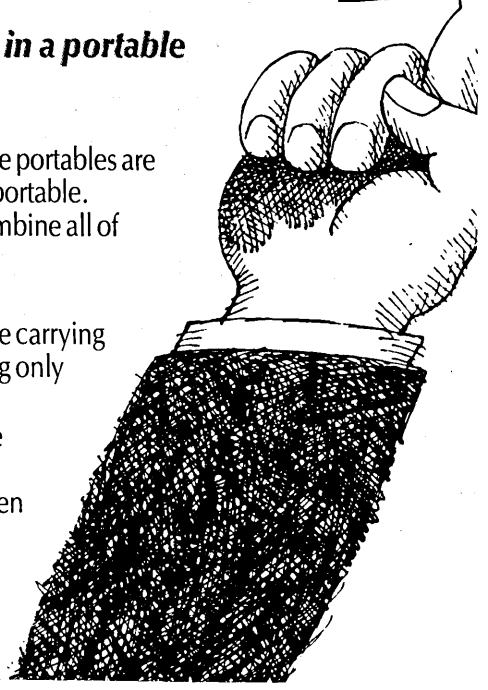

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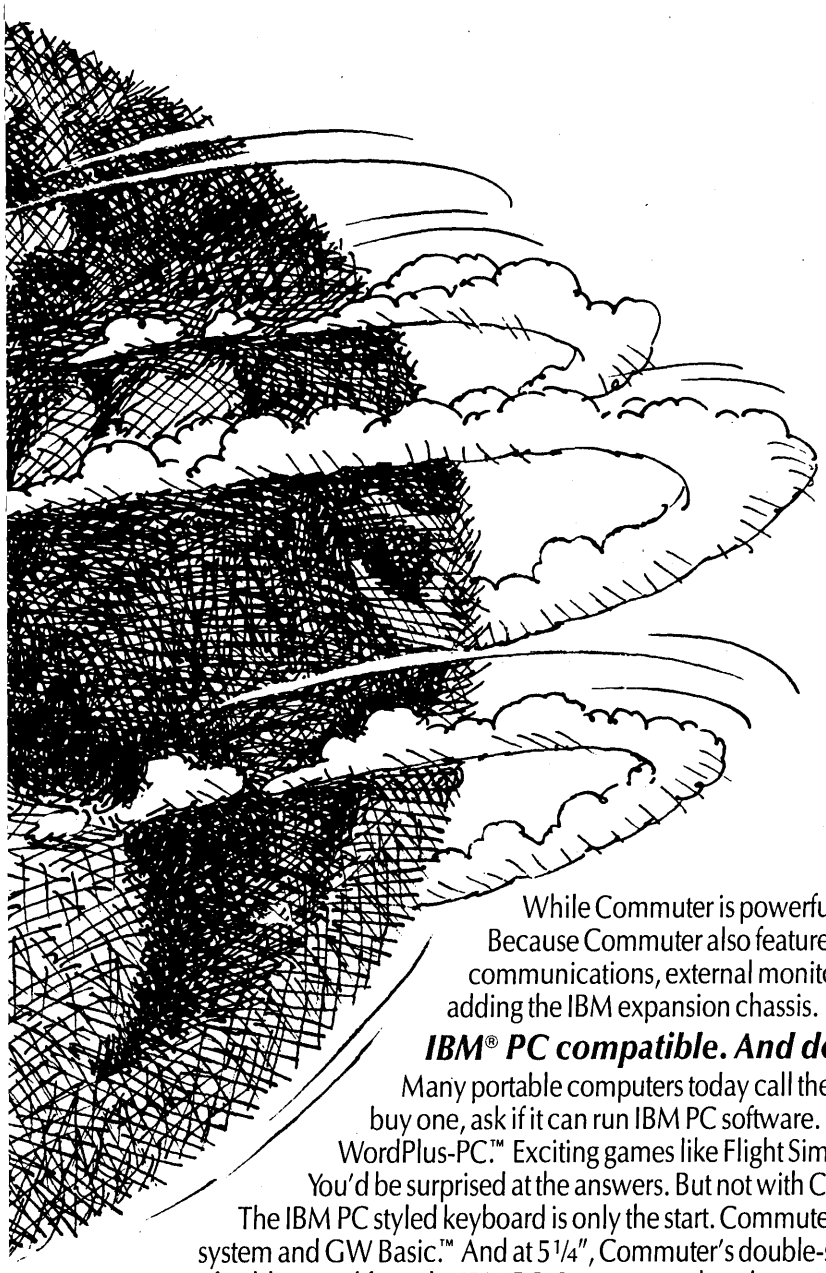

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PEOPLE

AI IN THE WOODS

Within minutes of arriving at the house at the end of the quiet side road, my misconceptions became apparent.

The voice on the telephone had talked of the search for new "paradigms," new patterns in machine intelligence; about bringing order to the chaos of an age-old problem: how to interpret the visual and verbal presentation of ideas. The voice had sounded crisp, efficient, and businesslike. Thus, I was not quite prepared for the fresh-faced young man who came to the door, or the informal atmosphere of this farmhouse-style building nestled deep in rural Massachusetts with its overtones of Woodstock, love, and peace.

To some extent, the Apple Computer culture has paved the way for the "baby-faced entrepreneur," and, indeed, the faces at Prelude Development Corp. are impossibly young, fresh, innocent—one might even add unworldly—to have titles like vp attached to them.

But first impressions can be deceiving in this idyllic place. The insistent ringing of the telephones, the clacking of IBM PCs, soon snap one out of reverie. This is a business—well drilled, highly organized—that happens to resemble a bunch of people having a good time.

Prelude has spun out of Lotus Development Corp., the Cambridge, Mass., developer of 1-2-3, an integrated software package that has dominated the pc software market for the past year or so. Prelude's staff comes largely from Lotus, where they worked on 1-2-3 and other projects. Not wanting to get lost in the fast-growing Lotus, the Preluders left several months ago to pursue upgrades to the 1-2-3 concept and inject a measure of so-called artificial intelligence (AI).

PETER GABEL: "We want to avoid situations where people would feel threatened by technology."

Outside, on this spring day, the apple trees stand like stark skeletons in neatly clipped rows; by fall they will be lush with fruit. For generations the family orchards of Stow have produced apples by the bushel, adding a note of industry to this sleepy little town. The youthful band, oblivious to the scenic splendors surrounding the house that serves as a base for their initial development work, have another harvest in mind, however. While resembling the apple growers, they have more in common with the Digital Equipment researchers in the nearby industrial town of Hudson, whose mission is likewise to bring forth fruit from the nascent AI industry.

Once more the persistent tapping of PC keyboards obtrude into one's thoughts and it's down to business. "The PCs were supplied by Lotus," says Paul Weiss, the boyish and denimed vice president for R&D who is first to speak. "In return we'll relicense our software development tools to them when they are completed in the summer." Like the others, Weiss's programming gifts would secure him a place in any corporation. "But I couldn't see making a life out of working for someone. If I wasn't here, I would be an academic, but it's less exciting and less free. Here there is the positive pressure of being out for yourself," he notes, casually pulling at his sneaker.

The group's tall, bespectacled leader, Peter Gabel, says the split from Lotus was inevitable. "Lotus is where it's at for what is termed decision support, but its 1-2-3 package is a poor analogy of the real world," he says, harking back to the days when he was development manager of the 1-2-3 project. "1-2-3 is best used in a vacuum—it doesn't help you gather in unstructured information and send it out. We have a vision of creating a market for a more organic solution bringing AI techniques to bear."

For Gabel, this means focusing on real world business problems, and doing things that are appropriate with the technology at hand.

"Most AI today focuses on expert systems that require the huge computational power of a mainframe or LISP processing. But we believe there's a lot that you can do with a pc, and we want to avoid situations where people would feel threatened by the technology."

The company has chosen the French AI development language Prolog to program the PC in such a way that it builds information models the same way a person would. Gabel's point is that people deal with external reality by making internal models of it. "The mind is a recognition machine. It has to be in a situation before it knows what to do. Without knowledge of the environment it is depicting, a computer can't properly comprehend information it is processing." One AI consultant, Howard Austin of Concord, Mass., refers to this as the "anthropologi-

PEOPLE

cal commitment." In order to achieve this, we must create knowledge we can interact with. Gabel adds, "Most computer programs, including 1-2-3, are not interactive."

In an effort to achieve an analogy of the real world, Prelude is focused on the issue of how knowledge representation can be reduced to practice in the software marketplace.

Armed with the mathematical formalism of Prolog and such AI techniques as frames, which divide knowledge by action or by the unfolding of events, Gabel is hoping to enable decision support to flower into full organic information management. The first step has been the creation of a complex compiler to allow Prolog to run on the PC, and development tools that allow information input through natural language as well as graphic and pictorial means. Gabel already is amazed at the performance of Prolog on his half-megabyte, 5MHz PC, which he says already delivers one-third the power of a DECsystem-10.

"Things are really racing along, and we should be into alpha phase soon, with customer beta tests following along next spring," he says.

Gabel credits his parents and early upbringing in Buffalo for his hard-core pragmatism. "They were intensely concerned with practical consequences and values," he says, laughing at the memory. "If I'm an entrepreneur at heart, they made me that way. I'm just actualizing the potential they helped create in me."

By the age of seven, this fair-haired, intense character already had his own business selling sunflower seedlings, juggling three paper routes at the same time. "During my high school years, I wrote a basic interpreter in APL. It didn't get me any money," he says ruefully, "but it got me a hell of a lot of computer time."

Gabel, who, like his colleagues, is in his twenties, followed up his college days with a stint at DEC as engineering supervisor for three years. "But I had to get out of the technical domain. I'm interested in it all—marketing, finance, business, you name it. It's not just the vision of creating a product alone which appeals to me. It's creating a whole new market."

Once more the college cafeteria atmosphere intrudes on the conversation. "It's tough," Gabel sighs, reading my thoughts. "I wished we looked older," he says, anticipating the round of venture financing that lies ahead. Inevitably, the Prelude team, numbering only nine so far, will have to transform themselves into wolves in business suits. Perhaps what they will need is a good front man, an actor who wears pinstripes well. A little gray around the temples might be good.

—R. Emmett Carlyle

HARDWARE

OFF—LINE

One of the major new products announced this summer was NEC's desktop 32-bit supermini. The Astra 300 runs under the proprietary ITOS operating system the company developed for some of its previous computers. The choice of ITOS rather than a Unix-based operating system struck some observers as odd, since American executives of the Tokyo-based conglomerate had stressed compatibility with de facto industry standards when they introduced their APC III several months ago. This time around, they said what all cpu vendors with proprietary operating systems say: there is already plenty of applications software available for the OS from the company and third-party suppliers. The company did say, however, that it may offer Unix at a later time.

State of the art, or whatever one wishes to call the avant garde of new products, new technologies, new generations, and new ideas in this industry, directly affects only a few of the country's dp shops. As with any industry, most of the rest wait to see how the pioneers fare in their encounters with each new wave of technology. And while many firms cater to the pioneers, and most of the ads in trade magazines emphasize the state-of-the-art nature of one product or another, we see relatively little aimed at the many shops that still have 1965-vintage 360 systems or are still using machines made by vendors no longer in the computer industry -- or even in existence. The vendors consider these machines antiquated, and would just as soon have users junk them and buy new equipment, regardless of how well the old iron is performing its functions.

(There is a philosophical question here as to whether a 20-year-old computer can even be called "antiquated" just because the vendor says so; sure, it's not as technologically advanced as today's new models, but there are still plenty of 1965 Fords on the road that get people to Burger King just as well as 1984 cars, after all, and their owners wouldn't consider them antiquated. Further inquiry on that is best left to the philosophers.)

It's gratifying to find among the hordes of the new some evidence that there are indeed firms that specialize in maintaining old computer systems, or in stocking spares and replacements for components of ancient equipment. Yet these firms seem to be embarrassed about their businesses, and often refer to old products and technologies as "mature" or "discontinued" rather than as "old." That's too bad, since there is often a certain charm in antiques -- and a mechanic with spare parts for a Stutz Bearcat is hard to find, but once found is worth all the silicon in California. The same holds true for old computers. One outfit we've found with a sizable inventory of old parts is Rochester Electronics Inc., in Wakefield, Mass. The firm began by stocking Motorola DTL flatpacks, TTL, RTL, 74H, 54H, SUHL, MECL, and other old parts, and currently makes a habit of purchasing ending inventories from Motorola, Texas Instruments, and Fairchild Semiconductor. In addition, it recently acquired authorization from Lansdale Electronics to use original circuit designs and masks from GE, RCA, TI, Motorola, Delco, Sprague, Raytheon, Solitron, and Signetics, so that it can supply users of devices made by those firms with new replacement parts. The firm also offers foundry service for bipolar wafer processing and testing services. Says Rochester president Curt Gerrish, "I specialize in the trailing edge of technology."

GRAPHICS CAPABILITIES

A variety of graphics capabilities previously available on IBM's mainframe computers are now avaible on its System/38. Also, terminals used with IBM's large systems can now be attached to S/38 via remote communications lines.

S/38's operating system now includes many features of a graphics program, Graphical Data Display Manager (GDDM), which is widely used on large IBM systems. Through programming, GDDM enables users to create diagrams and charts by drawing lines between any of the 138,240 addressable points on the 5292 Model 2 color display.

Also, part of the operating system is a System/370-compatible program called Graphics Data File (GDF), which permits graphics to be exchanged with another S/38, S/370, 43XX, or 308X. Another operating system feature, Presentation Graphics Routines (PGR), enables any user-written application program to create a variety of charts on one screen. A simplified graphics capability, Office/38 Business Graphics Utility (BGU), enables users to create eight types of charts using menus and prompts.

Now, 3270 terminals and devices that emulate them can be attached to an S/38 when it is acting either as a standalone or as a remote processor for an S/370, 43XX, or 308X host. Users can now install an S/38 and attach 3270 terminals to it via a 3274 control unit. The Business Graphics Utility has a basic one-time charge of $2,000 and a distributed service license option charge of $1,800. It is also available for a $100 basic monthly charge, $90 under DSLO. IBM CORP., Rye Brook, New York.

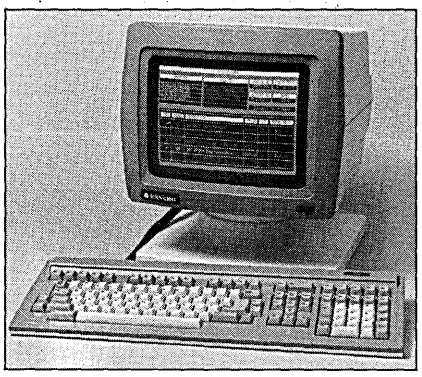
FOR DATA CIRCLE 301 ON READER CARD

DEC-COMPATIBLE

The 922 is an ANSI 3.64 video display terminal that is compatible with Digital Equipment Corp.'s VT-220 and VT-100 terminals.

The terminal combines the VT-220

HARDWARE



and VT-100 keyboards to enhance key placements, the vendor says, adding that operators familiar with the older VT-100 keyboard do not need to readjust to a new keyboard layout.

The video display has enhanced ANSI characteristics, including block mode and function keys that can be programmed in either the shifted or unshifted position. A 10-key calculator-style keypad is also included. The 922 VT-220 and VT-100 replacement vdt sells for $1,000. TELEVIDEO SYSTEMS INC., Sunnyvale, Calif.

FOR DATA CIRCLE 303 ON READER CARD

INTEGRATED OFFICE SYSTEM

The Knowledge Worker can function as a standalone system or operate with up to 127 other clustered workstations. Clustered systems can store up to 21GB of information; each station can store from 1.2MB on dual floppy disks up to 80MB on hard disks.

The workstation uses a Convergent Technologies engine. This vendor's value-added portion is a system called M-Path (for My Path). M-Path provides a single, consistent, and adjustable icon-driven user interface to all applications software and operational systems on the user's system. Each icon is a graphic presentation of everyday desktop/office tools.

This product uses four operating systems: CP/M-86, CTOS, Unix System V, and MS/DOS. It operates with BASIC, COBOL, FORTRAN, Pascal, C, and assembler computer languages. The workstation is also compatible with Ethernet local area and Knowledge-Net wide area networks and can exchange documents with Wang, IBM, and A.B. Dick Magna products.

The computer uses two microprocessors, the Intel 80186 and the Motorola 68010. It is equipped with 256KB of RAM and has slots for three 256KB RAM expansion cartridges.

The basic workstation consists of a 12-inch monitor, a keyboard, a central processor with 512KB of RAM, and a module with channels to accommodate two RS232C ports, an RS422 port, and a parallel printer port with a Centronics-compatible interface, power supply, and a 10MB hard disk with a 630KB floppy. Graphics enhancements are also available. The Knowledge Worker workstation costs $8,800. A.B. DICK, Chicago.

FOR DATA CIRCLE 302 ON READER CARD

PUNCHED CARD READER

The CR300-30 card reader and the RP8230 printing card reader punch fill a gap for users of Hewlett-Packard's HP 3000 minicomputer.

The CR300-30 card reader is a tabletop unit, which reads 300 cards per minute. Faster speeds, up to 600 cpm, are also available

The RP8230 printing card reader punch punches and prints cards at 45 to 75 cpm. Card reading is provided at 200 cpm. This peripheral can also be used as an off-line card punch, interpreter, and reproducer. Sample rentals are $360 monthly for one year for the CR300-30 reader and $465 monthly for the RP8230 printing card reader punch. Lower rates are available for longer rental terms. CARDAMATION COMPANY, INC., Frazer, Pa.

FOR DATA CIRCLE 304 ON READER CARD

SUPERMINICOMPUTER

The 8855 Model 10 is a 32-bit superminicomputer that incorporates SNA capabilities and concurrence of function, which allows it to meet the needs of distributed processing environments, the vendor says.

The 8855 Model 10 and the vendor's field-upgraded 600 Model 75 use a 16032 32-bit main processor chip and coprocessor functionality utilizing 80186 chip technology in 16-bit terminal and communications I/O processors. The computer allows up to 64 tasbs to operate the following functions at the same time: batch and interactive communications, SNA/SDLC and bisynchronous protocols, data entry, local file processing, and local database inquiry and update.

The hardware is housed in a four-tier cabinet that houses the main processor, terminal, and communications I/O processors; up to 2 million bytes real memory; an auto-load magnetic tape transport and controller; up to 132MB of disk storage; the power supply; and battery backup unit to maintain real memory in the event of a power outage. An additional cabinet can contain up to three more 132MB disks.

This system uses the vendor's DPEX V operating system and can be programmed in C. DPEX is terminal-oriented, multitasking, and provides users with data processing and communications capabilities. The 8855 Model 10 system, including 512KB memory, 132MB Winchester disk, 9/1600 auto-load tape, eight terminals, and a 300 lpm printer is priced at $97,500. NIXDORF COMPUTER CORP., Waltham, Mass.

FOR DATA CIRCLE 305 ON READER CARD

HARDWARE SPOTLIGHT

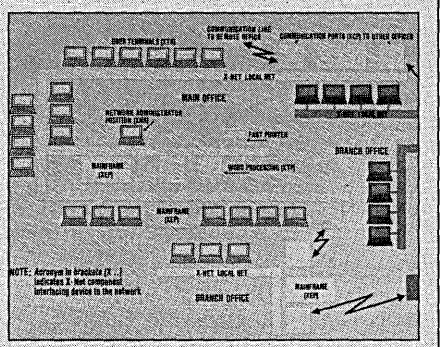
MULTIPLE HOSTS

X-Net is a local and wide area network that allows IBM 3278/3279 display stations, IBM PCs, and DEC VT-100 compatible terminals to communicate with IBM, DEC, and HP host computers on a one-cable plan.

For example, an IBM pc user can access a VAX database, or an IBM 3278 operator can access the company's IBM mainframe or DEC minicomputer. X-Net supports 3274 BSC and SNA/SDLC, plus a range of other terminal-to-mainframe protocols such as NCR and Honeywell.

Invisible to terminal operators, this network takes care of all protocol conversions, screen format mapping, frame routing, and flow control. According to the vendor, users need learn only four keyboard commands to use the net. Up to eight layers of password protection can be implemented to avoid unauthorized data access.

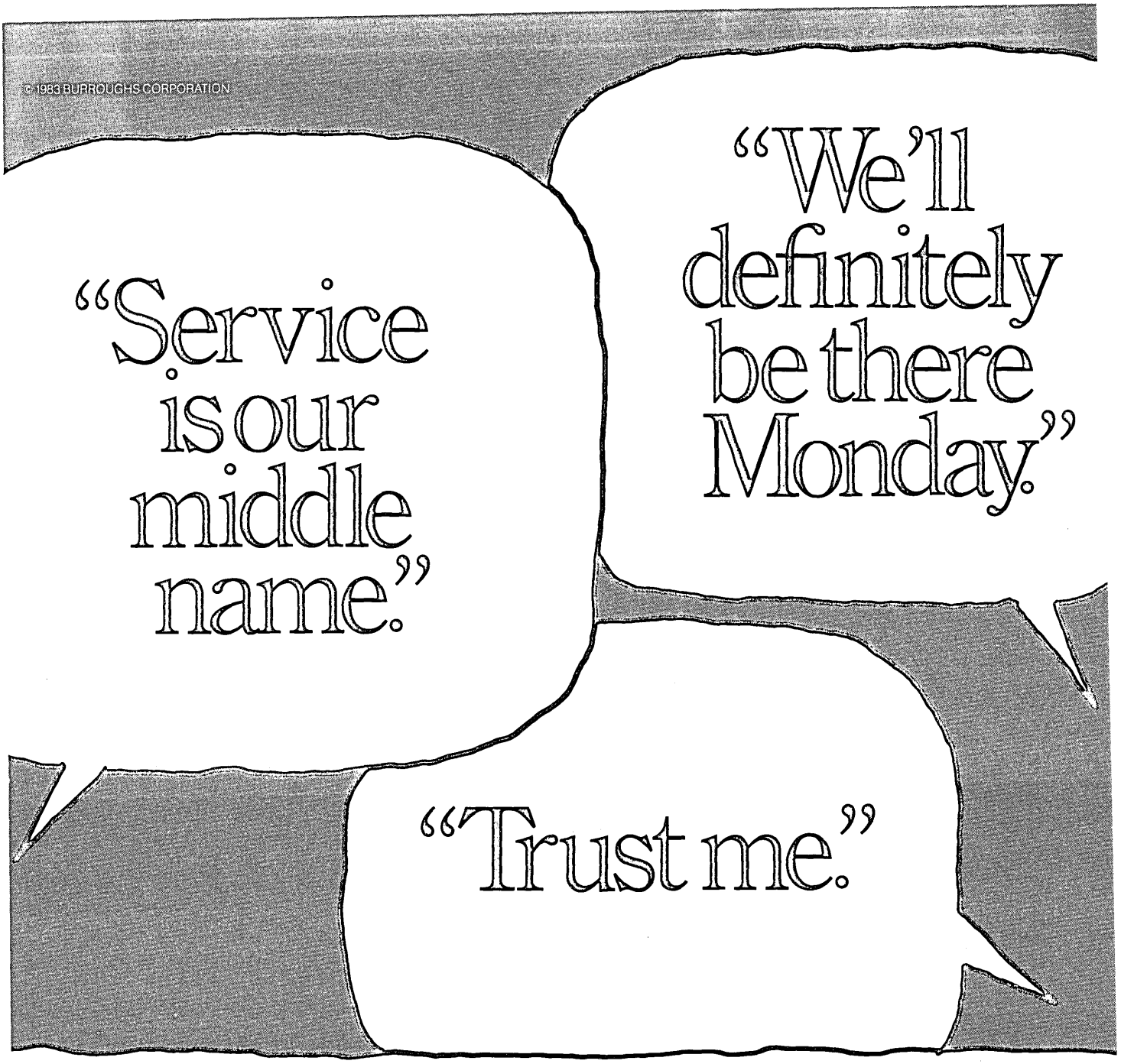
The product is a dual bus network with rooted-tree topology, which transmits on 95 ohm twin-ax cable. It allows up to 2,032 connections per site and is able to interconnect up to 225 sites via X.25 gateways.



The X-Net Controller commands the data transport system by means of a roll-call polling scheme. It continuously monitors the system's transmission demands and adjusts the individual network device's bandwidth accordingly.

The vendor says that data collisions are nonexistent under this access protocol, which accommodates data throughput up to 14.75Mbps. X-Net provides CCITT 16 CRC sum for receiver data integrity control under SPL-D signaling. X-Net is a modular-based system and costs $1,000 per connection. CR COMPUTER SYSTEMS INC., Los Angeles.

FOR DATA CIRCLE 300 ON READER CARD



TALK IS CHEAP.

Good service, however, isn't.

Which is why in the last three years Burroughs has invested over $100 million worldwide on improving our service and support.

For example, we spent a small fortune on the Burroughs Respond System—a sophisticated computerized operation that insures fast service for our customers. (Our average response time for mainframes is already under two hours, but we're determined to do even better.)

Our new $23 million Lisle Training Center is a "Service University" that trains many of our 16,000 service and support people in the latest state-of-the-art computer technology.

Our experts are taught, for example, to use a highly advanced diagnostic device called a logic analyzer which is remotely controlled so they can diagnose complex problems instantly from our customer support centers without the delay of travelling to your company.

What's more, the new Burroughs Parts Inventory Management System is designed to get you the right spare part at the right place and at the right time.

What all this adds up to is that Burroughs is committed to doing everything humanly (and electronically) possible to provide our customers with the best service and support in the industry.

And with $100 million behind that commitment, it's a lot more than just talk.

Burroughs

THE QUESTION ISN'T WHO'S BIGGER.
IT'S WHO'S BETTER.

HARDWARE

PLUG-COMPATIBLE PRINTERS

The 4303 is plug-compatible with the vendor's 3203-5 printer. It comes in 1,200 and 1,500 lpm models. Purchasers of the 1,200 lpm printer will be able to modify their printer to 1,500 lpms on-site with a field upgrade kit from the vendor.

The printer attaches to byte or block multiplexor channels on the 303X, 308X, or 43XX central processing units. Major mechanical features include steel print bands and a patented, single-actuator hammer bank mechanism. The unit comes in a sound-insulated cabinet that reduces noise to 60 decibels.

The unit uses 1,100 watts of power in full operation. The printer has a power lift hood to allow loading and aligning paper and changing bands and ribbons plus a power stacker for printed output. Purchase price is $30,500 for the 1,200 lpm model, and $35,000 for the 1,500 lpm version. The field upgrade kit costs $6,000. Lease prices are also available. MEMOREX CORP., Santa Clara, Calif.

FOR DATA CIRCLE 306 ON READER CARD

DESKTOP CAE WORKSTATION

The SCALDsystem IV is a Unix-based desktop workstation that provides the engineer with a graphics editor and the tools necessary to perform schematic capture, timing verification, logic simulation, and system documentation.

The workstation has a 16/32-bit 68010 microprocessor, demand paged virtual memory, 1MB of RAM, and a 10MB formatted Winchester hard disk. The system has a 15-inch, 720 x 560 pixel bit-mapped display and a 256KB display memory. It networks through the Ethernet local area network. SCALDsystem IV costs $20,000. VALID LOGIC SYSTEMS INC., Mountain View, Calif.

FOR DATA CIRCLE 307 ON READER CARD

UNIX-BASED SUPERMICRO

The WorkManager II and III and the WorkMaster are additions to this vendor's Unix System V-based supermicrocomputers. The WorkManager II and III are based on a 10MHz MC 68000 processor, while the WorkMaster uses the MC 68010. All three systems use Multibus IEEE-796 architecture.

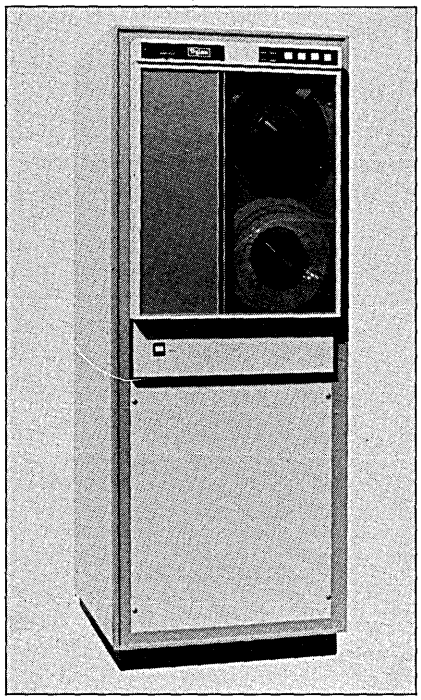
Both the WorkManager II and III use the UniSoft implementation of the Unix System V operating system. These units offer a total of 10 disk drive options in floppy, Winchester, and SMD formats ranging from 10MB to 474MB.

The WorkManager II and III have memory that may be expanded to 4.5MB, and offer disk storage of up to 594MB. The WorkMaster has memory expansion of up to 8.5MB and disk storage of up to 1.1GB. Any of the three systems may be configured with up to 18 I/O ports, a floating point processor, and Ethernet options. Networking capabilities are provided throug B-Net, a kernel implementation of TCP/IP network protocols that are compatible with the Berkeley 4.2 Unix. Pricing begins at $10,400 for the WorkManager II, $13,700 for the WorkManager III, and $26,700 for the WorkMaster. CYB SYSTEMS INC., Austin, Texas.

FOR DATA CIRCLE 308 ON READER CARD

MAGNETIC TAPE SYSTEM

The Series Ten GCR magnetic tape subsystem is designed for use with Hewlett-Packard's HP 1000 M/E/F series computers. It has a dual-density 800/1600 cpi



or tri-density 800/1600 at 75 ips, and 6250 cpi at 45 ips. According to the vendor, it requires only one slot in the computer chassis, and is plug-compatible with the HP operating system and DVR23 driver.

The system features transfer rates up to 280Mbps. It has a single-board interface in M/E/F chassis, and can accommodate up to four transports operating at the same speed. The Series Ten costs $17,400 for the dual-density and $20,000 for the tri-density GCR not including cabinet. It can be configured in a standard EIA rack mount or in an optional cabinet. DYLON DATA CORP., San Diego, Calif.

FOR DATA CIRCLE 309 ON READER CARD

PERSONAL COMPUTERS

The OASys 4100S and 4100X personal computers are designed to integrate with NBI's office automation product line. The units can share information, peripherals, and word processing with the vendor's workstations.

The personal computers are targeted for professional managers as well as clerical office workers. The 4100S is available with one or two 5¼-inch floppy disk drives, while the 4100X has one floppy disk drive and 10MB of hard disk storage. Both units will run software developed for the IBM PC and PC XT.

When attached to the vendor's OASys 64 cluster controller, the 4100S and 4100X may share information with other workstations. Both personal computers come with 128KB of memory, amber display color graphics capability, one parallel port, and two serial ports. A color display monitor is available at an additional cost. The detachable keyboard has 10 programmable function keys. Single unit pricing for the 4100S is $3,100 with a single disk drive and $3,650 for dual disk drive. Single unit pricing for the 4100X is $5,700. Quantity discounts are available. NBI, Boulder, Colo.

FOR DATA CIRCLE 310 ON READER CARD

DUAL REMOVABLE WINCHESTER

The DataSafe Dual 8/8R is an ISIS-II-compatible fixed/removable Winchester disk system for Intel Intellec Series II, III, and MDS-800 microprocessor development systems. It is designed for microprocessor project management for Intel Intellec users.

The unit provides a total of 32MB of storage—16 fixed and 16 removable—using two fixed and two removable 5¼-inch disks each with 8MB capacity. According to the vendor, complex projects using advanced 16-bit processors demand more speed and storage, faster backup, and easier file sharing, and this product addresses these problems.

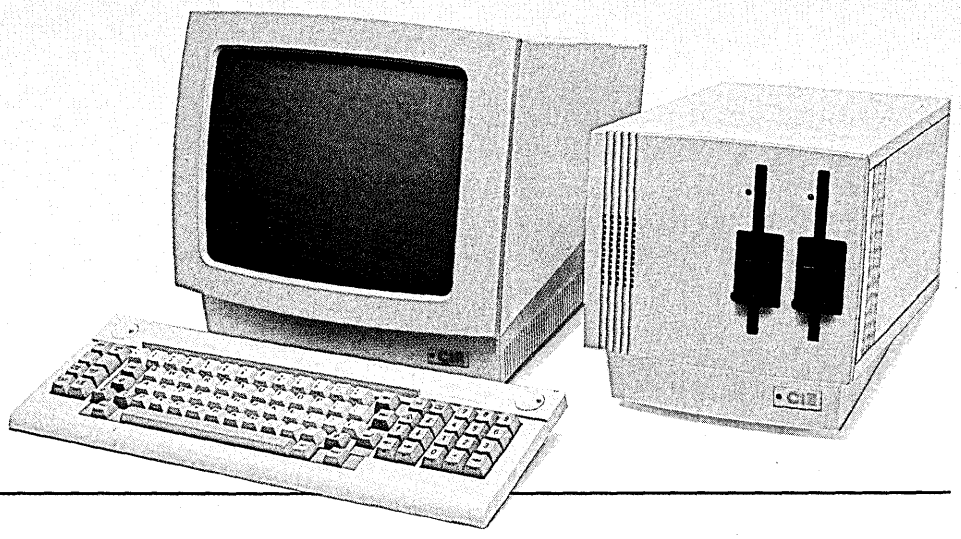
Each Winchester cartridge contains 41,580 disk blocks. It takes only 90 seconds to back up or copy an entire 8MB cartridge using the special track-to-track copy programs, COPYRL and COPYLR.

Compatible with the ISIS-II operating system, the unit has 166,320 blocks. Eight directories are available on-line, a maximum of four at a time. Directories are accessed as F0, F1, F2, and F3. Data transfer rate is 625KBps with an average seek time of 40 msec. Upon power failure, energy stored in the rotating spindle is used to generate power for the emergency head retract.

The unit fits on top of the Intellec Series II and III systems to save bench space. The DataSafe Dual 8/8R costs $12,000. A print-spooling option sells for $1,250. A lower cost unit with half the storage and one removable cartridge drive costs $9,000. WINCHESTER SYSTEMS INC., Woburn, Mass.

FOR DATA CIRCLE 311 ON READER CARD

—Robert J. Crutchfield



CAN YOU FIND THE SEVEN IBMs IN THIS PICTURE?

We'll tell you where to look. Inside the CIE-7800 and CIE-7850.

The 7800 terminal is plug compatible with the IBM 3178 and all five models of the 3278 series. That accounts for six IBMs.

Now, when you add in the CIE-7850, you also get 100% IBM PC compatibility. That makes seven.

Even more remarkable, the CIE-7800 costs less than any single one of those IBM terminals.

It's more compact, too. Over 40% smaller. But the screen is larger. By 36%.

The monitor tilts and weighs less than 20 pounds. Move it where you need it.

The detached keyboard has an 87-key IBM compatible layout. It can be user configured into any of 22 different U.S. and international keyboards.

The CIE-7800 is also available with concurrent alternate personalities that include DEC VT100,® IBM 3275/3276-2 (bisynch single station) and HP 2622, while still retaining IBM 3178/3278 compatibility.

And with the CIE-7850 plugged into the coax-A line, you have access to both online mainframe processing power and local IBM PC intelligence.

To learn more (and there are more advantages we haven't even touched on), just write or call our Distributed Systems Division Sales Representative: Alternate Channel Marketing, Inc., Suite 540, 3857 Birch Street, Newport Beach, CA 92660. Call toll-free 1-800-854-5959. In California, call 1-800-432-3687.

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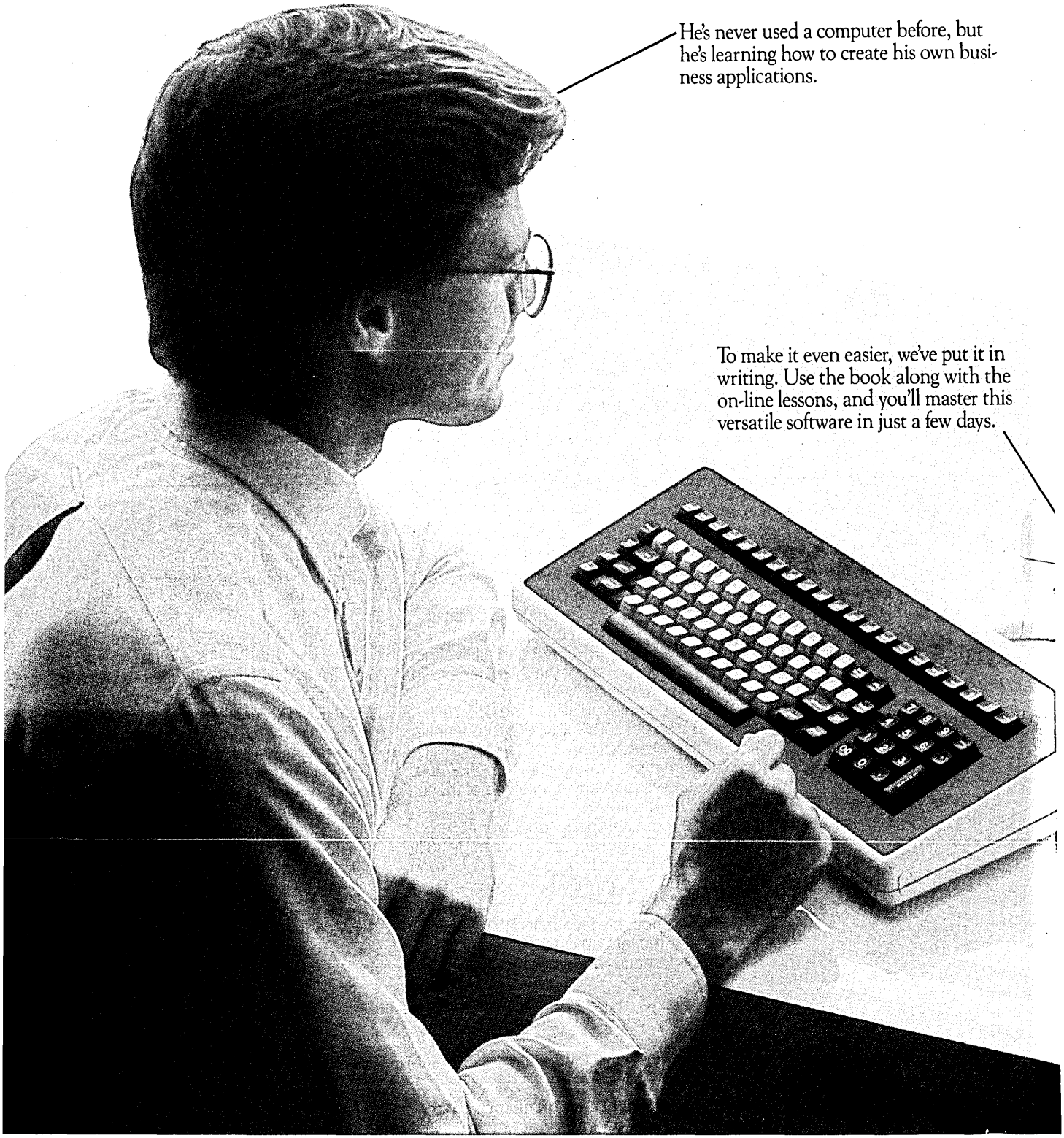
CIRCLE 102 ON READER CARD

If you think big computers are hard to use, this will teach you a lesson.

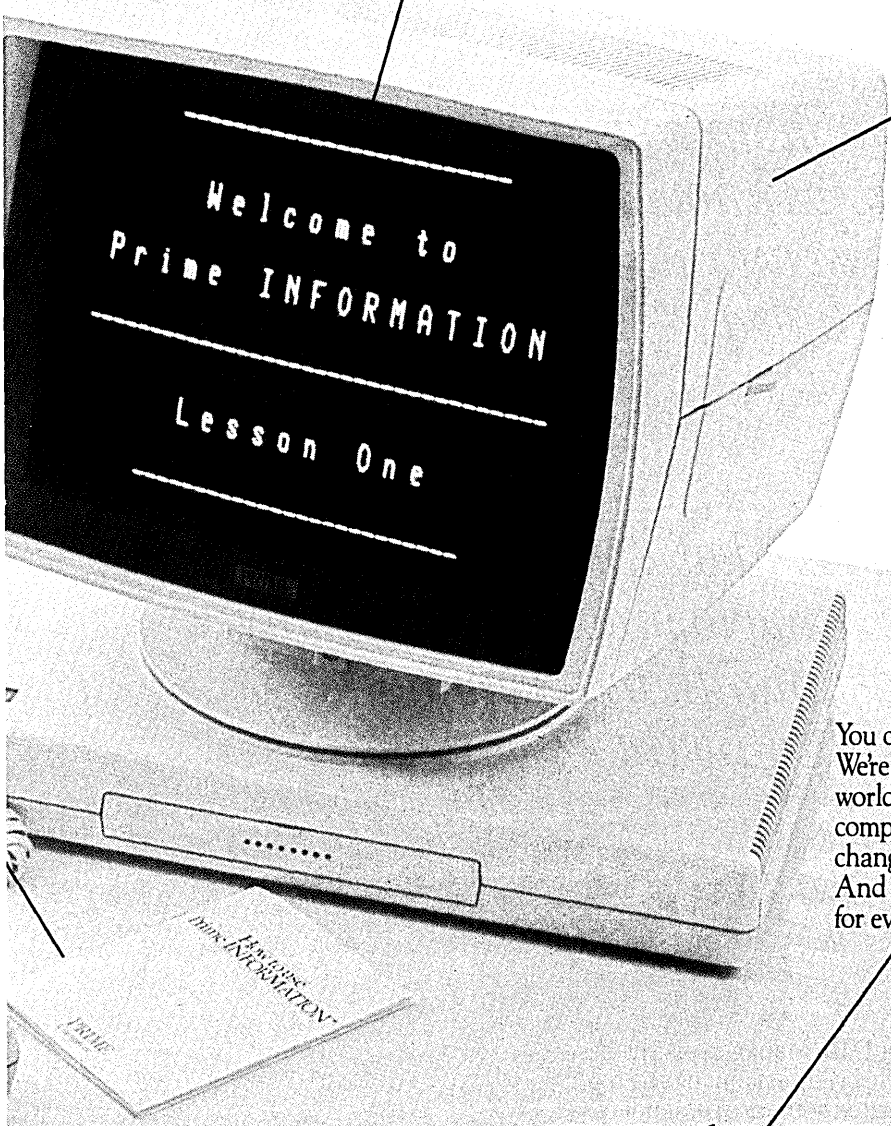


He's never used a computer before, but he's learning how to create his own business applications.

To make it even easier, we've put it in writing. Use the book along with the on-line lessons, and you'll master this versatile software in just a few days.

Prime INFORMATION™ software is self-teaching. Anyone can use it. For reviewing budgets. Checking sales results. Handling expense reports. Tracking inventory. It's a complete data management system.

It looks like a personal computer, but it's really connected to a powerful Prime® computer. So everyone can share Prime INFORMATION whenever they need to. Yet everyone can work on different jobs at the same time.



You can do more with a Prime system. We're a Fortune 500 company with worldwide support. With a family of computers so compatible, you can interchange hardware and software at will. And with over 1,000 software solutions for every imaginable need.

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We're versatile, so you can do more.

CIRCLE 103 ON READER CARD

Smart Software is smartest choice.

"Lotus' Symphony was the hands-down loser and little known Innovative's Smart Software the surprise winner in an integrated software face-off that also included Ashton-Tate's new Framework package."

InfoWorld

"ComputerLand of Arizona's major corporate accounts came to preview Symphony and Framework last month but went home talking about Smart Software."

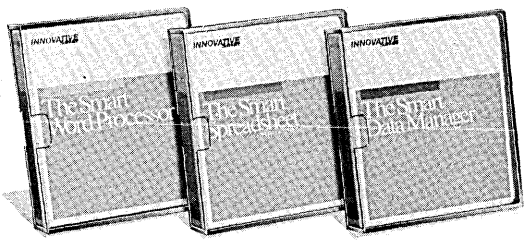
PC Week

In an integrated software showdown, Smart Software was the overwhelming victor according to the 35 corporate decision makers who participated in this thorough capabilities evaluation.

The final concensus: At this point, Symphony™ deserves no encore and Framework™ was not in the picture. But clearly, Smart Software—featuring The Smart Spreadsheet with Graphics, The Smart Word Processor, and The Smart Data Manager—is the best and the brightest among the top integrated software contenders.

Find out why smart people are praising Smart Software. Ask your dealer for an enlightening demonstration, or call 800-GET-SMART for information on our Smart demonstration disk.

Smart Software, available for the IBM PC/XT and compatibles, is the smartest software choice you can make.



Smart Software

from Innovative Software, Inc.

CIRCLE 104 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

Big Brother, or Uncle Sam at any rate, should be watching you when you're near a computer. At least that's the message from the American Bar Association's task force on computer crime, which recently released a report demanding a comprehensive set of federal laws on the subject. The report included the results of a survey performed by the group of computer system managers of 283 private firms and government agencies. The survey found that nearly half of the respondents had suffered verifiable incidents of computer crime during the previous year, and that annual losses for each company ranged from $2 million to $10 million. Almost 70% said that none or only some of the incidents were reported to the police, largely because the firms feared shareholder suits. Although they believed 75% of the incidents were inside jobs, only 60% of the culprits were caught. The dp managers saw computer crimes as more important than white collar crimes like securities, consumer, and tax frauds.

The bar association's demands have met with some success. Seven computer crime bills have been introduced in Congress, but none has passed yet. Twenty states have such laws on the books, and New York State recently passed a bill that would make breaking into a computer or tampering with a computer's data a felony. The New York law is particularly important because so much of the nation's banking, finance, insurance, communications, and other data-intensive businesses are based in the state. While the law was proposed in response to a bunch of high school students who broke into a hospital's computer, its implications are far more important for the huge service companies whose skyscraper headquarters line New York City's streets.

The laws are certainly in tune with the lawyers' and dp managers' concerns, but there are still the problems of detection and enforcement. While other kinds of frauds can often be discovered quickly, fraud by computer is as close as we have come to the "perfect" crime: in many cases, a white collar criminal with enough savvy to crack a computer system will also be able to cover his tracks well. Even nonerasable media like optical disk drives do not, by themselves, protect against tampering. The drives simply and transparently ignore data that in magnetic drives would be erased, and read only the replacement data. Moreover, as the bar association's survey shows, firms that have discovered computer crimes often are not willing to prosecute the offender. Yet these companies need to buck up to possible embarrassment or suits and pursue computer criminals relentlessly; otherwise, there is too little to deter potential criminals, who may see no more wrong in stealing vast sums of money from an employer by computer than they do in pilfering paper clips or pens.

Companies worry about more than money, of course, and computer crime also includes items like modifications to employee records. In areas like electronic publishing, computer crime can even include sabotaging a product. Laurance Urdang Inc. of Essex, Conn., for example, is one of several firms working to computerize all 60 million words and 2 million quotations of the Oxford English Dictionary. Imagine what would happen if someone entered that project's database and started tinkering with spellings or definitions. The results might not be ruinous (some might even be humorous, depending on the culprit's wit), but they could be humiliating and costly to fix.

VM ACCOUNTING

JARS VM is a virtual machine accounting and chargeback system. It is designed to report on VM machine and CMSBATCH usage. It also tracks project accounting, financial chargeback, and VM system management.

It features CMS machine utilization reporting so users can report on the various resources used by the virtual machines. Project accounting allows users to assign activity and responsibility codes without ending a VM session. Each CMSBATCH execution can be assigned to a user machine project and can be identified by the execution task (job name).

The system also provides the capability to track usage of software products. Exception reporting lets users select or reject records based on specified selection criteria. An historical database can define multiple history files at the desired detail level. Options include a chargeback capability that allows multiple billing algorithms as defined by users and a monitor data support option that lets the system accept and reformat monitor data, providing to the user a detailed tool to pinpoint and manage VM bottlenecks. JARS VM supports IBM or compatible mainframes operating under the VM environment. Report execution can be under DOS/VSE, OS, or CMSBATCH. The software costs $7,000. JOHNSON SYSTEMS INC., McLean, Va.

FOR DATA CIRCLE 326 ON READER CARD

ACCOUNTING SOFTWARE

PHD is a relational database system that integrates with the vendor's MBA accounting software products. The package offers custom reporting and data access capabilities using data from multiple file views without having to set up a separate file for data. It can also function as a standalone.

The product is shipped with predefined views of the major MBA accounting files. Users can also describe views of the files' information by drawing forms on the screen and relating separate files

on the screen and relating separate files by name. According to the vendor, a major advantage of this product is that it allows users to create unique, nonstandard relations between individual accounting data files on screen.

The product's capabilities include calculating totals, subtotals, and averages from information files. It allows management to view and report all information in the integrated system in any manner, not just in standard, predefined accounting formats. The software also allows users to create files that are external to the MBA accounting data and relate those files to the accounting.

The package can be integrated with other microcomputer productivity tools such as Framework and Symphony. Multiple views may be defined for all data, and 160-column reports can be created through the software's windowing mechanism. Views are set up by using its view mode editor. Editing and data entry are performed by using standard word processor function keys. It operates under CP/M, CP/M-86, MP/M-II, Concurrent PC/DOS, MS/DOS, and Turbo/DOS. The software requires 64KB of RAM and dual floppy disk drives. PHD costs $500. MICRO BUSINESS APPLICATIONS INC., Atlanta.

FOR DATA CIRCLE 327 ON READER CARD

MVS MONITORING SYSTEM

Deltamon/MVS provides users with the ability to monitor and detect any dataset change, including attributes, contents, and residence. It will continuously monitor MVS system data, such as system program libraries, MVS procedure libraries, hardware configuration, and MVS operational status.

The product will furnish change verification through change monitoring, improved configuration visibility by displaying historical hardware configuration data, and means for an installation to detect changes that bypass normal change control procedures. It also has the ability to rebuild certain MVS paramaters by means of historically collected data.

This software can answer questions pertaining to what changes have occurred in the application production library or what hardware was added or removed. It also tracks SRM tuning changes and changes in the paging configuration. Operating environment requirements include MVS/SP1.3 and later systems. Deltamon/MVS costs $14,500. CANDLE CORP., Los Angeles.

FOR DATA CIRCLE 330 ON READER CARD

PROGRAMMING LANGUAGES UNDER MS/DOS

This vendor has released new versions of Microsoft Pascal, FORTRAN, and C compiler for its MS/DOS operating systems. The vendor has added two new math libraries to Pascal, supplementing the existing 8087 coprocessor and the 8087 emulation support. The first math package offers high-speed performance without an 8087 chip. With support for both single-precision and double-precision numbers, it is faster than the emulation software with only slightly less accuracy, the vendor says.

A second optional math package offers programmers of business applications more accurate dollars and cents calculations with the use of BCD floating point arithmetic. The 14-digit decimal format eliminates many of the rounding problems of binaiy math. Pascal 3.2 also includes MS/DOS 2.0 run-time support.

This release of FORTRAN includes all the new floating point math and MS/DOS 2.0 file and overlay linking options, as well as support for large arrays of complete numbers. This version of FORTRAN can handle almost unlimited data arrays. The language enhancements have overcome the 6uKB segment restrictions for arrays and common blocks, allowing manipulation of extremely large matrices. When used in conjunction with module linking, a single program can now exploit the entire 8086 memory up to 1MB. It also supports complex number calculations in addition to specific and generic conversion intrinsics conforming to the ANSI 77 standard.

This version of C supports use of path names to take advantage of the DOS directory structure as well as I/O redirection. With expanded addressing capabilities, programs compiled in this vendor's C can now make use of the full memory of the system. A programmer may choose the small, medium, compact, or large memory model, based on the needs of a particular application.

All versions include MS/DOS 2.0. Pascal 3.2 costs $300, FORTRAN 3.2 lists for $350, and C 2.0 sells for $500. MICROSOFT CORP., Bellevue, Wash.

FOR DATA CIRCLE 328 ON READER CARD

S/38 TELEX CONNECTION

The CMTLX/38 is a telex communication module that allows System/38 users to create, transmit, receive, file, redistribute, and manage telex messages. The software also provides users with an internal electronic mail facility as well as a connection to the telex network provided by ITT.

Messages can be entered into a screen, picked up from the spool file, or retrieved from an archive or standard text file for addressing to a telex number. Frequently used telex addresses can be stored and retrieved automatically by reference to a user-defined address. Messages can be transmitted to individual addresses or to distribution lists containing both telex and non-telex locations. Users can archive messages created and received for future referencing or further transmission. In addition, messages and reports

SOFTWARE SPOTLIGHT

DECISION-SUPPORT SERVICE

MARKSMAN is a computer-based service that organizes and formats data on prices, products, distribution, and promotion to help managers make marketing decisions. The service combines hardware for information gathering, software systems that tailor reporting and formatting preferences, professional counseling on information needs, and long-term customer training.

According to the vendor, the service is aimed at middle to high-level marketing managers and their analysts in Fortune 1,000 codpanies. It helps marketing professionals address steps in the decision-making process like analysis, planning, implementation, and control. The system also provides basic analytical tools and data management capabilities for marketing decisions. Also, the product is transparent to users, and information can be downloaded from a mainframe to a micro, where the data can also be incorporated into a spreadsheet.

MARKSMAN unites the various elements of the marketing function through individual and shared-access information. It can work with internal systems and also allow users to compare and contrast the company's information with outside data. It can separate departments, divisions, subsidiaries—in the U.S. and abroad—to be part of an integrated system.

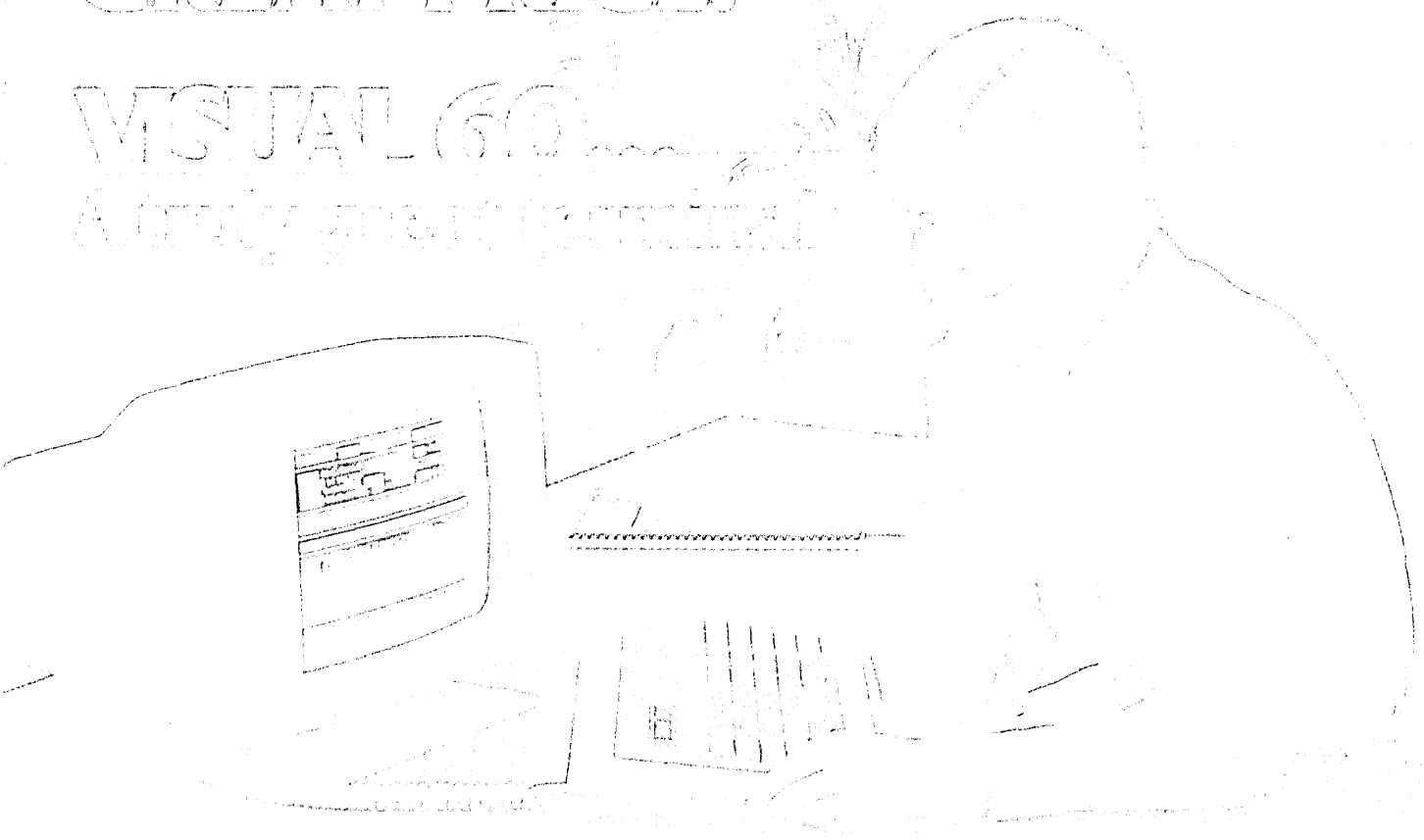
The service contains a number of application components devoted to such areas as management of the annual plan and promotion tracking. It is designed to address 80% to 90% of the various classes and levels of information; the remaining 10% to 20% can be tailored to meet the user's special needs. Users establish rules to determine the level of security and access. Data used or created from one component can be used in all MARKSMAN components, and access to all the vendor's marketing and financial databases is included.

According to the vendor, initial files can be built either from the user's computer tapes or terminal entry, or computer-to-computer. Prices vary; typical Fortune 1,000 users will be charged approximately $60,000. CONTROL DATA CORPORATION, Business Information Services, Greenwich, Conn.

FOR DATA CIRCLE 325 ON READER CARD

GREAT DISPLAY.
GREAT KEYBOARD.
GREAT AESTHETICS.
GREAT EMULATIONS.
GREAT PRICE.

VISUAL 60



can be automatically generated by the user-data processing program for transmission to the telex network.

The system transmits into the telex network through ITT's Databridge facility, which accepts high-speed transmission at 2,400 or 4,800bps. This facility means that bisynchronous communications can be established between the S/38 and the telex network without the need for a protocol converter, according to the vendor. Users still have full telex network services of answer-back notification and confirmation of delivery to the destination telex machine, regardless of its location. The CMTLX/38 module as a standalone messaging facility is licensed for $3,600 or $4,200 depending on the user requirement. ORION SOFTWARE INC., Cambridge, Mass.

FOR DATA CIRCLE 335 ON READER CARD

INTEGRATED SOFTWARE

Goldengate is an integrated set of information management and decision-support tools including an electronic spreadsheet, a full-function document processor, a local relational database management system, color business graphics, a file manager, and mainframe communications capabilities.

According to the vendor, this product allows personal computer users to manage mainframe information and initiate mainframe processing to populate Goldengate with information extracted from the corporate database. Users then perform computations and broadcast the results via the electronic mail capability.

Each of its tools utilizes a common screen format and consistent set of commands and is able to share data with other tools. Help and tutorial capabilities have been incorporated into the system. The product employs the concept of separating data from the models that process that data. The model, or worksheet, stores the procedure, or definition, for accessing the data. Each time the model is used, fresh data can be extracted for the corporate database to populate the model.

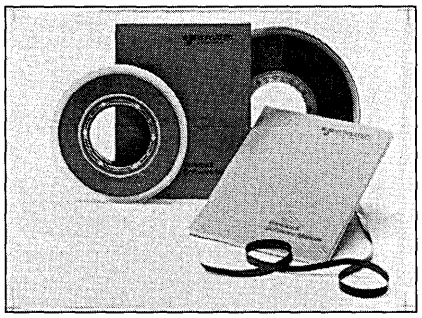
The software runs on the IBM Personal Computer or PC compatibles with a minimum of 5MB hard disk and 256KB of RAM. An IBM color graphics card and PC/DOS 2.0 are required. The 3270 communications are implemented through the IRMA card. Goldengate costs $800. CULLINET SOFTWARE, Westwood, Mass.

FOR DATA CIRCLE 331 ON READER CARD

OFFLOADS HOST

Fastplot is a utility for SCICARDS and SCHEMACTIVE software. It enables use of Versatec random element processor hardware to offload sorting and rasterization required for fast, electrostatic plotting.

According to the vendor, this reduces host overhead, shortens processing time, and provides consistent data input to plotter for better quality. The product supports color and monochrome plotting. It requires Versaplot random or color random plotting software on a Digital Equipment VAX system. The utility is written in FORTRAN 77 and is available on magnetic tape in 800 or 1,600bpi. Fastplot costs $2,000. VERSATEC, Santa Clara, Calif.



FOR DATA CIRCLE 337 ON READER CARD

COBOL DEBUGGER

The Interactive COBOL Debugger (ICD) is for use with COBOL68 and COBOL74 on Burroughs' large systems.

It is an on-line, interactive facility that allows the COBOL programmer to monitor and control program execution from a terminal. Functions include dynamic setting of breakpoints, the ability to display and change program variables, on-line help, query about declared program variables, the ability to execute programs a statement at a time, and source-file display.

The debugger is activated by one statement at compile time. In all other respects, the compiler is identical to the standard Burroughs compiler. ICD costs $7,500. A demo tape is available for $100. UNIVERSITY COMPUTING SERVICES CORP., McLean, Va.

FOR DATA CIRCLE 329 ON READER CARD

C PROGRAMMING TOOLS FOR VAX

The REX C-86 is an integrated C language microprocessor development tool that converts any VAX host computer under VMS or Unix operating systems into a multi-user engineering system for developing, testing, and debugging microprocessor-based products in the 8086/80186 line.

The package provides a modular C language development environment that integrates the compiler, code generator, linker, and symbolic debugger, plus full test program simulation of I/O and event interrupts. According to the vendor, its modular structure supports division of a software development project among a number of specialists.

The system has a two-pass C cross compiler that generates ROMable reentrant object code aimed at real-time embedded system applications like automation devices, robotics equipment, and real-time controllers. It also includes a structured 8086/8087/80186 macro assembler, object code locator, object code linker, and object code librarian. High-level debugging is expedited by a listing file containing global system symbol maps and assembly language mnemonics interleaved with original C source statements as well as an optional symbolic software simulator.

Besides the object librarian, the development tool provides a portable C run-time library with a full set of Unix-compatible I/O routines, code conversion and string manipulation routines, and a math library that supports the 8087 numeric data processor. The basic price of REX-C86 C programming environment software is $13,000. SYSTEMS AND SOFTWARE INC., Costa Mesa, Calif.

FOR DATA CIRCLE 334 ON READER CARD

HOSPITAL SOFTWARE

The HP 79001CS is a hospital financial management software application that helps provide hospital management with financial control in the rapidly changing prospective-payment environment. This package is an integral part of the vendor's health care information system.

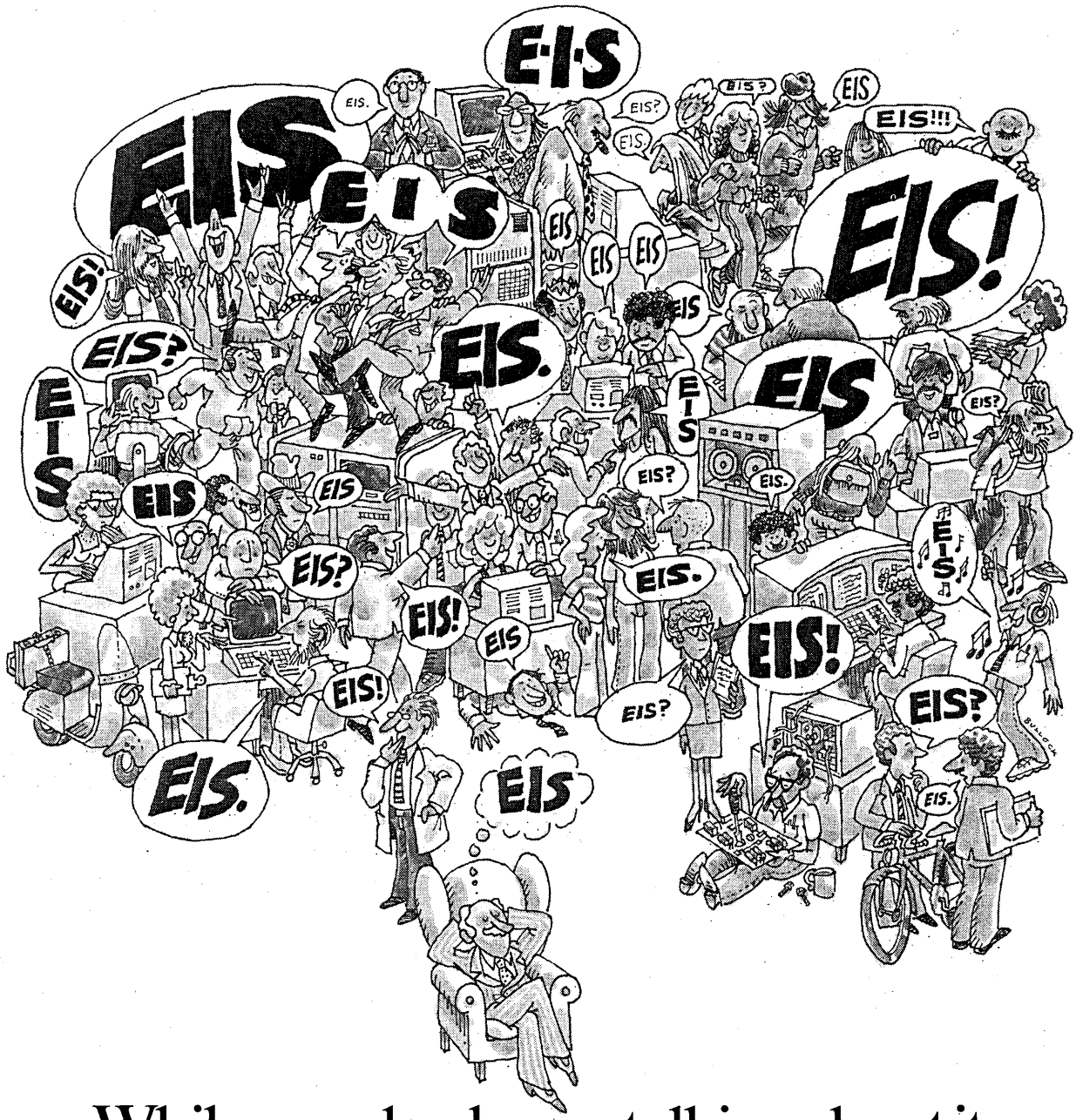
This application offers hospitals complete access to financial information on-line in any report format desired. The software creates a data dictionary that allows users to extract information in the exact format desired. In addition, real-time processing of the data provides hospitals with up-to-the-minute information.

According to the vendor, large manuals and multilevel help screens have been eliminated. By pressing the question mark key, the system will provide users with detailed information on how to use the desired application.

Designed to run on the HP 3000 business computers, this software includes comprehensive case-mix management, medical records applications, and management reporting. Its multi-entity capability provides organizational flexibility across major applications. A credit/collection module and on-line demand billing help the hospital improve its revenue collection. The vendor has also augmented this system with a patient care management application that provides the framework for hospital order entry and interdepartmental communications. The HP 79001CS hospital financial management application and hardware have a base price of $600,000. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 333 ON READER CARD

—Robert J. Crutchfield



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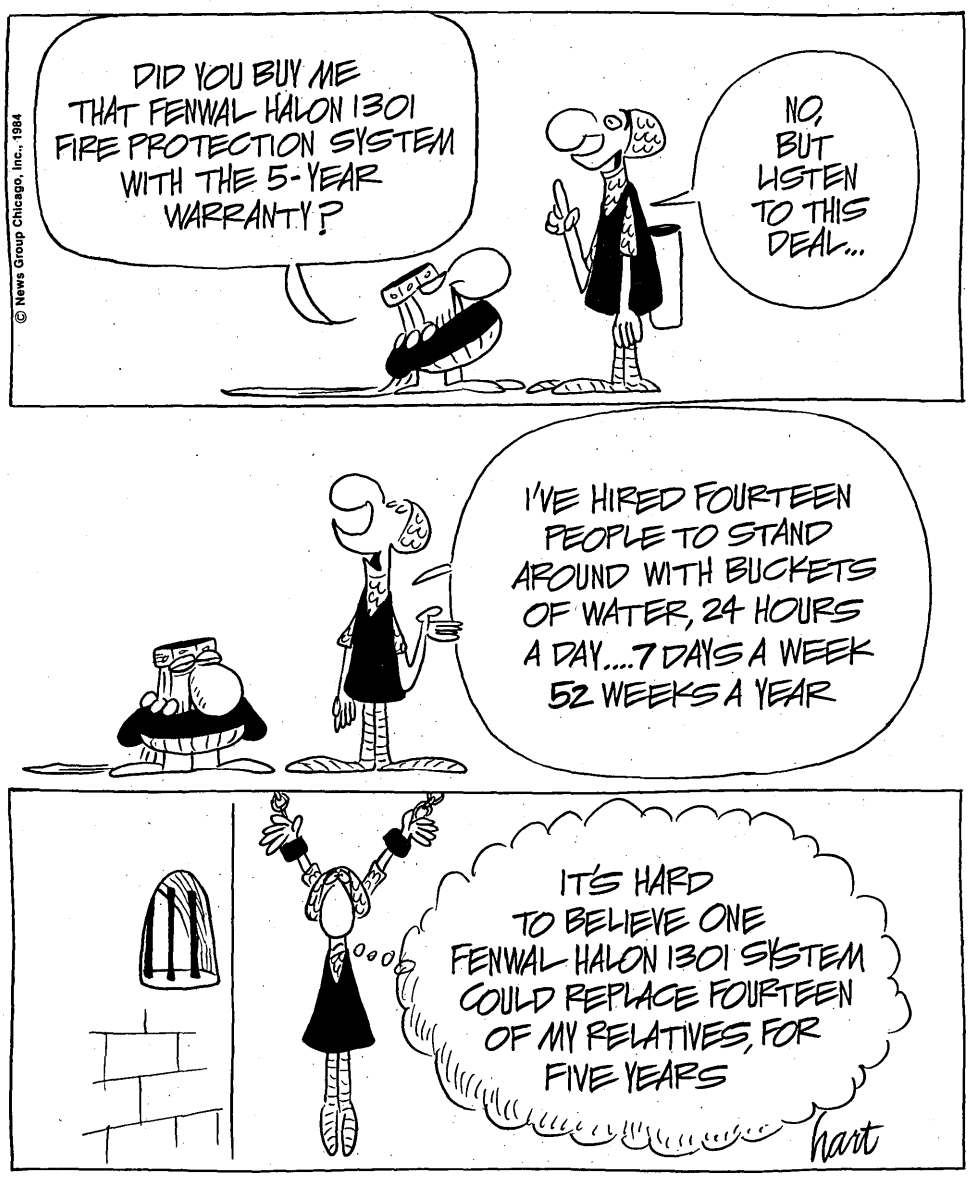

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SOURCE DATA

BOOKS

TECHNICAL MANAGER'S SURVIVAL BOOK
by Melvin Silverman
STRATEGIC DATA PROCESSING
by James W. Cortada

It seems that even in this age of consumerism and "truth in advertising" you still can't judge a book by its cover. When confronted with the choice of which of these two books to read first, I chose the *Technical Manager's Survival Book* because it seemed that it would be the better and more readable of the two.

This book appeared to be one of those very popular management theory books, with its snappily designed jacket proclaiming the book would "show you, as a leader-manager, how to improve your decision-making abilities through a personal management system that will work for you not just in your present position but in all the higher positions it can lead to." A bit wordy, but it sounded great. The jacket shamelessly exhibited the author's remarkable collection of credentials including a BSME, an SME, an MSIE, an MBA, an MA in clinical psychology, a PhD in industrial-social psychology, and, as if that weren't enough, he's also a registered professional engineer. But even these formidable credentials were tempered by "over 20 years of direct technical experience."

The other choice, *Strategic Data Processing,* seemed to be just some slightly skimpy textbook from the Prentice-Hall Series in Data Processing Management. It had no jacket at all, no promotional messages, and lacked any information about the author other than a mention that he worked for IBM. I made a call to the publisher and was told that it was indeed a textbook and wasn't supposed to have a jacket, but they would send me a press release about the author.

The choice was clear; with all those varied credentials, the first author must be a real generalist, able to bring together and explain all the confusing trends and events of our age. The technical manager is clearly among those most affected by these happenings, so this book must be just what the PhD ordered. I was disappointed. The author of the more impressive-looking book seems to have become, as a result of all his credentials, not a generalist but an ultraspecialist. The ultraspecialty seemed to be the application of advanced psychological jargon to technical management issues. While appearing on the outside to be a pop management book, it is actually a dreary academic-style textbook, each chapter complete with fictionalized case studies, questions, answers to case questions, references, and further readings.

These are, of course, matters of style, and style is only the setting for the substance of a book. So I trudged on, hoping to find the perspective implicitly promised by the author's credentials. Either it wasn't there, or you had to have as many degrees as the author to find it. I dug through layer upon layer of jargon, charts with circles and arrows, and prodigious citations of pronouncements by every psychology and management theorist. I should have been tipped off right in the introduction when the author assured me that "there will be no references to the company, the group, or the worker unless that reference centers on benefits to you." This does not sound like a presentation of the overall picture, which is so badly needed.

There was, however, one saving grace. Reading this book could easily teach you enough impressive jargon to snow your boss. This could certainly aid in your survival as a technical manager. McGraw-Hill, New York (1984, 368 pp., $29.95).

The deceivingly unimpressive second book, *Strategic Data Processing,* turned out to be a clear, readable, and most of all, useful overview of data processing in the business world. No dp terms are used that the average non-dp manager would have much trouble with, but a glossary is thoughtfully provided anyway. Past, present, and possible near-term future trends are explored, as are the resulting effects on dp and its host organization. The author seems to have enough real-world insight to understand that dp managers are often interrupted and may have little time available for reading books like his. He mercifully makes it easy for the chronically harried to follow his text by adhering to the venerable principle of first telling us what he's going to tell us, telling us, and then telling us what he told us; each chapter begins with a brief italicized paragraph describing what the chapter is about, and ends with a summary, usually labeled as such. References, charts, and citations are kept within reasonable limits.

The author uses Richard L. Nolan's classic article, "Managing the Crises in Data Processing" *(Harvard Business Review,* March/April 1979) as a primary building block to describe the evolution of dp within organizations.

The stages postulated in this article are conceptually useful divisions in the long transition from the early days of computing to what is possible, but not usually practiced now. The early days began with a single fantastically expensive central computer serving an entire multimillion dollar corporation. This computer usually had less power than a typical 1984 executive toy. Administration of this now-laughable ratio of computing power to number of users required a bureaucratic, industrial-age organization style. The glass-enclosed colossus had to be fed the numbers for crunching 24 hours a day by a team of highly paid priestlike specialists. All proceeded in orderly, uniform, assembly-line fashion so that not a single expensive machine cycle was wasted.

Today, when the astoundingly low cost of computing makes it "cheaper to buy more of it than to restrict its use," we find virtually all companies experiencing severe growing pains. The transition has been difficult simply because things were so different at the beginning. The stages described are helpful guideposts along this continuum. The book traces the typical historical evolution of dp departments as costs are lowered, computing power becomes dispersed, and users become

more directly involved. We are given proper cautions that the model is only typical and that different parts of a single dp department or company may be at different stages. Nonetheless, the stages serve as a useful means to assess just where any particular operation is in this evolution. This is no mere post-hoc exercise because most companies are not even near the "maturity" stage at present.

The author holds throughout to his message that "information is a corporate asset to be treated much like money, people, or buildings." This observation is quite accurate and must be heeded to properly manage any operation, not just dp. Indeed, Pamela McCorduck, coauthor of the acclaimed *Fifth Generation*, goes so far as to maintain that information is the "new wealth of nations." No book claiming to deal with strategic data processing can avoid this as a major focus and still be relevant.

Much of the book is devoted to general business topics. An overview of what kinds of hardware and software tools are now available is presented. We find discussions of application acquisition and justification dealing with such current issues as write-your-own vs. purchased software, database systems, and long-term applications planning.

The author also covers how the organization of dp has changed and will continue to change under the pressure of rapidly evolving technologies. The currently crucial issue of centralization vs. decentralization is illuminated. Users' rising demand for the immediate and local computing, which they can now for the first time afford, clashes both with the clear needs for centralized databanks and with the still prevalent traditional centralized dp organization.

Later on, three chapters are devoted to currently burgeoning, new dp application areas. Office systems are covered first, starting with one of those revelations-that-we-knew-all-the-time. Office activity, organization, and tools changed little in the past 50 years, until the now just-penetrating wave of office automation. This is remarkable considering how much time so many of us spend in offices.

Computer assisted design, computer assisted manufacturing, and robotics are similarly penetrating the production plant environment. We are provided with a nontechnical discussion of their effects on the manufacturing branch of the business world. I mention business again because the author never wavers in his insistence that all this technology, no matter how fascinating, must still be reconciled with the bottom line. Happily, he can see far enough past the next two quarters to consider the long-range benefits to be reaped by investing thought, and then money and effort, right now. The human factors of fear and resistance to change are discussed, both on the individual and institutional levels, in the form of problems from unions and entrenched corporate bureaucracies.

Strategic Data Processing closes by astutely calling our attention to the "silent revolution" in the way people are being trained. Computers are increasingly used to make training more productive and cost-effective. The message here is that this is a legitimate concern for dp. Even though we usually find dp looking at corporate training departments only as users, they should pool their respective talents to further their company's mission. Prentice-Hall Series in Data Processing Management, Englewood Cliffs, N.J. (1984, 199 pp., $24.95).

—Robert Jules Siegel

REPORTS & REFERENCES

AI UPDATE

DM Data, specialists in interpreting and transferring high-tech trends information to management, has published its annual report on "The Emerging Artificial Intelligence Industry." This year's report, "AI Trends '84," includes both a description of the technologies used and profiles of 50 of the key companies and their products. DM Data says the industry is expected to create a $3 billion market by 1990, and is growing at a rate of 70% to 100% a year. Market areas of expert systems, natural language software, computer aided instruction, visual recognition, voice recognition, and AI computers are covered in the report as well as reviews of government activities, AI languages, fifth generation computers, Japan Inc., and future trends. The 134-page report costs $195. For more information, contact DM Data Inc., 6900 E. Camelback Rd., Suite 700, Scottsdale, AZ 85251, (602) 945-9620.

OPTICAL GUIDE

A new Fiber Optics Technical Directory is available from Technical Data Publishing Corp. (no relation to Technical Publishing Co., publisher of DATAMATION) for $50 in the U.S. and $65 elsewhere. Contained in the guide are chapters on consultants, applications, an introduction to fiber optics, fiber optics, products and services index, distributors and representatives, technical data, technical paper review, glossary, symposia and exhibits, and related books. Each section contains information, photographs, and specifications on a complete system and/or product within that category. Vendors can be contacted by using the product and services index. For more information contact Technical Data Publishing Corp., 53 Lake Shore Dr., Rockaway, NJ 07866.

MANAGING ADMINISTRATIVE SYSTEMS

The International Information Management Congress (IMC) is distributing a new textbook on OA and management called *Administrative Office Management: The Electronic Office.* IMC says the text weaves the latest information on automation technology throughout its discussion of issues from communications to motivation. It provides instruction in designing and managing the automated office, presenting separate chapters on the major automated systems of wp, dp, reprographics, records management, micrographics, and telecommunications. The 772-page book is published by John Wiley & Sons and costs $34 if sent by surface mail, $48 if sent by air. To order the book, refer to publication IMC-145 (prepaid orders only) to IMC, Publications Service, P.O. Box 34404, Bethesda, MD 20817.

SEMINARS

SNA SCOPE

Data-Tech Institute is conducting a three-day workshop on the Systems Network Architecture in various cities throughout the country this fall. The institute says that the course examines SNA through real-world implementations with strong emphasis on capabilities, benefits, and limitations associated with the utilization of SNA-based communications systems. Also emphasized is the way various protocols are used in SNA products to control user-to-user communications. Attendees will learn about linking multiple SNA networks, new document interchange software, major vendor's gateway software, analysis of multiple vendor environments, pcms, transmission and path control, data flow control, as well as alternatives to IBM's SNA. The course costs $725, which includes the seminar, workbook, and all meeting materials. It will be held at the following locations: Garden City, N.Y., Sept. 29-21; St. Louis, Sept. 24-26; Seattle, Oct. 3-5; San Jose, Calif., Oct. 10-12; Houston, Oct. 17-19. For more information contact the Data-Tech Institute, 386 Franklin Ave., P.O. Box 569, Nutley, NJ 07110 or call (201) 661-2300.

VENDOR LITERATURE

IEEE BOOK CATALOG

The 1984 Publications Catalog Update of the Computer Society of the IEEE has been published. The 16-page catalog lists the 80-plus titles available on a wide variety of subjects and applications in computer science and engineering. IEEE Computer Society Press, Silver Spring, Md.

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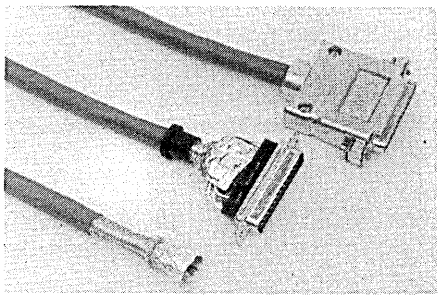

TIME & SERVICES

JOB MARKETPLACE

ON THE JOB

LOSS IN SPACE

Innovation is supposed to make life easier for us. Think of all your kitchen appliances, and how difficult things would be without them. Without a stove, you'd have to build a fire for a hot meal. That would mean chopping wood, stacking it, lighting it, monitoring the fire constantly, putting it out properly, cleaning up the inevitable mess, and making preparations for the next meal. It's a lot simpler with an oven, right? Takes up much less room, and on the whole is a lot neater and safer.

Technology should be doing pretty much the same thing for the modern office. Desks and offices cluttered with paper, typewriters, file cabinets, in boxes, out boxes, and all the other equipment needed to do our jobs, should become less and less cramped as OA refines and simplifies our necessary tools.

That's not always the way it works, however. You've heard the complaints: Dan Sveever in accounting broke his toe tripping over the wires that spill out of his new pc. Everybody's grousing about eyestrain and back problems because your company's word processor is a single-unit model that doesn't allow for vdt or keyboard adjustment. Perhaps *you* can't even find your desk because it's cluttered with printout sheets, floppy disks, and instruction manuals. Even worse, you can't find an empty outlet for your coffee pot. Progress is taking its toll on you.

So what can you do about it? How can we help technology make our lives simpler, safer, and more productive?

Well, there are groups (like NIOSH) studying the problems that may arise from the use of the new office equipment. There are exercises people can do at terminals to relieve tension and cramped muscles. There are terminals where position or screen intensity can be

adjusted for maximum comfort, keyboards that can be moved to relieve cramped fingers, and acoustically designed covers for the noisy printer that's making your secretary homicidal.

With an instinct for territoriality, people resent anything that invades their "space," be it clutter or noise or whatever. Time and care should be taken in the implementation of new office equipment so that employees can adapt to technology in a pleasant, dignified fashion.

One group dedicated to this cause is the Office "Landscape" Users Group (OLUG), established in 1969. OLUG works toward the "practical application of the 'landscape' office planning concept to effect a proper office environment."

Just what exactly is landscape planning? Well, first we must distinguish between the open and closed plans in offices. The open plan eliminates the fixed walls dominated by the closed plan (which is the way most offices are set up).

The historical origin of the open plan is in the early 1960s, when the Quickborner Team (based in Germany) began developing its ideas, and Dr. R. Probst was challenging office tradition in the United States.

The Quickborner team centered its ideas on the basis that offices were characterized by a dualism of interests and requirements: the employees and the organizations in which they worked. The team tried to make the best of this situation by creating an environment that would satisfy and motivate the individual, be economical and functional, and improve group performance as well.

Probst, however, based his ideas on the "human performer," developing a new workstation concept. His "systems furniture" concept typically consisted of interconnecting panels to provide each office worker with a movable, adaptable enclosure. Landscaping is an expansion of the open plan in that it considers all the work patterns, communications, and interaction needs of a particular office, as well as its future growth. Furniture, by the way, is not a primary concern. The process of landscaping first identifies all the functions within an organization and their relationships with each other (in terms of *communication*, not just the official organizational chart). The next step is to design a plan to accommodate all the functions and their interrelationships. Then the plan identifies the equipment people will actually need, in order to develop a set of design requirements in the form of furniture and equipment. The furniture is then selected accordingly.

OLUG is a voluntary group of facilities managers and other professionals dedicated to furthering the office landscape concept. In addition to think tank meetings, OLUG holds biannual symposia to share user experiences, and promote a better planning approach to the design of new buildings, or the rearrangement of or changes to office space "with the objective of giving management a better tool to providing an improved office environment with the ultimate goal of improving the productivity of the office worker."

The 32nd such symposium will be held Nov. 26-29 in Atlanta. At the last meeting attendees discussed remedies for worker discomfort and "cable cramps" often related to the current proliferation of the pc. The group did note, however, that the pc has at least one beneficial side effect: the lowering of ambient office light. Many of today's offices use 70 to 80 footcandles of illumination compared with the 140 to 160 footcandles of brightness of a decade ago.

For more information on OLUG and its upcoming symposia, contact Frank J. Carberry, Managing Director, Box 11182, Philadelphia, PA 19136.

—Lauren D'Attilo

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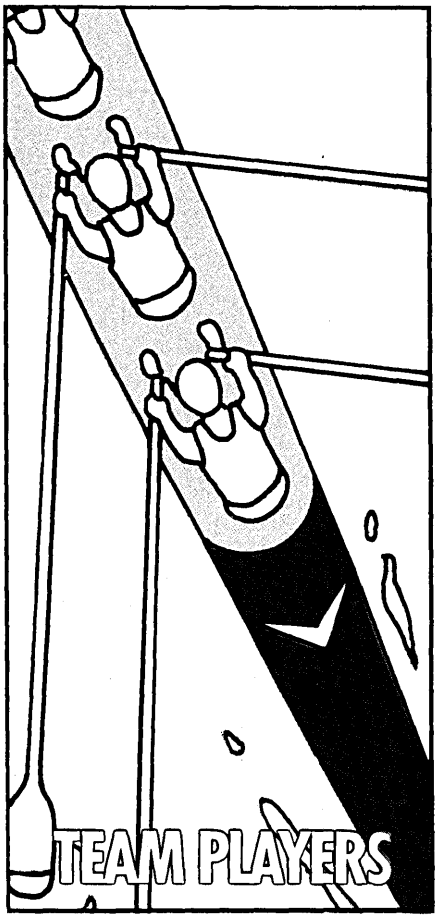

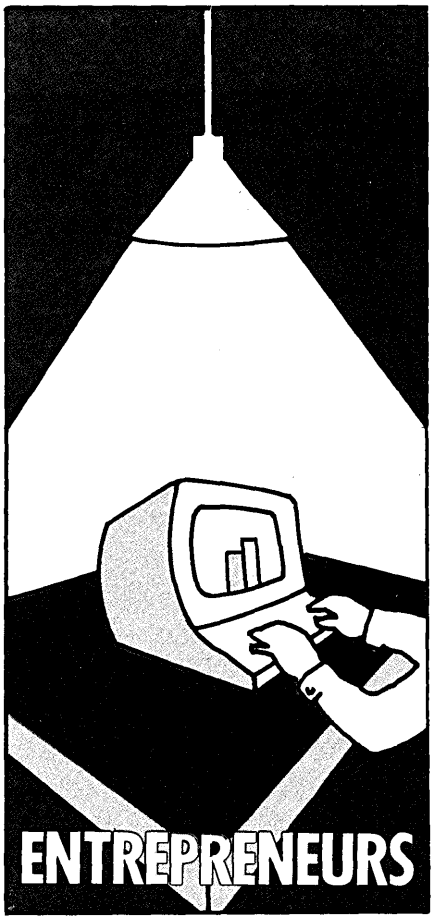

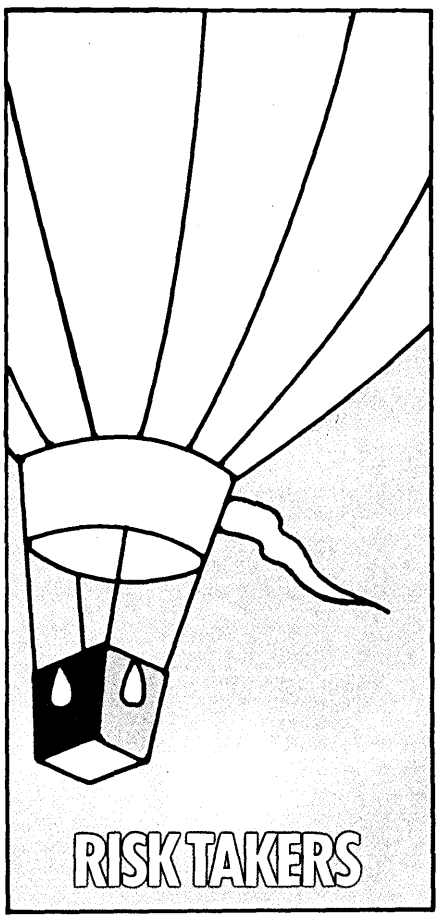

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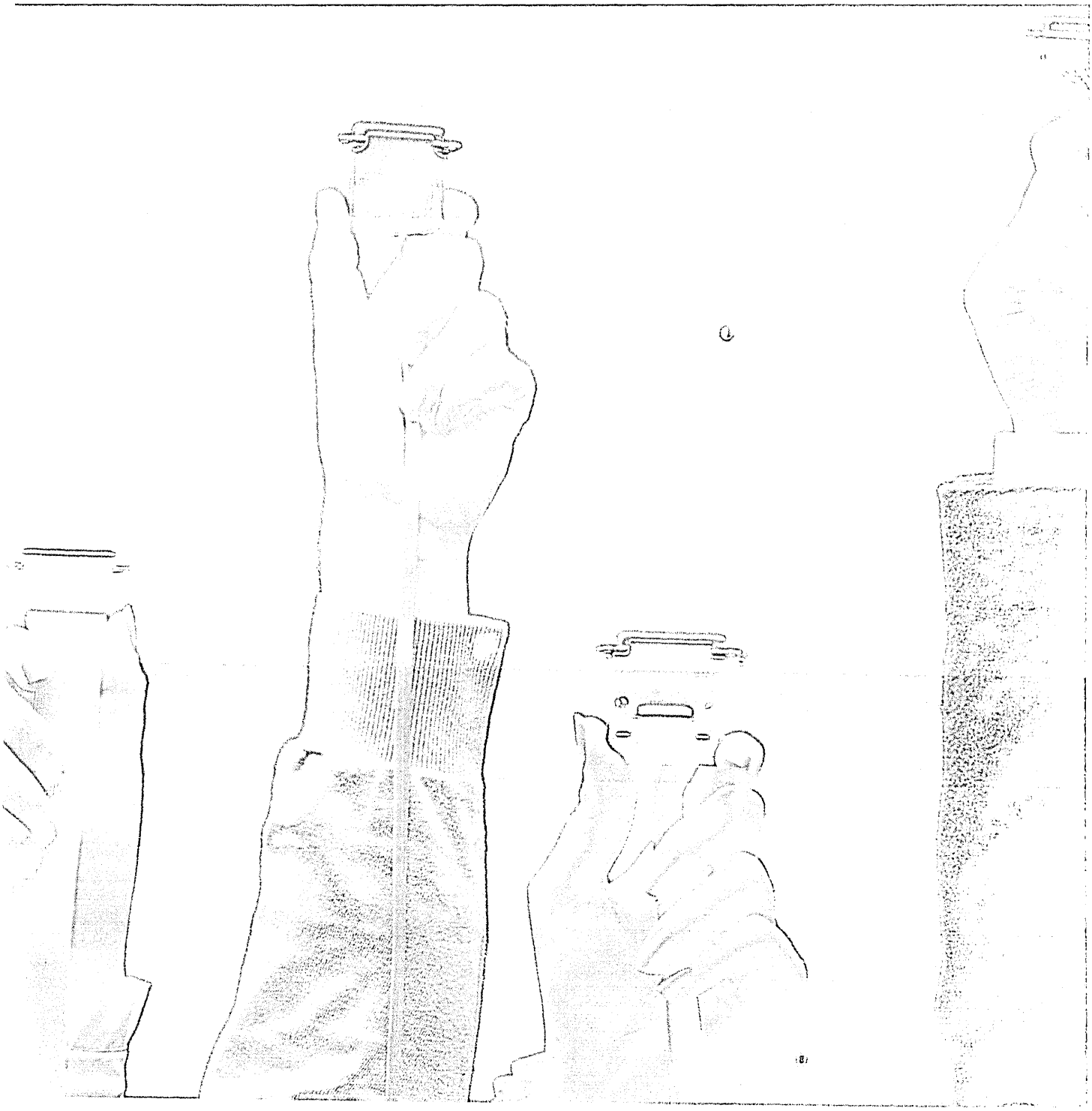

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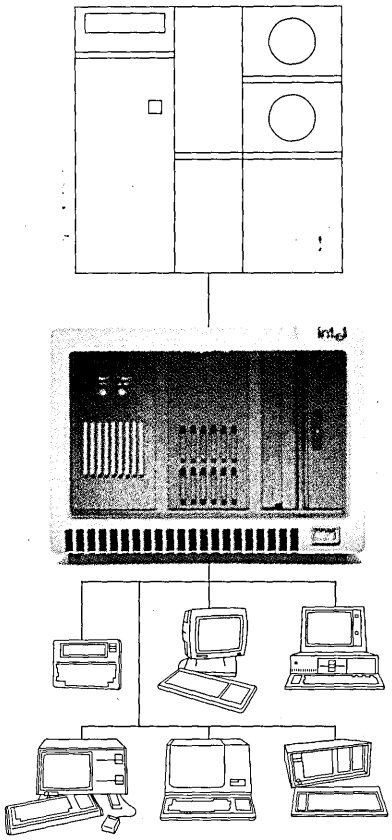

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***According to the Gartner Group, who took the time to figure out all the hidden costs, each direct pc-to-mainframe connection costs approximately $22,000. Each. *Xenix and Multiplan are trademarks of Microsoft Corporation. © 1984 Intel Corporation.*

CIRCLE 110 ON READER CARD

ADVERTISER'S INDEX

An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

GOING IT ALONE

The most recent version of American entrepreneurial spirit burst into the data processing market from the rapidly changing world of technology—the same world that spawned micros, the growth of software companies, and the development of new kinds of service organizations. This entrepreneurialism has helped bring independent consulting into its own.

Independent computer consultants work on contract instead of as full-time salaried employees. They perform the same tasks for a daily rate, or fee for service, rather than for an annual salary combined with standard employee benefits. More and more people are leaving full-time dp employment to become consultants.

Changes in employment statistics can be predicted by analyzing the number of classified help wanted advertisements. For example, a rise in help wanted ads signals the various government agencies that there will be a future decrease in the unemployment rate.

Applying this kind of analysis to dp consulting reveals a sharp increase in the demand for independent consultants. To quantify our assessment that independent consulting is on the rise, we examined the *New York Times* classifieds pages of the last four years. Back in 1981, there were 40% more advertisements for full-time consulting candidates than for independent. In late 1982, this relationship started to change, and in early 1983, the number of ads for independent consulting just about matched those for full-time consultants. Today, the number of advertisements for independents is double that for full-timers.

Another strong indication that the independents have captured a large portion of the consulting industry was reflected in the results of a recent survey conducted by a highly regarded Wall Street bank. The bank's newly organized central contract administration reviewed each of their 80 consultants in great detail. This review process included conducting personal interviews and asking each consultant to complete a company personnel form required by the bank for all new full-time employees. The consultants had to fill in information regarding their employment situation and salaries. The idea was that if all levels of the bank's employees were required to complete such a form, then certainly a highly paid consultant, who had access to sensitive information, should be required to do the same. The head of contract administration started out with an estimate that 15% of the consultants were independents. The bank's policy is to request that the consulting firms notify the bank when independents are being substituted for full-time employee consultants. As it turned out, over 60% of their consultants were in fact independents.

There are a number of reasons why so many people have gone into independent consulting. For one thing, dp professionals are highly motivated by the entrepreneurial spirit. Traditional consulting firms—those that employ and maintain a permanent salaried staff—need to adjust their internal business to meet the diversified demand of the market while demonstrating sensitivity to rising labor costs. To satisfy the market, these firms have begun mixing independents in with their full-time consultants. The mixture yields hybrid firms that represent both their own full-time consultants as well as independent consultants who now acquire the status of subcontractors.

Why do dp professionals go out on their own? What effect have they had on the industry? What risks do these people take? Independents are lured to their new state by the promise of more money, a desire to do the work they know and like best, the challenge of running a business free from bureaucracy and politics, and the ever-increasing demand for their talent. Obviously, most people take the plunge into independent consulting for the monetary reward. Independent consultants, on average, can earn in seven months what they normally earned in a year working for a firm full-time. (This route gives rise to the possibility of the $100,000 programmer that IBM predicted.)

Along with monetary gains, the independent consultant can cash in on the rarity of special expertise. As a new form of technology ages, the competition in that area grows because more people acquire the skill. The aging process often spells diminished value of the knowledge and, therefore, diminished worth of the expert for a particular corporation. The specialty can have a very long and well-rewarded life, however, if the expert takes it on the road.

The independent approach provides dp professionals with a career path that encompasses the best of both the corporate management and technical development routes. The corporate path is appealing primarily because of the monetary gain associated with moving up the corporate ladder into a management position, and, almost invariably, out of a technical position. The technician thus acquires broader responsibilities but sacrifices continued technical development and risks becoming technically obsolete. Independents can remain as technically acute as they wish while earning a larger income. Furthermore, the independent is exposed to more diverse projects and organizations which, in the long run, can enhance and broaden an individual's perspective. If an independent ever decides to return to corporate life the consulting experience provides the corporation with a more mature and well-rounded dp professional.

Consulting firms have also contributed to the increased number of independent consultants. The rising cost of labor, especially during the recent recession, put many consultants on downtime (a period between assignments), and forced traditional consulting firms to seek alternatives to keeping qualified people on staff. These firms must absorb the cost of salaries even when their consultants aren't working. In the meantime, clients

READERS' FORUM

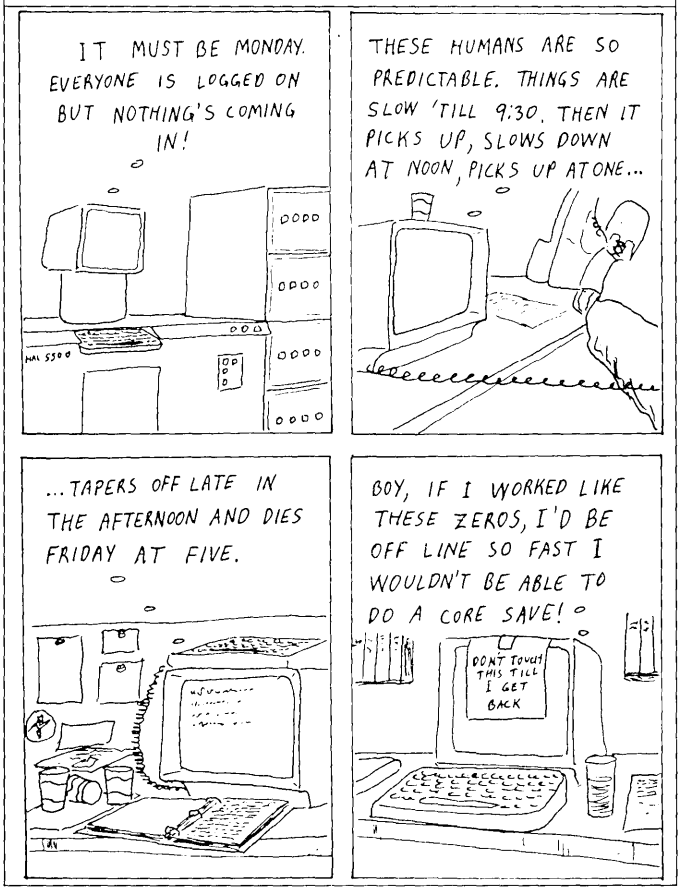
have been demanding more diverse and precise consulting fits, thus putting pressure on full-time firms to subcontract work to independents. The cost of retaining specialists on salary is high. To reduce this expense, consulting firms can engage independent consultants with expertise in specific areas, as needed. (ADAPSO reports that personnel costs can account for 60% of a consulting firm's overhead expense.)

In the past, consulting firms could always somehow force their employees who were between assignments into client requirements whether or not they were truly suitable. Many consulting firms would resort to bargaining: temporarily lower rates or give free consulting time or quantity discounts (five consultants for the price of four). But client organizations now realize that merely populating an assignment with consultant bodies does not yield the most efficient long-term cost benefit. The recession's squeeze has created a more critical customer of consulting services; the full-time employee consulting firms, therefore, had to consider subcontracting for highly specific assignments.

What, you may ask, would keep anyone from becoming an independent in such a rewarding environment? The costs of corporate benefits, for one thing, and assuming the risk for downtime, for another. These concerns lose significance, though, when one considers the financial reward most independent consultants can enjoy. Traditional employment benefits such as insurance, education, and vacation time at an average per diem rate can be covered by independent consultant earnings in approximately one month of billing. In the case of working couples, some of the insurance benefits are covered under the spouses' plans, which eliminates this concern. An independent consultant can construct a more precise and suitable benefit plan anyway.

The greatest risk for independents is downtime. But by

DIGITS BY ROY MENGOT



working just seven months a year, they can provide themselves with enough compensation to equate to the gross salary they would have earned as full-time employees. In any case, the great demand for qualified dp professionals in today's marketplace minimizes concern about downtime.

Client organizations have also helped force independents to work through consulting firms. Client organizations with multimillion dollar consulting budgets put up a barrier to dealing with independents directly. This barrier is a qualified vendor list for which the client firms require specific qualifications for entry, including detailed financial statements, reference checks, extensive liability insurance, and fidelity (performance) bonds. (Fidelity bonds are almost impossible for an individual to obtain.)

Consultants themselves often seek representation by consulting firms. Individual consultants do not usually have the wide spectrum of client contacts required in an ever-changing marketplace. Assuming they had the contacts, they would still need to spend a great deal of time finding out where their skills were needed, a bewildering—even overwhelming—task for one person. To support this search for an appropriate market, an independent would need to raise his rates to cover the potential loss in revenue. In many cases, independent consultants lack the marketing talent it takes to sell themselves directly. A final reason is cash flow. Even at higher billing rates, going into a consulting assignment without benefit of an intermediary often means a lag time between work completed and payment received. This period can span 60 to 90 days, and sometimes longer. The independent consultant would have to be in a position to absorb daily living expenses for this waiting period. By dealing through a consulting firm, which would regularly reimburse him, the consultant is spared the interruption in income.

Independents should pay attention to the details of the contractual relationships and agreements they sign with consulting firms. They should also carefully review the master agreement the firm has with the client organization. It is the latter agreement that may dictate whether or not a consultant receives payment, especially when performance issues surface. Independents should also be leery of signing certain assignment agreements that require they represent themselves as full-time employees of the consulting firm or that severely limit their representation to certain companies. These types of agreements are restrictive and ethically questionable.

On the other hand, a good reason for clients to deal through a consulting firm is for liability purposes. If the client dealt directly with independent consultants and encountered performance problems, he would have no recourse to recover losses except to terminate the consultant's contract early. Thus, leverage over an independent consultant is rather limited; in a dispute, large organizations risk being seen as Goliaths to the little Davids even if justice is on the client's side. A consulting firm is more likely to offer the client organization some type of retribution for poor performance, such as overlapping replacement consultants at no extra charge.

Because there are so many independent consultants, some large corporate users of consulting services are considering the idea of forming in-house service bureaus that would behave exactly like consulting firms that represent independents. Client organizations are considering this option either to reduce consulting expenditures or to provide a means for their central contract administration areas to offer this service to other corporations and become profit centers instead of simply in-house staff areas. In the first case, corporate users hope to avoid paying the management fee consulting firms charge for representing independent consultants. That fee is the portion of the bill retained by the consulting firm after the independent has been paid. It must take into account the consulting firm's costs, overhead, commissions, and profit margins.

READERS' FORUM

Systems Information Resource (SIR) conducted an extensive marketing survey to determine the prevalent fee. After interviewing hundreds of consultants, SIR compiled a statistical database encompassing their billing rates, client organizations, consulting firms, and the rate the consultants received for a particular assignment. These numbers were later verified by reference checks with independent consultants who applied to SIR. The survey showed the average management fee in the dp consulting industry was 34%, and the normal range was between 22% and 46%. Further, the higher the billing rate the greater the management fee percentage. This is understandable because it is easier to hide higher fees in higher rates. The survey also supports the opinion that most firms representing independents have a "get what you can" attitude toward pricing. After a while, consulting firms seem to develop a cynical attitude toward pricing. They know which organizations are willing to pay more for a consultant and charge those companies accordingly.

Pure logistics argues against a corporation assuming responsibility for dealing directly with independents. Merely screening and selecting the few consultants actually required would mean an incredible amount of traffic into an organization. A large staff would be needed to interview, screen, track, monitor, advertise for, and run reference checks on all these consultants. And, because it always comes down to availability, a service area must maintain many more names of consultants on file than it can actually use to be properly prepared to meet requirements as they come up. This activity can be very costly and time-consuming unless the client base is large enough to support it.

After analyzing the various rates, management fees, and costs, we concluded that most firms gravitate toward the 34% margin (although some are able to operate, profitably, with a 20% management fee) because it allowed a billing rate to which client organizations were accustomed. For example, if the overhead costs were taken away—that is, the costs of down-time, benefits, education, and vacation time—the billing rate for the independent should actually be less than that for full-time employees. The so-called hybrid consulting firms (representing both full-time and independents) have brought the cost of the independent up to par with the full-time consultant to avoid underpricing their own employees. Such a tactic is understandable for a hybrid firm because overhead expenses—not even including salary and benefits—are much higher in comparison with those of firms that represent independents exclusively. To cover a higher administrative expense the management fee is forced up to the 34% level.

An interesting side note is that dp managers seem willing to pay higher rates for the same candidate. Their buying decisions are based on long-standing relationships with certain consulting firms rather than on what may be more financially prudent. A glaring example was one client who was willing to pay $1,200 a week more for four independent consultants through one firm, rather than obtain the same talent for significantly less through other channels.

Consulting firms have gotten away with this approach because, until recently, client organizations were aware only of bottom-line billing rates. A more educated client, newly informed of what a rate actually comprises, will expect it to drop. Because the changing environment includes more and more independent consultants, most clients don't know what the rates could be.

—Jeffrey M. Short
New York, New York

If you'd like to share your opinions, gripes, or experiences with other readers, send them to the Forum Editor, DATAMATION, 875 Third Ave., New York, NY 10022. We welcome essays, poems, humorous pieces, or short stories.

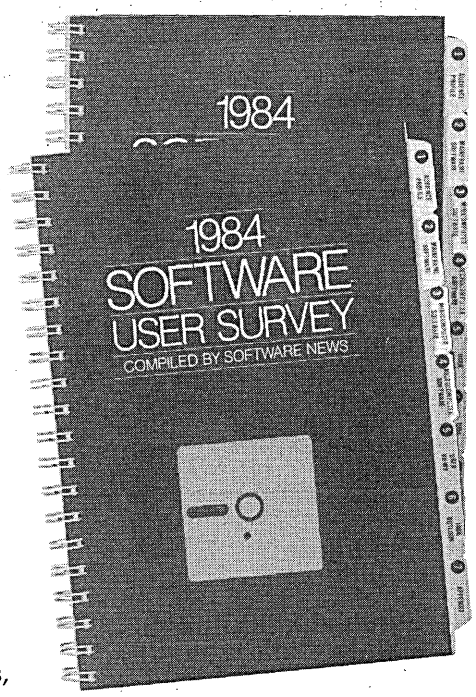
Second Annual Software User Survey Forecasts Prosperity and Problems for Major Vendors

Be prepared for some eye-openers in 1984's software market...order your personal copy of the Software User Survey today

The results are now in from the second annual Software User Survey conducted by Software News. Over 2000 major national accounts participated.

Virtually every sector of the U.S. economy was polled...banks, insurance firms, manufacturers, distributors, medical and legal groups, educational institutions, systems houses, process industries, etc. The respondents identified the software packages they are now using and what they plan to buy in 1984. The mainframes, minis and microcomputers currently in use and those planned for purchase in 1984 are also identified.

The 200-page report of the survey results ranks the leading software vendors by their relative market shares. The expected increases in 1984 software expenditures are analyzed separately for mainframes, minis and micros. Twenty-seven specific categories of applications and systems software were studied to identify the fastest growing segments. Examine the Table of Contents for more details.



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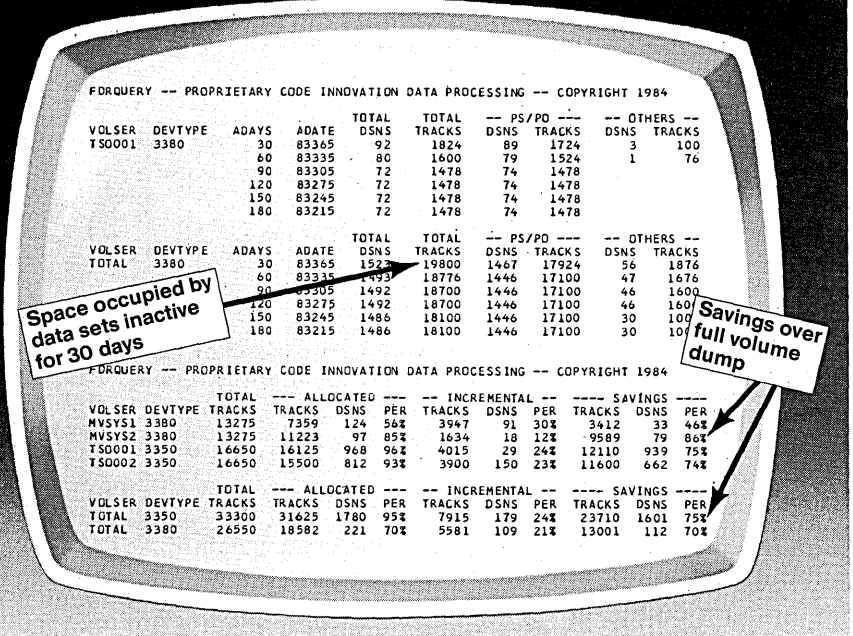

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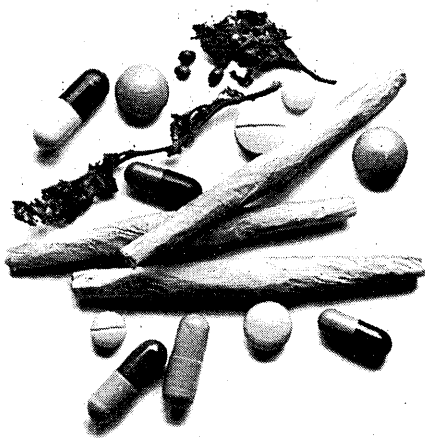
CIRCLE 24 ON READER CARD

Get involved with drugs before your children do.



Sooner or later, someone's going to offer to turn your children on.

It could be their best friends.

And chances are, you won't be anywhere in sight.

So what can you do?

Obviously, the time to talk to your children about drugs is before they have to make a decision on their own.

Which means you have to learn something about drugs.

Learn the dangers. And learn to recognize the signs of drug use. Listlessness in your child. Sudden drop in school grades. Temper flare-ups and staying out late a lot.

Learn about peer pressure on a twelve-year-old. Then show them you understand how important their friends are to them. But also tell them that real friends won't insist they do drugs.

Check your own personal habits. You can't tell a child about the dangers of drugs with booze on your breath.

But it's through love and understanding that you can be the most effective. Threatening to tear their arms off just won't work.

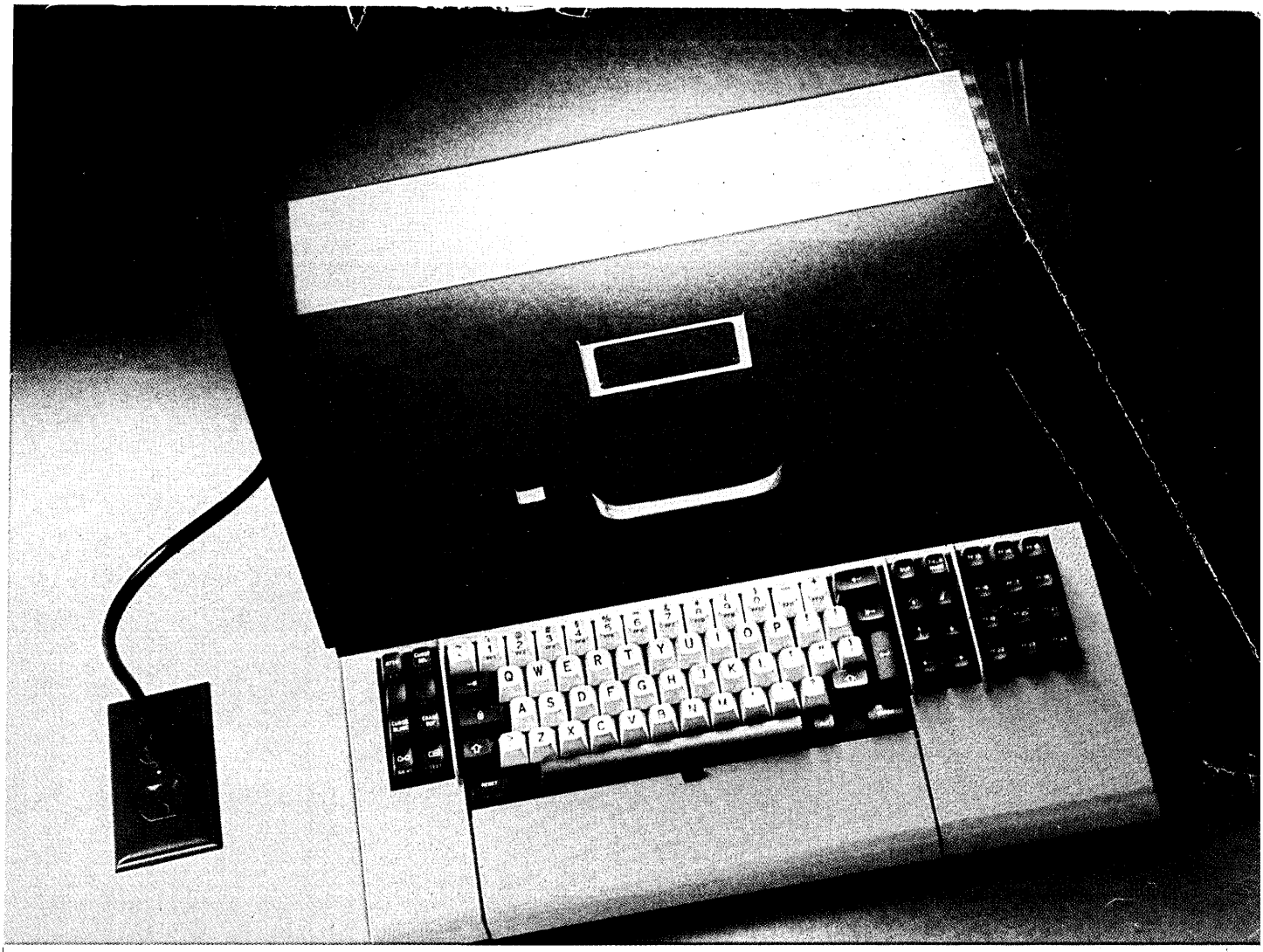
You can get a lot more ideas from the booklet, "Parents: What You Can Do About Drug Abuse." Write: Get Involved, P.O. Box 1706, Rockville, Maryland 20850.

Remember, it doesn't always happen to someone else's kids.

After all, there are over 35 million drug users in America.

And they're all someone's children.

Ad Council A public service of this publication and the National Institute on Drug Abuse.



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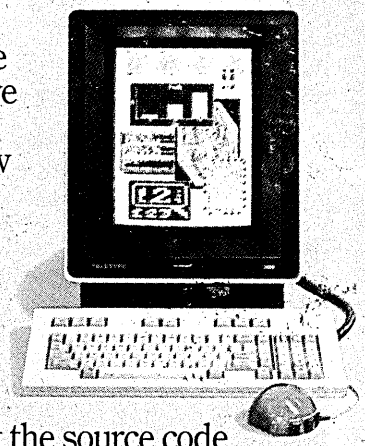
CIRCLE 26 ON READER CARD

OUR 5620 TERMINAL WILL CHANGE THE WAY YOU VIEW YOUR UNIX* SYSTEM.

If you want to get the most out of your UNIX System, get the single terminal that performs like six—the 5620 Dot-Mapped Display from Teletype Corporation. This terminal is an exceptional value because it offers graphics and capabilities you'd expect to find only in higher-priced workstations.

With its unique capability to divide the display into six windows, the 5620 makes excellent use of UNIX System V resources to greatly improve productivity. You create and control the size and position of each window simply, using the electronic "Mouse." Unmodified host programs then view the windows as separate terminals, making it possible for you to work on several things at once.



Just think how much easier that'd make it for you to prepare documents and graphics, do computer aided engineering or write and debug programs. Imagine, for example, while a program is compiling in one window, you edit the source code in a second window, check output in a third window, and send and receive mail concurrently in a fourth window.

The 15-inch diagonal display boasts 100 dots per inch, which gives you high resolution graphics and font capabilities. Complete with a full 32-bit processor and up to one megabyte of memory, you can also offload the host by running programs in the 5620.

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